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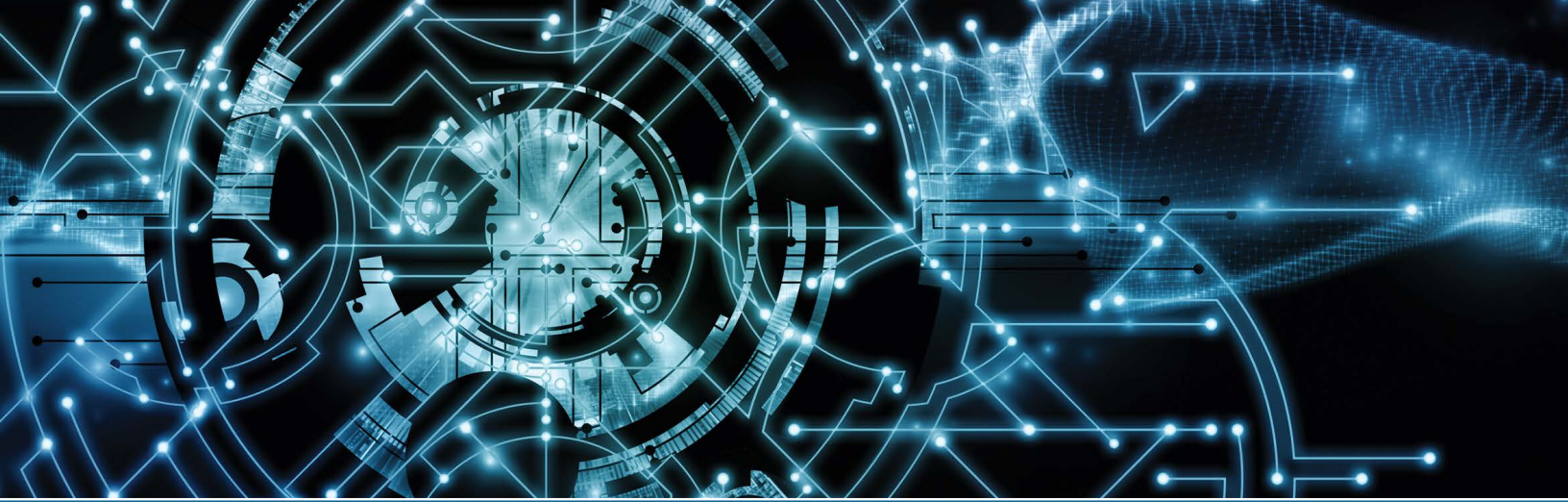


COMPLETE A+ GUIDE TO IT HARDWARE AND SOFTWARE

CompTIA® A+ Exams 220-1101 & 220-1102
Lab Manual

CHERYL A. SCHMIDT
CHRISTOPHER A. LEE





Complete A+ Guide to IT Hardware and Software Lab Manual

A CompTIA A+ Core 1 (220-1101) & CompTIA
A+ Core 2 (220-1102) Lab Manual

NINTH EDITION

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FLORIDA STATE COLLEGE AT JACKSONVILLE

CHRISTOPHER A. LEE

PEARSON IT
CERTIFICATION

Complete A+ Guide to IT Hardware and Software Lab Manual, Eighth Edition

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About the Authors

Cheryl Schmidt is a professor of Network Engineering Technology at Florida State College at Jacksonville. Prior to joining the faculty ranks, she oversaw LAN and PC support for the college and other organizations. She started her career as an electronics technician in the U.S. Navy. She teaches computer repair and various networking topics, including CCNA, network management, and network design. She has published other works with Pearson, including *IP Telephony Using CallManager Express* and *Routing and Switching in the Enterprise Lab Guide*.

Cheryl has won awards for teaching and technology, including Outstanding Faculty of the Year, Innovative Teacher of the Year, Cisco Networking Academy Instructor Excellence Award, and Cisco Networking Academy Stand Out Instructor. She has presented at U.S. and international conferences. Cheryl keeps busy maintaining her technical certifications and teaching but also loves to travel, hike, do all types of puzzles, and read.

Christopher Lee teaches Information Technology and Electronics at Florida State College at Jacksonville. A native of Greenville, South Carolina, Chris earned a bachelor's degree and a master's degree in Electrical Engineering from Georgia Institute of Technology. He taught his first computer programming classes at age 14! Since then, he has worked for a variety of companies including IBM, Nortel Networks, Evans Solutions, Convergys Corporation, NGA Human Resources, and himself. His experience spans several industries: Telecommunications, Youth Outside the Educational Mainstream, Information Technology, Higher Education, Human Resources Outsourcing, and Community Development.

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Dedications

A Note to Instructors from Cheryl:

I was a teacher long before I had the title professor. Sharing what I know has always been as natural as walking to me, but sitting still to write what I know is not as natural, so composing this text has been one of my greatest challenges. Thank you so much for choosing this text. I thank you for sharing your knowledge and experience with your students. Your dedication to education is what makes the student experience so valuable.

A Note to Students:

Writing a textbook is really different from teaching class. I have said for years that my students are like my children, except that I don't have to pay to send them through college. I am happy to claim any of you who have this text. I wish that I could be in each classroom with you as you start your IT career. How exciting!

IT support is an ever-changing field. You have to be excited about the never-ending changes to be good in this field. You can never stop learning, or you will not be very good anymore. I offer this important piece of advice:

Consistent, high-quality service boils down to two equally important things: caring and competence.
—Chip R. Bell and Ron Zemke

Acknowledgments

From Cheryl Schmidt:

I am so thankful for the support of my family during the production of this book. My husband, Karl, daughters, Raina and Karalina, and son-in-law, Marc, were such a source of inspiration and encouragement. My grandsons, Gavin, Riley, Logan, and Liam, and my granddaughters, Brie and Liv, are a constant source of wonderment for me. Thanks to my mother who recently passed away, Barbara Cansler, who taught me to love words, and my brother, Jeff Cansler, for just listening. Thanks to my walking buddy, Kellie, for the miles of letting me work through knotty sections. Thanks to my colleagues, adjuncts, and students at my college who offered numerous valuable suggestions for improvement and testing the new material. Thanks to my colleagues Pamela Brauda and David Singletary for inspiring me as a teacher. Finally, I want to thank my co-author and a great teacher, Chris Lee, as well as my personal technical team, Justin Ache, Raina Durrence, Marc Durrence, and Jeff Burns.

Many thanks are also due the folks at Pearson. The professionalism and support given during this edition was stellar. Thank you so much, Pearson team, especially James Manly, Eleanor Bru, Kitty Wilson, Mandie Frank, and Chris Crayton. I thank the whole team so much for your conscientious efforts.

Finally, thank you to the students who have taken the time to share their recommendations for improvement. You are the reason I write this book each time. Please send me any ideas and comments you may have. I love hearing from you and of your successes. I may be reached at cheryl.schmidt@fscj.edu.

From Chris Lee:

I am thankful for the lifetime of support and guidance that have allowed me to achieve my dreams and contribute to this book. My parents, Brenda McClinton and Herman Brown, have always encouraged me to follow my own path. They have also been my favorite remote “clients,” as they have embraced computer technology whereas many of their peers find it intimidating. My grandparents, Roosevelt and Bettye Nelson, are my biggest cheerleaders; they're always excited to hear about my latest projects during our weekly phone calls. I appreciate the patience and motivation from my son, Jawara, as he discovers his own niche within the world of computer science and in life itself.

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Credits

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Introduction

Complete A+ Guide to IT Hardware and Software, ninth edition, is a textbook and optional lab manual intended for one or more courses geared toward CompTIA A+ Certification and computer repair. It covers all the material needed for the CompTIA A+ Core 1 (220-1101) and CompTIA A+ Core 2 (220-1102) exams. The book is written so that it is easy to read and understand, with concepts presented in building-block fashion. The book focuses on hardware, software, mobile devices, virtualization, basic networking, and security.

Some of the best features of the book include the coverage of difficult subjects in a step-by-step manner, carefully developed graphics that illustrate concepts, photographs that demonstrate various technologies, reinforcement questions, critical thinking skills, soft skills, and hands-on exercises at the end of each chapter. Also, this book is written by teachers who understand the value of a textbook as we both are very active in the classroom and community.

What's New in the Ninth Edition?

This edition has been revised to include more relevant coverage of hardware, including SSD migration and a few new network concepts, such as updated wireless standards, updated browser security settings, and DNS material. Some references to Windows 7 were left where it is quite different from Windows 8, 10, or 11. More scripting is included as well. The following are a few of the many new features of this edition:

- > This book conforms with the latest CompTIA A+ exam requirements, including those of the CompTIA A+ Core 1 (220-1101) and CompTIA A+ Core 2 (220-1102) exams.
- > Chapter 2 now includes information on Cat 8 and direct burial cable, as well as updated graphics showing motherboard ports.
- > Chapter 3 now includes information regarding ARM processors.
- > The video information in Chapter 4 has been moved to Chapter 8. Chapter 4 introduces TPM, which is covered in more depth in Chapter 18.
- > The book has always been filled with graphics and photos, but even more have been added to target those naturally drawn to the IT field. This edition is full color.
- > There are questions at the end of each chapter, and even more questions are available in the test bank available from the Pearson Instructor Resource Center.

Organization of the Text

The text is organized to allow thorough coverage of all topics and also to be a flexible teaching tool. It is not necessary to cover all the chapters, nor do the chapters have to be covered in order.

- > **Chapter 1** provides an introduction to IT and careers that need the information in this book. It identifies computer parts. Chapter 1 does not have a specific soft skills section, as do the other chapters. Instead, it focuses on common technician qualities that are explored in greater detail in the soft skills sections of later chapters. Finally, Chapter 1 provides a great introduction to using Notepad, the Windows Snipping Tool, and internet search techniques.
- > **Chapter 2** is about connecting things to a computer and port identification. Details are provided on video, USB, and sound ports. The soft skills section is on using appropriate titles.
- > **Chapter 3** details components, features, and concepts related to motherboards, including processors, caches, expansion slots, and chipsets. Active listening skills are the focus of the soft skills section.
- > **Chapter 4** deals with system configuration basics. BIOS options, UEFI BIOS, and system resources are key topics. The soft skills section covers the importance of doing one thing at a time when replacing components.

- > **Chapter 5** steps through how to disassemble and reassemble a computer. Tools, ESD, EMI, and preventive maintenance are discussed. Subsequent chapters also include preventive maintenance topics. Basic electronics and computer power concepts are also included in this chapter. The soft skills section involves written communication.
- > **Chapter 6** covers memory installation, preparation, and troubleshooting. The importance of teamwork is emphasized as the soft skill.
- > **Chapter 7** deals with storage devices, including SATA SCSI, SAS, and SSDs. RAID is also covered. Phone communication skills are covered in the soft skills section of this chapter.
- > **Chapter 8** covers video and multimedia devices, including optical drives, sound cards, cameras, scanners, and speakers. The chapter ends with a section on having a positive, proactive attitude.
- > **Chapter 9** provides details on printers and multifunction devices. A discussion of work ethics finishes the chapter.
- > **Chapter 10** is on mobile devices, including details on mobile device operating systems, configuration, backup, security, and troubleshooting. The soft skills section takes a brief foray into professional appearance.
- > **Chapter 11** covers computer design. Not only are the specialized computers and components needed within the types of systems covered, but computer subsystem design is also included. Because design and troubleshooting use higher levels of critical thinking skills, the chapter also includes a review of troubleshooting, including logic, error codes, and troubleshooting flowcharts. The soft skills section provides recommendations for dealing with irate customers.
- > **Chapter 12** handles internet connectivity, virtualization, and cloud technologies. It covers internet browser configuration, along with the soft skill mentoring
- > **Chapter 13** introduces networking. Basic concepts, terminology, and exercises make this chapter a favorite. Appendix A provides an introduction to subnetting that can be used in conjunction with this chapter. The focus of the soft skills section is being proactive instead of reactive.
- > **Chapter 14** provides an introduction to operating systems in general and discusses basic differences between the Windows versions and how to function in the various Windows environments. The soft skills section includes tips on how to stay current in this fast-paced field.
- > **Chapter 15** provides an introduction to scripting and includes how to function from the command prompt and the basics of scripting in Python, JavaScript, shell scripting, VBScript, batch files, and PowerShell. The soft skills section discusses looking at a problem from the user's perspective and being more empathetic.
- > **Chapter 16** covers Windows 8, 10, and 11. Details include how to install, configure, and troubleshoot the environment. Avoiding burnout is the soft skill discussed in this chapter.
- > **Chapter 17** discusses the basics of macOS and Linux. It provides a basic introduction to these two environments to help a technician become familiar with the environment and a few tools. The soft skills section talks about being humble.
- > **Chapter 18** describes computer, mobile device, and network security. The soft skills section is on building customer trust.
- > **Chapter 19** guides the student through operational procedures such as workplace safety, recycling, disposal, a review of power protection, change management, and communication skills.
- > **Appendix A** is an introduction to subnetting and variable length subnet mask (VLSM).

1

Introduction to the World of IT Labs




Lab 1.1 Getting Started in Windows 10 or 11

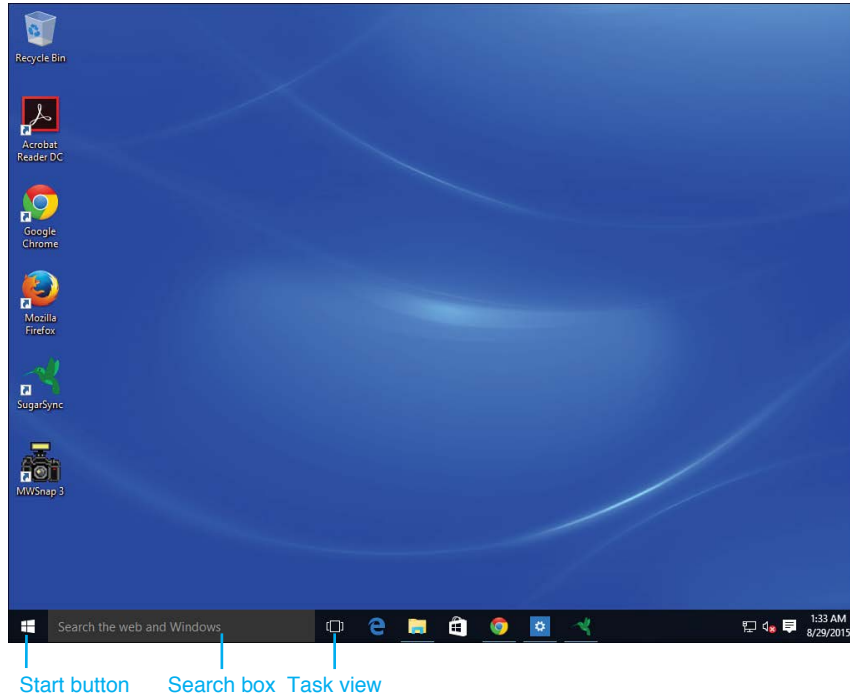
Objective: To be able to use Windows 10 or 11 to locate and launch applications and locate Control Panels used in future labs

Parts: Windows 10/11 computer

Procedure: Complete the following procedure and answer the accompanying questions.

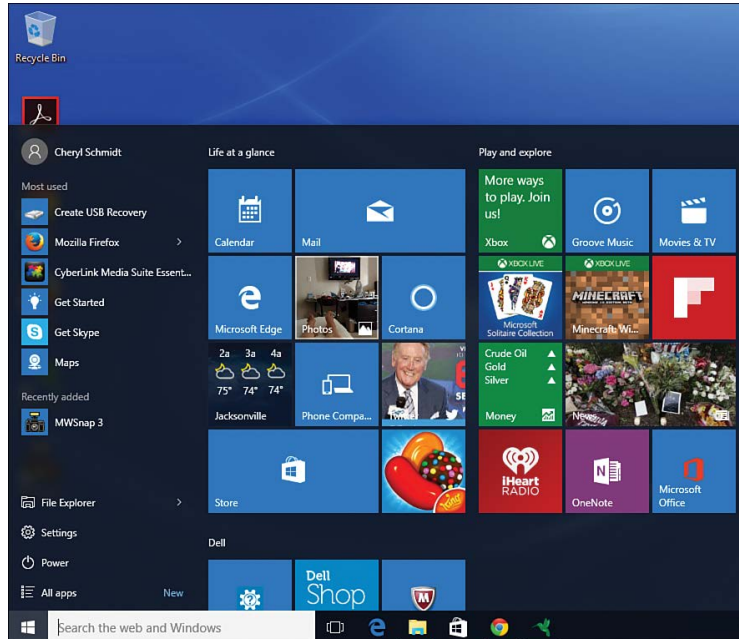
1. Power on the computer. If the computer is locked, the method use to unlock a Windows desktop depends on the type of computer you have:
 - > **Touch screen:** Press your finger on the screen and move upward.
 - > **Desktop computer:** Press any key and release, click the mouse anywhere, click the mouse near the bottom of the screen, or hold the mouse button down while moving the cursor upward.
 - > **Laptop:** Press any key and release, click the mouse anywhere, hold down the left trackpad section or button, or move the cursor upward.
2. Type the password or PIN. Contact the instructor or lab assistant if the password is unknown.

Note: Anywhere in this lab when the direction is to “click” or “select” something, if a touch screen is available, you can tap with your finger instead.
3. Windows 10 and 11 were designed for both traditional desktop and mobile (touch) devices. The Windows 10 or 11 desktop is different from previous Windows version, as shown in Lab Figure 1.1. You can press the  key on the keyboard at any time to bring up the Start menu.



LAB FIGURE 1.1 Windows 10 desktop

4. Notice the leftmost *Windows* icon; this is the Windows 10 or 11 version of the Start button. Select the *Start* button to access apps, as shown in Lab Figure 1.2.



LAB FIGURE 1.2 Windows 10 Start button

5. Again select the *Windows* (Start) icon to return to the desktop.
List one icon of a commonly used application that is on your desktop.

6. Select the *Start* button again. The most commonly used apps are at the top. Scroll through the options. Notice that the list contains both applications and folders.

- In Windows 10, locate and select the *Windows Accessories* folder to expand it. In both Windows 10 and 11, locate and select the *Notepad* app and launch it.

What is the name of the first menu item shown on the far left inside the Notepad app?

- Notice the three buttons in the top-right corner in the Notepad window (see Lab Figure 1.3). These buttons are found in almost every window that opens. Lab Table 1.1 details the purpose of each of these buttons.



LAB FIGURE 1.3 Windows buttons within a window

LAB TABLE 1.1 Windows top-right window buttons

Button	Purpose
Minimize (straight line)	Keeps the program running but removes it from being active on the screen. Use (Alt)+[Tab] to re-access the app.
Maximize/Restore down (rectangle)	Used to make the window that holds the app full screen (maximize) or, if you size the window, restore it to its default size.
Close (X)	Used to close an app.

- Select the *Minimize* button (straight line). Notice that the application icon displays at the bottom of the screen in the taskbar as a small blue spiral notebook.
- Click on the *Notepad* application icon at the bottom of the screen on the taskbar. The Notepad application opens on the screen. Click the *Close* button (X) to close the application.
- Another way to locate and launch an app is by using the *Search* textbox. Select the icon that looks like a magnifying glass or click inside the textbox and type the word **note** but do not press **[Enter]**. Notice that the Notepad desktop app is listed at the top of the screen. Any other app that has *note* in the app name also appears.

List one other app that is shown that has the letters “note” in its name. Write “None” if no other apps appear.

Note: When you have two or more applications open in Windows 10, you can hold down the **(Alt)** key and press the **[Tab]** key to cycle through any open applications.

- Search for, select, and launch the *Calculator* app. The Calculator app opens.
Which leftmost icon is directly below the word Calculator? [clock | plus sign | 3 bars | left arrow]
- Close the *Calculator* app.

14. Select the *Start* button. Launch one of the other apps.

Which app did you choose?

Instructor initials: _____

15. Close the application by selecting the *Close* button.


Lab 1.2 Using a Search Engine

Objective: To use Google to effectively search for information

Parts: Windows computer with internet access

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer. Log in or unlock the screen.
2. *Windows 7 users:* Select the *Start* button in the bottom-left corner, select *All Programs*, and then select a web browser.

Windows 8 users: Access and launch a browser app such as Windows Edge, Google Chrome, or Mozilla Firefox from the Windows start screen. If one is not readily visible, click on the Windows icon in the bottom-left corner to get a customized view of the applications. (On a mobile device, this may be a Windows symbol that you touch on the front side of the device to access these apps. You can then click the  that is inside the circle in the bottom left to view all apps and pick a browser app from there.)

Windows 10 users: Access and launch a browser app such as Microsoft Edge, Google Chrome, or Mozilla Firefox from the Windows start screen. If one is not readily visible, select the *Start* button and scroll through the list to locate a browser app. Click on the browser app name to launch it.

3. In the browser window, type the following: **www.google.com**


If a computer user has a Dell Windows 10 computer that the user complains is slow to boot, what search terms would you put in the browser window? List at least three.

4. In the search textbox, type the following: **Windows 10 computer problems**

Approximately how many results list at the top of the screen under the menu?

5. Change the search criteria to **Windows 10 computer problem** (removing the *s* from *problems*).

Approximately how many results list at the top of the screen under the menu?

6. Go into the first three problems by clicking on the first title line. To return to the search results, click the *Back* arrow (.

Do any of the problems have anything to do with slow booting?

7. In the search textbox, type the following: **Windows 10 slow boot**

Access the first result by clicking on the title line.

What was the solution given in the resulting web link?

8. Sometimes suggestions for computer solutions contain links to software that might not be free after so many days and may contain malware or a virus. Only click on a link or use software tools from trustworthy vendors. Return to the search criteria by clicking on the *Back* arrow (←) or retyping **www.google.com** in the search textbox. Now change the search to **Microsoft Windows 10 slow boot**. Look at the number of results listed and then access the first result.

Approximately how many results are available?

Access the first result by clicking on the title line.

What was the solution given?

Do you think that this might be a good solution for the person who owns the Dell computer?

[Yes | No | I have no idea]

9. Now add the word *Dell* to the search criteria, searching for the following: **Microsoft Windows 10 Dell slow boot**

Approximately how many results are available?

Access the first result by clicking on the title line.

What solution was given?

Lab 1.3 Performing a Screen Capture

Objective: To use the Microsoft Windows Snipping Tool and Snip & Sketch tool to effectively capture information

Parts: Windows computer with the Snipping Tool application and the Snip & Sketch tool

Procedure: Complete the following procedure and answer the accompanying questions. If you are not familiar with launching an application, complete Lab 1.1 before doing this lab.

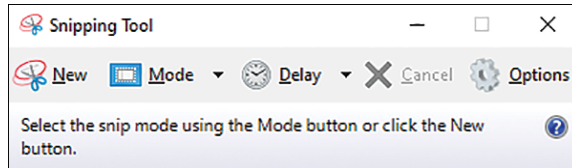
TECH TIP

How to do a quick screen capture





On a Windows machine, press the Print Screen key and use the Paste function to paste the image into an application.

To take a screenshot on a Mac, hold these three keys down, one at a time (keeping each one down as you add another key): (⇧+⌘+Ⓜ). To capture a portion of the screen, use (⇧+⌘+Ⓜ+Ⓝ). To capture a window or menu, use (⇧+⌘+Ⓜ+Ⓝ+Spacebar). By default, the screenshots save to the desktop, and you can move them to a folder later.

1. Power on the computer. Log in or unlock the screen.
2. Access a web browser. Leave it on the screen.
3. Many times when you are solving a problem, performing a task, or helping someone else, a picture is worth a thousand words. Locate and launch the Snipping Tool by expanding Windows Accessories or searching using the Windows Search textbox. The Snipping Tool application starts, as shown in Lab Figure 1.4




LAB FIGURE 1.4 Snipping Tool application window

4. The Snipping Tool enables you to capture everything that shows on the screen (full-screen snip), a particular window that is open on the screen (window snip), a particular section of the screen that could be captured in a rectangle (rectangular snip), a particular part of the screen that is oddly shaped, or simply an icon or a symbol (free-form snip). Click the  beside the *Mode* menu option. Four options display. The default one has a  beside it.
5. Click on the *Tools > Options* menu item. One particular option that you can select by clicking inside a box is the *Ink color* to select a color along with the *Show selection ink after snips are captured* option. This feature automatically creates a box around whatever information is captured. Do not select it yet. Click *Cancel*.
6. Ensure that the browser window is not taking up the entire desktop area. You can use the Maximize/Restore Down button located in the top-right corner to size the window. (Refer to Lab Figure 1.3 and Lab Table 1.1 in Lab 1.1 for information on the buttons that are in the top-right corner.)
7. In the Snipping Tool window, click the  beside the *Mode* menu option and select *Full-screen Snip*. The Snipping Tool application captures whatever is on the screen. If that is not what you want to capture and you only want to capture the search textbox, click *New*, and the Snipping Tool reverts to the small window.
8. Click on the  beside *Mode* again and select *Window Snip*. With a window snip, you must take the additional step of clicking on the window that you want. Click anywhere in the browser window.

What information is shown inside the Snipping Tool window?

List one instance in which you think an IT person might use the window snip option.

9. Pretend this still is not what you wanted because it is too big, and you want to just capture the search textbox. Click the *Minimize* button (the button to the left of the Maximize/Restore Down button you used before) within the browser window.
10. Re-access the browser window by clicking anywhere on it. In the address bar of the browser window, type **www.pearson.com** in the textbox at the top of the screen but do not press the  key.
11. With the browser window open, re-access the Snipping Tool by clicking on the *Snipping Tool* icon located in the taskbar (the icon showing scissors within a red circle) at the bottom of the screen. If the taskbar is not there, hold down the **(Alt)** key and, while continuing to hold it down, press **(Tab*)**. The currently running programs appear. Press the **(Tab*)** key again until the Snipping Tool is selected. Let go of both keys, and the Snipping Tool application window appears on the screen. Ensure that the Snipping Tool application window is on a part of the desktop by itself (not on top of the browser window). In order to move a window, you can click on the top part of the Snipping Tool window and, while continuing to hold down the mouse or touchpad, drag the window to a different part of the screen.
12. Click the *Mode* menu option and select *Rectangular Snip*. The screen appears grayed out. This is normal. A crosshairs symbol (which looks like a plus symbol) appears on the screen. Move the screen cursor (which, in turn, moves the crosshairs symbol) to the top part of the browser window, which contains the search textbox. Click and drag the crosshairs until it captures the part of the browser window that shows **www.pearson.com**.

List one instance in which you think an IT person might use the rectangular snip option.

13. After taking a screen capture, the Snipping Tool window has more menu options available. Click the *File* menu option.

Which four *File* menu options are available?

14. Click the *Edit* menu option. This option can be used to select *Copy* so you can simply paste into an email or word processing document. Select the *Tools* menu item. Point to the *Pen* option and select *Blue Pen* from the menu. Use the pen to circle the words *pearson.com*.

Instructor initials: _____


15. Access the *Tools* menu item again and select the *Highlighter* option. Highlight *www*.

Instructor initials: _____

16. Close the Snipping Tool window by clicking on the *Close* button, which is located to the immediate right of the *Maximize/Restore Down* button. The *Close* button is in the top right of the Snipping Tool application window and has an X on the icon.

17. When asked if you want to save the snipped document, click *No*.

Note: Only do Steps 18–22 if using a Windows 10/11 computer.

18. Using the Windows *Search* textbox, locate and open the *Snip & Sketch* tool. Notice the message on the screen about how you can use  + **Shift** + **S** as hotkeys to capture the screen.

19. Click the down arrow beside the word *New* in the upper-left corner and select *Snip Now*. Crosshairs that look like a plus sign appear on the screen. Click on the crosshairs and keep the mouse button held down to drag the crosshairs to make a rectangle that captures part of the screen. Let the mouse button go. This is known as a rectangular snip.

20. The part of the screen you drew appears in the *Snip & Sketch* window. If it does not appear, repeat step 19.

Instructor initials: _____

21. Notice at the top of the screen that tools appear. Click on the highlighter icon that is shaded yellow. When you click on it, notice that a blue underline appears, showing that it is selected. Move the pointer somewhere in the window where the captured image appears. Click and hold the mouse or pointer and drag it to highlight a part of the screen. Use either the pencil or ballpoint pen tool to further modify your capture.

Instructor initials: _____

22. Close the window. You do not have to save the document.

Lab 1.4 Creating a Text File

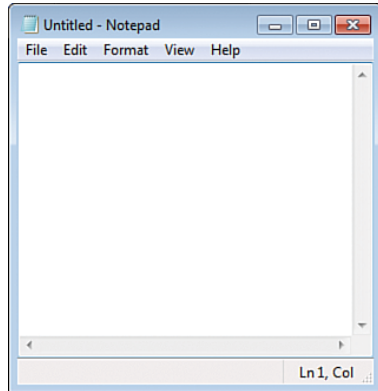
Objective: To use various applications to create a text file

Parts: Windows computer

Procedure: Complete the following procedure and answer the accompanying questions. If you are not familiar with launching an application, complete Lab 1.1 before doing this lab.

Note: If you do not have Microsoft Office or Microsoft 365, you can download Apache OpenOffice (openoffice.org) and install it on a Windows, Linux, or Mac computer. You can then use OpenOffice to open Word, Excel, and PowerPoint documents as well as create your own files. You can also use Google Docs (docs.google.com).

1. Power on the computer. Log in or unlock the screen.
2. Locate and launch the *Notepad* application. The Notepad application starts, as shown in Lab Figure 1.5.



LAB FIGURE 1.5 Notepad application

Which five menu options are available?

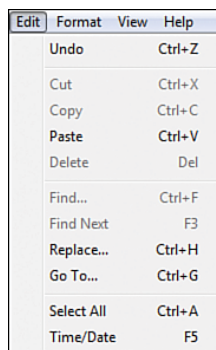
Which menu option do you think would be used to automatically insert the date and time?

Explore the menu options to determine which option would be used to turn on change the font.

Explore the menu options to determine which option would be used to turn on word wrap.

Explore the menu options to determine which option would be used to print a document.

- Notepad can be used to document problems on a computer that does not have a word processing app loaded, that does not have a working word processing app, or that has other issues. It can also be used for scripting, which is covered in Chapter 15, “Introduction to Scripting.” Both Microsoft Notepad and WordPad ship with the Windows operating system. Notepad does not have as many capabilities as WordPad. One of the things you can do with Notepad is insert the date and time into the document. Click the *Edit* menu item to see the full Edit menu, as shown in Lab Figure 1.6.

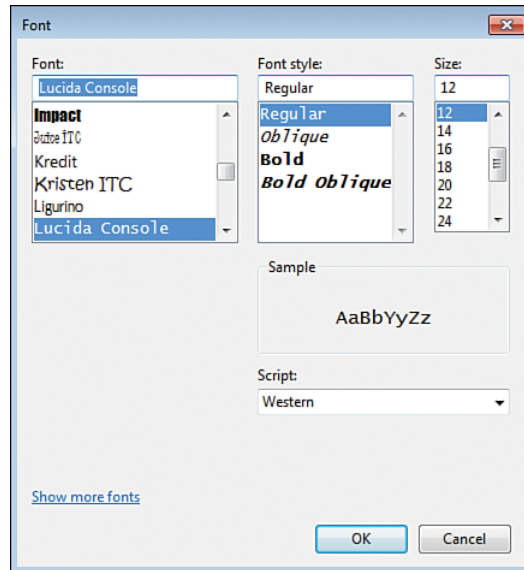


LAB FIGURE 1.6 Notepad Edit menu

- Notice the words on the left and the corresponding keystrokes to the right. This means, for example, that you can either use the mouse to access the *Edit* menu and then select *Time/Date*, or you can simply press the (F5) key to do the same thing. Click away from the Edit menu so you can try the keyboard shortcut. Click inside the blank *Notepad* window. Now press the (F5) key.
- Click the *View > Status bar* menu option.

What did this option do?

6. Click the *View > Status bar* menu option again and notice that there is now a check mark by the Status bar option, indicating that this option is enabled.
7. Notepad allows a few font modifications. To make the date and time boldface, start by clicking the *Format > Font* menu option to see the options, as shown in Lab Figure 1.7.



LAB FIGURE 1.7 Notepad Font dialog box

What is the default font (the font that is selected and highlighted by default)?

What are the names of the first and last font types? Use your mouse and the scrollbar to see the fonts.

8. Click the *Bold* option in the Font style section. Click the *OK* button to return to the Notepad window. Your date and time should have turned bold. Repeat steps 7 and 8 if the words are not boldfaced.
On your own, add the following message to the Notepad document. Ensure that you use the Verdana Regular 12 font type and size:
Replaced display and tested. User confirms that the problem is solved.

Instructor initials: _____

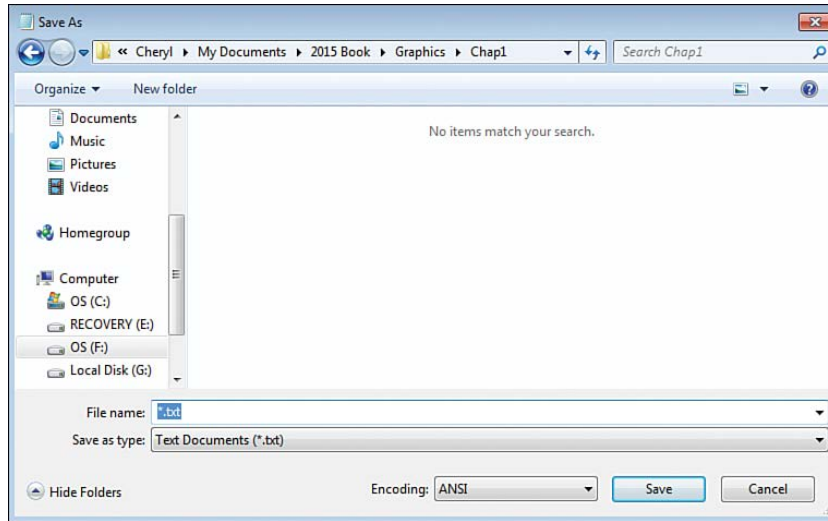
9. Click the *Help > View Help* menu option.
Which help topic would be of most interest to you?

10. Close the *Help* window by clicking on the *X* in the upper-right corner.
11. A header is a part of a document that might not appear on the screen, but when the document is printed, the information inside the header prints at the top of the page. A footer is at the bottom of the document. To insert a header and a footer in Notepad, click on the *File > Page Setup* option. Note that when you change the information in the header and footer, that information stays there for the current Notepad document and future documents as well.
Use *Help* to determine what *&f*, the default setting for the header, and *Page &p*, the default setting for the footer, mean. Document your findings.

12. Close the *Help* window.

Instructor initials: _____

13. To save the document, click *File > Save As*. A window with several options appears, as shown in Lab Figure 1.8.



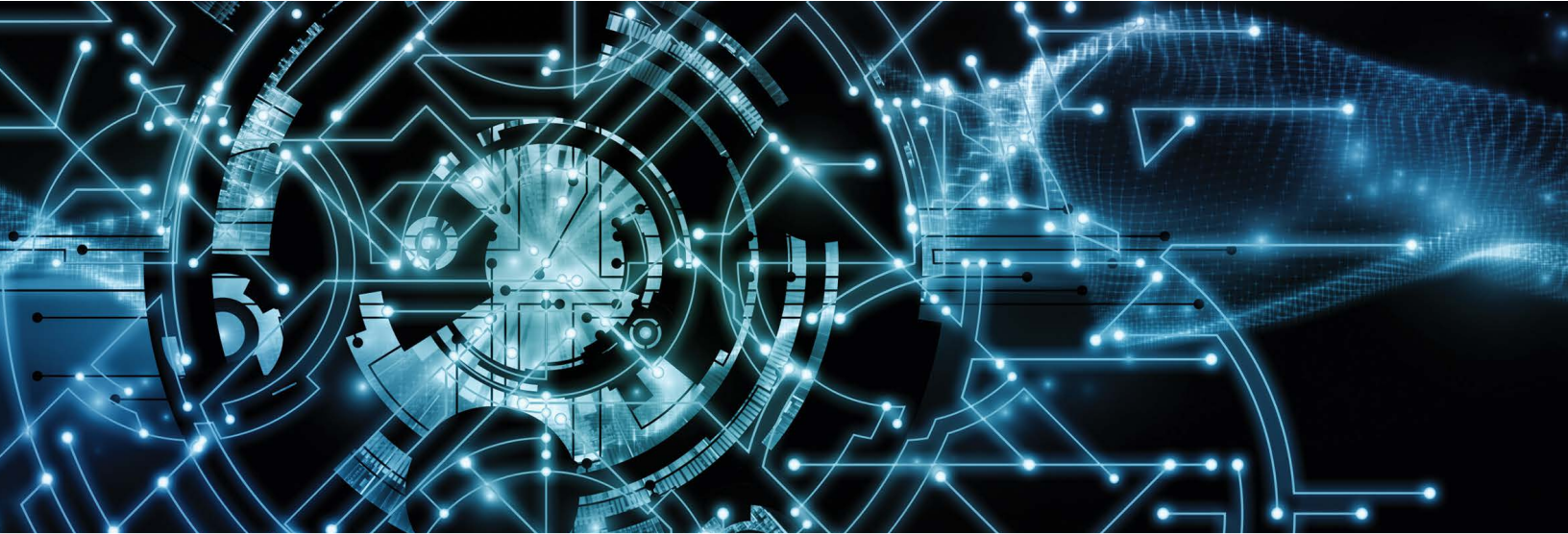
LAB FIGURE 1.8 Notepad Save As menu

14. When saving a file, you want to give it an appropriate name by entering it in the *File name* textbox. Start typing **documentation** in this textbox and notice how it automatically replaces the highlighted *.txt name. Do not press **Enter** yet.
15. The current location is shown at the top of the screen. To change this location and save it onto a flash drive, for example, you must first select your flash drive from the left window. Note that drive letters change depending on the system. In Lab Figure 1.8, the flash drive is G:. Click the *Documents* option in the left window. If any folders are on the drive, they appear. Click the *Cancel* button.
16. In the Notepad window, click the *Close* button (the button with a red X in the top-right corner).
What message appears?
-

17. Click the *Don't Save* button.

2

Connectivity Labs



Lab 2.1 Identifying Ports

Objective: To identify various computer ports correctly

Parts: Computer ports, either built into a specific computer or as separate adapters

Procedure:

1. Contact your instructor for a computer on which to work or to obtain adapters.
2. Identify the computer port(s) given to you by the instructor. In Lab Table 2.1, fill in the connector type, number of pins, and port type. Note that you may have to refer to information in the book or on the internet.

LAB TABLE 2.1 Connector identification

Connector type (DVI, HDMI, RJ45, etc.)	Number of pins	Port purpose (video, USB, NIC, etc.)
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

Lab 2.2 Identifying Devices/Ports

Objective: To identify various computer ports correctly based on the type of connected device

Parts: Computer that has devices connected

Procedure:

1. Contact your instructor for a computer on which to work.
2. Ensure that the computer is powered off.
3. Each device connected to the computer will go through the same three-step process: (1) Identify one item attached to the computer. Trace its cable to a port. In Lab Table 2.2, write the name of the device in the first line. (2) On the same line in the second column, identify all ports that the device could possibly use to attach to the computer. (3) Disconnect the device from the port. On the same line in the third column, identify the port to which the device actually attaches. Do the same for all devices connected to the computer.

Note: You may have to refer to information in the book or on the internet.

LAB TABLE 2.2 Port Identification

Device attached	Ports that possibly could have this device attached	Remove device and identify the port the device actually connects to. Reattach device when finished.

3

On the Motherboard Labs



Lab 3.1 Using Windows to Discover Processor Information

Objective: To identify various computer features, such as the type of processor being used, processor socket, and additional expansion ports

Parts: Computer with Windows 7, 8, 10, or 11

Procedure: Complete the following procedure and answer the accompanying questions.

Note: If you do not remember how to locate an application, please refer to Lab 1.3.

1. Boot the computer and log in.

In Windows 7, access *Windows Explorer* through *All Programs > Search programs and files*.

In Windows 8/10/11, access *File Explorer* by using the *Search* function or a desktop tile.

2. Right-click on the computer in the far left panel. This is commonly shown as *Computer* or *This PC*. Select *Properties*. Use the information displayed to answer the following questions.

Which processor is used?

How much RAM is installed?

When was Windows installed?

What version of Windows is installed?

3. Close the window. Use the *Search* function to locate and launch *Device Manager*. From the top menu, select *View > Devices by type*.

4. Expand the *Computer* category by clicking on the icon to the left. Right-click on the computer listed under the word *Computer* and select *Properties*. Close the window once the question is answered.

Is the computer a 32- or 64-bit computer?

5. Expand the *Processors* category.

How many CPUs are listed?

Instructor initials: _____

6. Expand the *System devices* category.

List any expansion slot types shown.

7. Close all windows.

8. Right-click on the taskbar or use the *Search* function to locate and open *Task Manger*.

9. Select the *Performance* tab and click on the *CPU* option from the components listed in the left column. Task Manager shows key processor information, including the number of cores and sockets found on the motherboard.

What is the current CPU utilization rate?

What is the current CPU speed?

Does the CPU speed stay the same? [Yes | No]

How many CPU sockets does the motherboard have?

How many CPU cores are present?

How many logical processors are present? Note that if you are viewing the usage of individual processing cores, you can right-click on the graph and select *Change graph to > Overall utilization*.

Why would a computer show a different number of CPU cores than the number of logical processors? Note that this information is not shown in Task Manager.

Is virtualization enabled? [Yes | No | Does not show]

List the L1, L2, and L3 cache values.

Where is the L1 cache physically located? Note that this information is not shown in Task Manager.

How long has the system been up?

Look in the right corner. Who is the CPU manufacturer? [Intel | AMD | Other]

What is the CPU model number?

Instructor initials: _____

- Close all windows.

Lab 3.2 Identifying Processor Speed, Processor Socket, and Ports

Objective: To identify various computer features, such as the type of processor, processor socket, and additional expansion ports

Parts: Computer with internet access

Procedure: Complete the following procedure and answer the accompanying questions.

- Boot the computer.
- Use *File Explorer* and the *Computer* or *This PC* properties to determine the processor type and speed. Write down the processor type and speed.

- Power off the computer and unplug the power cable. Open or remove the cover. Locate the processor. Which type of processor socket is on the motherboard? If you are unsure, use the internet as a resource. Use some of the search skills described in Chapter 1, "Introduction to the World of IT." Write down the processor socket type.

Which model of processors can go into this type of socket?

List the type of cooling that is used for the processor.

- Look at the back of the computer, where the ports are located. List every port located on the computer and one device that could connect to the port. Document your findings using Lab Table 3.1. Add more lines as needed.

LAB TABLE 3.1 Activity for computer ports

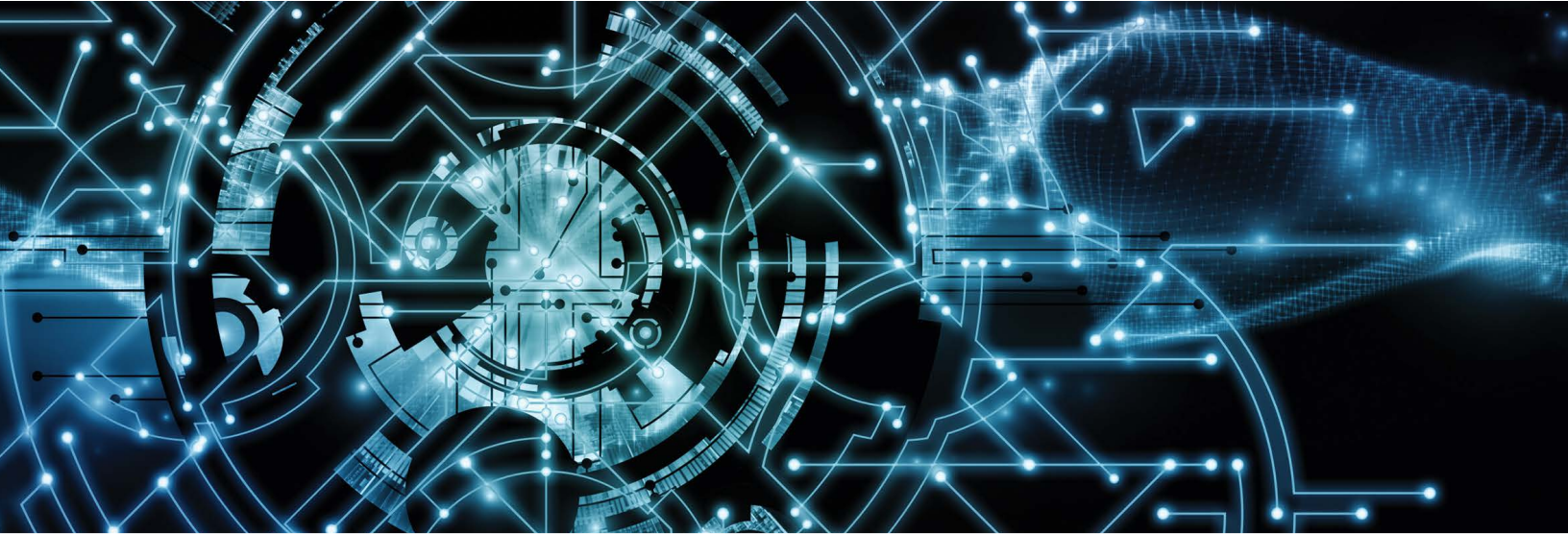
Port	No. of ports	Device that commonly connects to the port

- Locate a picture on the internet of a motherboard that contains a 2.5 Gb/s Ethernet LAN port. List the motherboard model and document the URL for the site where you find this image.

6. Using the internet, locate a mini-ITX motherboard for less than \$200. Provide the name/model of the motherboard and the URL where you found this information.

4

Introduction to Configuration Labs



Lab 4.1 Determining the Configuration Method

Objective: To determine which configuration method a computer uses

Parts: A computer and internet access

Procedure: Complete the following procedure and answer the accompanying questions.

1. Open the computer and look at the motherboard. Note that you may have to use the computer model number and the internet to do research for parts of this lab or to answer some of the questions. Verify any information found on the internet with what you see in the computer.

Document (write down) the location, name, and purpose of every motherboard jumper.

2. Locate the motherboard battery and document the battery type.

What type of battery is installed?

What is an advantage of having a battery that keeps CMOS information?

How can you tell the purpose of a jumper(s)?

What is one of the first indications that a motherboard battery is failing?

What is the keystroke(s) required to access the Setup program?

Lab 4.2 Examining BIOS/UEFI Options

Objective: To examine BIOS/UEFI features

Parts: A computer

Note: Internet access may be required.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and watch the screen closely for directions for how to access the BIOS/UEFI. Press the appropriate key before the operating system boots. Note that you may have to restart the computer or power it down and then power it back on in order to access the BIOS/UEFI. This may take several tries. You may also be required to research the computer brand and model on the internet to determine which keystroke is required.

Which keystroke is required to access BIOS/UEFI?

2. Examine the main menu.
List at least three main menu options.

Which keystroke(s) allow(s) you to save settings and exit BIOS/UEFI?

3. Explore various menus in order to answer the following questions.
List the boot devices in the order in which they are currently configured through BIOS/UEFI.

First boot device: _____

Second boot device: _____

Third boot device: _____

On which menu screen can you set a power-on password?

List the options you can set for any integrated motherboard port.

The BIOS/UEFI enables which type of monitoring? Select all that apply and add any that are not listed.

[power | fan | CPU | HDD (hard disk drive) | temperature]

What diagnostics, if any, are available through BIOS/UEFI?

Which power saving options, if any, are available through BIOS/UEFI?

Through which menu option is virtualization support enabled or disabled?

Which tool would a technician use for troubleshooting?

Which setting(s) would you choose to make the computer boot faster?

What is the BIOS/UEFI version?

Which keystroke(s) allow(s) you to exit BIOS/UEFI without saving any changes?

- Using whatever keystroke(s) you documented in the last question of step 3, exit BIOS/UEFI without saving any changes.

Lab 4.3 Accessing BIOS/UEFI Through Windows 8 or 10

Objective: To access BIOS/UEFI through the operating system

Parts: A working Windows 8, 10, or 11 computer

Note: Refer to Lab 1.2 or Lab 1.3 for directions on basic Windows 8 or 10 usage.

Procedure: Complete the following procedure and answer the accompanying questions.

- Power on the computer and log in as required.
- With newer devices that have fast-booting hard drives, accessing BIOS/UEFI setup is challenging. Windows 8 and higher support accessing BIOS/UEFI through Windows, but not all vendors add this support:

Windows 8: Point to the upper-right corner of the screen or access *Settings > Change PC Settings* link > *Update and Recovery > Recovery > Restart Now* button > *Troubleshoot > Advanced Options > UEFI Firmware Settings > Restart* button.

Windows 10: Access *Settings > Update and Security > Recovery > Restart Now* button > *Troubleshoot > Advanced Options > UEFI Firmware Settings* or *Startup Settings > Restart* button.

Windows 11: Access *Settings > System > Recovery >* in the *Advanced startup* section, select the *Restart Now* option twice > *Troubleshoot > Advanced Options > UEFI Firmware Settings* or *Startup Settings > Restart* button.

Describe a situation in which you think a technician would use this technique.

What BIOS/UEFI options are available on the main screen?

What option or keystroke(s) allow(s) you to exit BIOS/UEFI?

What option or keystroke(s), if any, allow(s) you to set the settings to the default?

- Using whatever keystroke(s) you documented in the last question of step 2, exit BIOS/UEFI without changing any settings.

Lab 4.4 Configuring System Resources Through the Setup Program

Objective: To access the system resources through the Setup program

Parts: A computer

Procedure: Complete the following procedure and answer the accompanying questions.

- Power on the computer.
- Press the appropriate key(s) to enter the Setup program.
- Go through the various menus or icons until you find an interrupt (IRQ) setting for a particular device or port.

Write the device or port and the associated IRQ in the space below.

IRQ	Device or port

Why do different devices generally not have the same interrupt?

- _____
4. Go through the various menus or icons until you find an I/O address setting for a particular device or port. Write the device or port in the space provided, along with the associated I/O address.

I/O address	Device or port

Why must each device and port have a separate and unique I/O address?

How do I/O addresses, interrupts, and memory addresses get assigned to an installed adapter?

What is the best tool to use for viewing interrupts, I/O addresses, and memory addresses that have been assigned?

5. Exit the Setup program.
6. Go to Device Manager and determine whether the information collected in steps 3 and 4 is the same.

Instructor initials: _____

Lab 4.5 Examining System Resources by Using Windows

Objective: To be able to view and access system resources by using Windows

Parts: A computer with Windows loaded

Procedure: Complete the following procedure and answer the accompanying questions.

- Power on the computer and verify that Windows loads. Log on to the computer, using the user ID and password provided by the instructor or lab assistant.
- Locate and access *Device Manager*. If necessary, refer to Chapter 1 labs for basic Windows usage.
- Click the *View* menu option and select *Resources by Type*.

Which types of system resources are shown?

4. Click the *plus sign* (or arrow) or *Interrupt Request (IRQ)* to expand the section.

Scroll through the list to determine whether there are any interrupts in use by multiple devices (the same number used by two things). If so, list one.

What device, if any, is using IRQ8?

Is this the standard IRQ for this device?

What device, if any, is using IRQ0? [keyboard | mouse | system timer | numeric data processor]

Instructor initials: _____

5. Collapse the *Interrupt Request (IRQ)* section. Expand the *Input/Output (IO)* section.
What is the first I/O address range listed for the first occurrence of the *Direct memory access controller*?
-
- What is the first I/O address range listed for the first occurrence of *Motherboard resources*?
-
- What is the first I/O address range listed for the first occurrence of *System timer*?
-
6. Collapse the *Input/Output (IO)* section. Expand the *Direct Memory Access (DMA)* section.
Are any DMA channels being used? If so, list them.
-
-
7. Collapse the *Direct Memory Access (DMA)* section. Expand the *Interrupt Request (IRQ)* section again. Click to select any device listed in the *Interrupt Request (IRQ)* section. Note that you may need to scroll down to the bottom to see devices you recognize. Once a device is selected, move your mouse slowly over the icons at the top until you locate the *Update device driver* icon. When the mouse is moved slowly enough, a description of the icon appears.
In what position is the *Update device driver* icon located?
[first | last | second | third from the right | answer not listed]
-
8. Move your mouse slowly over the icons at the top until you locate (but do not click!) the *Uninstall device* icon. Now locate the *Disable device* icon. Both options can be used to troubleshoot problem devices.
In what situation do you think a technician would use either option?
-
9. From the main menu, select *View > Devices by Type*. Expand any section and select a particular device. Note that the questions cannot be answered unless you expand a section and select a device under the section heading. Select the *Action* menu item and select *Properties*. The *Properties* window opens. The *General* tab shows you the status of the device and whether it is working properly.
What device was chosen?
-
- What is the status of the device?
-
10. Click the *Driver* tab, which shows information about the device driver.
What device driver version is being used by the device chosen?
-
- What other important button is found on this tab that you think might be used if a device is not performing exactly as expected?
-
11. Click the *Resources* tab, which shows what system resources a particular device is using. Note that if a device does not show the *Resources* tab, select another device that does have the *Resources* tab so the questions can be answered.
What resources are being used?
-

What message displays in the conflicting *device list* section?

Is the *Use automatic settings* checkbox enabled?

Instructor initials: _____

- Click the *Cancel* button to return to Device Manager. Close the Device Manager window.

Lab 4.6 Becoming Familiar with Device Drivers

Objective: To become familiar with finding a driver, driver information, and the current driver version

Parts: A computer with access to the internet

Procedure: Use the internet and a computer to answer the following questions.

- A customer is looking to upgrade to Windows 11. She has a Creative Labs Sound Blaster Z PCIe sound card installed.

This question requires two answers. Is there a device driver for this card that the customer can use if she decides to upgrade? Provide the URL where you find the answer. Note that if you are in a virtual environment where the computers do not have internet access, you will have to use your own computer (and not the virtual environment) to do the search.

- A user has a Windows 10 64-bit computer with a Gigabyte video card model GV-R523D3-1GL installed. Note that if you are in a virtual environment where the computers do not have internet access, you will have to use your own computer (and not the virtual environment) to do the search.

This question requires two answers. What is the latest device driver version for the video card? Provide the URL where you find this information.

- This step can be done using a specific tool on the computer in order to find the answer.

What are the device driver version and date for any USB root hub on the computer?

- Locate any particular device (not a device category) in Device Manager. Use the Driver tab to determine the driver version currently used. List the device and the driver version.
-
-

Instructor initials: _____

- Use the internet to research the answers to the questions.

What is the latest Windows 10 driver revision for a StarTech PCIe HDMI 4K video capture card part number PEXHDCAP4K? List the driver version number and the URL where you found this information.

A chemistry teacher uses a Wacom One tablet attached to a macOS computer. List the latest driver available and the URL where you found this information.

5

Disassembly and Power Labs



Lab 5.1 Performing Maintenance on an Antistatic Wrist Strap

Objective: To understand how to care for and properly use an antistatic wrist strap

Parts: Antistatic wrist strap
Computer chassis
Multimeter

Note: Electrostatic discharge (ESD) has great potential to harm the electronic components inside a computer. Given this fact, it is vitally important that you practice proper ESD precautions when working inside a computer case. One tool you can use to prevent ESD is an antistatic wrist strap. This tool channels any static electricity from your body to the computer's chassis, where it is dissipated safely.

Procedure: Complete the following procedure and answer the questions.

1. Examine the wrist strap for any obvious defects, such as worn or broken straps, loose grounding lead attachments, or dirt or grease buildup.
2. If necessary, remove any dirt or grease buildup from the wrist strap, paying close attention to the electrical contact points, such as the wrist contact point, the ground lead attachment point, and the computer chassis attachment clip. Use denatured alcohol to clean these contact points.
3. If possible, use a multimeter to check continuity between the wrist contact point and the computer chassis attachment clip. A reading of 0 ohms of resistance indicates a good electrical pathway.

How many volts of static electricity does it take to harm a computer's electrical components?

4. Adjust the wrist strap so it fits snugly yet comfortably around your wrist. Ensure that the wrist contact is in direct contact with your skin, with no clothing, hair, and so on in the way.
5. Attach the ground lead to the wrist strap and ensure that it snaps securely into place.
6. Attach the computer chassis attachment clip to a clean metal attachment point on the computer chassis.

7. Any static electricity generated or attracted by your body will now be channeled through the antistatic wrist strap to the computer chassis, where it will be safely dissipated.

How many volts will an ESD be before you will feel anything?

Should you use an antistatic wrist strap when working inside a CRT monitor or laser printer high-voltage power supply? Why or why not?

Instructor initials: _____

Lab 5.2 Disassembling and Reassembling a Computer

Objective: To disassemble and reassemble a computer correctly

Parts: A computer to disassemble

A toolkit

An antistatic wrist strap (if possible)

Note: Observe proper ESD handling procedures when disassembling and reassembling a computer.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Gather the tools needed to disassemble the computer.
2. Clear as much workspace as possible around the computer.
3. Power on the computer.

Why is it important to power on the computer before you begin?

External Cables

4. Turn off the computer and all peripherals. Remove the power cable from the wall outlet and then remove the power cord from the computer.
5. Note where the monitor cable plugs into the back of the computer. Disconnect the monitor, including the power cord, and move it to a safe place. Take appropriate notes.
6. Remove all external cables from the back of the computer. Take notes about the location of each cable. Move the peripheral devices to a safe place.

Did the mouse cable connect to a PS/2 or USB port?

Computer Case Side Access or Removal

7. If possible, remove one or both sides of the case. This is usually the most difficult step in disassembly, especially if the computer is one that has not been seen before. Diagram the screw locations. Keep the cover screws separated from other screws. An egg carton or a container with small compartments makes an excellent screw holder. Label each compartment and reuse the container. Otherwise, open the case as directed by the manufacturer.

Adapter and Internal Cable Placement

8. Make notes or draw the placement of each adapter in the expansion slots.

9. On your notes, draw the internal cable connections before removing any adapters or cables from the computer. Make notes regarding how and where the cable connects to the adapter. Do not forget to include cables that connect to the motherboard or to the computer case.

List some ways to determine the correct orientation for an adapter or a cable.

Internal Cable Removal

10. Remove all internal cables. Some cables have connectors with locking tabs. Release any locking tabs before disconnecting the cable. Make appropriate notes regarding the cable connections. Some students find that labeling cables and the associated connectors makes reassembly easier, but good notes usually suffice.

Warning: Do not pull on a cable; use the pull tab, if available, or use the cable connector to pull out the cable.

Adapter Removal

11. Start with the left side of the computer (as you look at the front of the computer) and locate the left-most adapter.
12. If applicable, remove the screw or retaining bracket that holds the adapter to the case. Place the screw in a separate, secure location away from the other screws that were already removed. Make notes about where the screw goes or any other notes that will help you when reassembling the computer.
13. Remove the adapter from the computer.

Why must you be careful not to touch the gold contacts at the bottom of each adapter?

14. Remove the remaining adapters in the system by repeating steps 11–13. Take notes regarding screw locations, jumpers, switches, and so forth for each adapter.

Drives

15. Remove all power connections to drives, such as hard drives, optical drives, and so on. Note the placement of each drive and each cable, as well as any reminders needed for reassembly.
16. Remove any screws holding the drives in place. Make notes about where the screws go. Keep these screws separate from any previously removed screws.
17. Remove all drives.

Why must you be careful when handling a mechanical hard drive?

What would you do differently when handling an SSD than when handling a SATA hard drive?

Power Supply

18. Before performing this step, ensure that the power cord is removed from the wall outlet and the computer. Remove the connectors that connect the power supply to the motherboard.
19. Take very good notes here so you will be able to insert the connectors correctly when reassembling.
20. Remove the power supply.

What is the purpose of the power supply?

Motherboard

21. Make note of any motherboard switches or jumpers and indicate whether the switch position is on or off.

What is the importance of documenting switches and jumpers on the motherboard?

22. Remove any remaining connectors. Take appropriate notes.
23. Remove any screws that hold the motherboard to the case. Place these screws in a different location from the other screws removed from the system. Write any notes pertaining to the motherboard screws. Look for retaining clips or tabs that hold the motherboard into the case.
24. Remove the motherboard. Make notes pertaining to the motherboard removal. The computer case should be empty after you complete this step.

Instructor initials: _____

Reassembly

25. Reassemble the computer by reversing the steps for disassembly. Pay particular attention to cable orientation when reinstalling cables. Before reconnecting a cable, ensure that the cable and the connectors are correctly oriented and aligned before pushing the cable firmly in place. Refer to your notes and install the motherboard in the computer case and reconnect all motherboard connections and screws.
26. Install the power supply by attaching all screws that hold the power supply in the case. Reattach the power connectors to the motherboard. Refer to your notes.
27. Install all drives by attaching screws, cables, and power connectors. Refer to your notes. Attach any cables that connect the drive to the motherboard.
28. Install all adapters. Attach all cables from the adapter to the connecting device. Replace any retaining clips or screws that hold adapters in place. Refer to your notes and diagrams.
29. Connect any external connectors to the computer. Refer to your notes, when necessary.
30. Replace the computer cover. Ensure that slot covers are replaced and that the drives and the front cover are aligned properly. Ensure that all covers are installed properly.
31. Reinstall the computer power cable.
32. Once the computer is reassembled, power on all external peripherals and the computer. A chassis intrusion error message might appear. This just indicates that the cover was removed. Did the computer power on with POST error codes? If so, recheck all diagrams, switches, and cabling. Also, check a similar computer model that still works to see whether you made a diagramming error. The most likely problem is with a cable connection or with a part that is not seated properly in its socket.

Instructor initials: _____

Lab 5.3 Determining Amps and Wattage

Objective: To determine the correct capacity and wattage of a power supply

Parts: Power supply
Internet access (as needed)

Procedure: Complete the following procedure and answer the accompanying questions.

1. Locate the documentation stenciled on the power supply, if possible.
2. Use the internet to find documentation about the power supply on the manufacturer's website. Use the information you find on the power supply or the website to answer the following questions.

How many amps is the power supply rated for at 5 volts?

How many amps is the power supply rated for at 12 volts?

How many +12V rails does the power supply have?

What is the maximum rated output power of the power supply, in watts?

Instructor initials: _____

Lab 5.4 Performing a Continuity Check

Objective: To perform a continuity check on a cable and find any broken wires

Parts: Multimeter
Cable and pin-out diagram

Procedure: Complete the following procedure and answer the accompanying questions.

1. Obtain a meter, a cable, and a pin-out diagram from your instructor.
2. Set the meter to ohms.
3. Power on the meter.
4. Lay the cable horizontally in front of you. The connector on the left is referred to as Connector A. The connector on the right is referred to as Connector B.
5. Determine the number of pins on the cable connector. On a sheet of paper, write numbers vertically down the left side of the paper, ensuring that there is a number for each connector pin. At the top of the numbers, write **Connector A** as the heading. Create a corresponding set of identical numbers vertically on the right side of the paper. (See step 5 of Lab 5.5 for an example of how to set up this table.)
6. Check the continuity of each wire. Document your findings by placing a check mark beside each pin number that has a good continuity check.

Which meter setting did you use to check continuity, and which meter symbol is used for this setting?

7. Power off the meter and return all supplies to the instructor.

Instructor initials: _____

Lab 5.5 Drawing a Pin-Out Diagram

Objective: To draw a pin-out diagram using a working cable

Parts: Multimeter
Good cable

Procedure: Complete the following procedure and perform the accompanying activities.

1. Obtain a meter and a good cable from your instructor.
2. Set the meter to ohms.

Instructor initials: _____

3. Power on the meter.
4. Lay the cable horizontally in front of you. The connector on the left is referred to as Connector A. The connector on the right is referred to as Connector B.

5. Touch one meter lead to Connector A's pin 1. Touch the other meter lead to every Connector B pin. Notice when the meter shows zero resistance, indicating a connection.

Using the table that follows, draw a line from Connector A's pin 1 to any Connector B pins that show zero resistance. Add more pin numbers as needed to the table or use a separate piece of paper. Remember that all pins do not have to be used in the connector. There are no review questions; however, there is a connector table that contains connection lines.

Connector A	Connector B
<input type="checkbox"/> 1	<input type="checkbox"/> 1
<input type="checkbox"/> 2	<input type="checkbox"/> 2
<input type="checkbox"/> 3	<input type="checkbox"/> 3
<input type="checkbox"/> 4	<input type="checkbox"/> 4
<input type="checkbox"/> 5	<input type="checkbox"/> 5
<input type="checkbox"/> 6	<input type="checkbox"/> 6
<input type="checkbox"/> 7	<input type="checkbox"/> 7
<input type="checkbox"/> 8	<input type="checkbox"/> 8
<input type="checkbox"/> 9	<input type="checkbox"/> 9
<input type="checkbox"/> 10	<input type="checkbox"/> 10
<input type="checkbox"/> 11	<input type="checkbox"/> 11
<input type="checkbox"/> 12	<input type="checkbox"/> 12
<input type="checkbox"/> 13	<input type="checkbox"/> 13
<input type="checkbox"/> 14	<input type="checkbox"/> 14
<input type="checkbox"/> 15	<input type="checkbox"/> 15

6. Power off the meter.
Instructor initials: _____
7. Return all supplies to the instructor.

Lab 5.6 Checking a Fuse

Objective: To determine whether a fuse is good

Parts: Multimeter
Fuse

Procedure: Complete the following procedure and answer the accompanying questions.

- Obtain a meter and a fuse from your instructor.
- Look at the fuse and determine its amp rating.

What is the amperage rating of the fuse?

- Set the meter to ohms.

Instructor initials: _____

- Power on the meter.
- Connect one meter lead to one end of the fuse. Connect the other meter lead to the opposite end.

6. Look at the resistance reading on the meter.

What is the resistance reading?

Is the fuse good?

7. Power off the meter.

Instructor initials: _____

8. Return all materials to the instructor.

Lab 5.7 Using a Multimeter

Objective: To check voltage and resistance levels using a multimeter

Parts: Multimeter
AA, AAA, C, D, or 9-volt battery
Extended paperclip or wire

Caution: Keep both hands behind the protective rings on the meter handles. See Figure 5.23.

Procedure: Complete the following procedure and perform the accompanying activities.

1. All voltage inside a computer is DC voltage (except for some parts inside the power supply). Learning how to measure DC voltage is important for a technician. The best place to start is with a battery. Obtain a battery. Look carefully at the battery and determine where the positive end or connector is located (it usually has a + [plus] symbol nearby) and where the negative end or connector is located.

Why is it important to locate positive and negative on a battery?

2. Look carefully at the battery and determine the voltage rating.

Document your findings.

3. Place the battery on a flat surface. If the battery is an AA, AAA, C, or D battery, place the battery so that the positive side (the side with a nodule) points toward your right side. If the battery is a 9-volt battery, place the battery so that the connectors are facing you and the positive connector (the smaller connector) is on your right side.

4. If the meter has leads that attach, attach the black meter lead to the appropriate port (colored black or labeled COM). Attach the red meter lead to the positive port, marked with a plus sign (+).

5. Turn on the meter. Set the meter so that it is measuring VDC (DC voltage). This might involve manually rotating a dial and/or pushing a button. Note that some meters can autodetect the setting, but most require this configuration.

Document what you did to configure the meter for VDC.

What indication, if any, did the meter show in the meter window that VDC is being measured?

6. Hold the meter leads so that the black lead is in your left hand and the red lead is in your right hand. Ensure that your hands are behind the protective ring on the meter handle. Refer to Figures 5.22 and 5.23 if you are unsure.

7. Place the black meter lead to the negative side (left side or left connector). Also touch the red meter lead to the positive side (right side or right connector) of the battery.

Make a note of the meter reading.

Based on your findings, is the battery good (usable in an electronic device)?

8. Now reverse the meter leads, placing the black lead to the positive side and the red lead to the negative side.

Record your findings.

What was different from the original meter reading?

Instructor initials: _____

9. Perform this voltage check on any other batteries given to you by the instructor or lab assistant.

10. Straighten a paperclip or obtain a wire. Place the paperclip or wire on a flat surface.

11. Change the meter so that it reads ohms. This is normally shown by the omega symbol (Ω).

While having the meter leads up in the air (not touching each other), what does the meter display?

-
12. Touch the meter leads together to make a complete circuit or path.

What does the meter display now?

13. Touch one meter lead to one end of the paperclip or wire and touch the other meter lead to the opposite paperclip or wire end. Sometimes it is easier to just lay the meter lead on top of the wire, close to the end.

What is the meter reading?

14. Some meters have the ability to make a sound when a wire is good. This is frequently shown on the meter as a sound wave. If your meter has this ability, configure the meter and redo the test. You can see how much easier this would be than trying to hold your meter leads straight and watch the meter.

Instructor initials: _____

15. Power off the meter. Disconnect the leads as necessary. Return all parts to the appropriate locations.

Lab 5.8 Checking Wall Outlet and Power Cord AC Voltage

Objective: To check the voltage from a wall outlet and through a power cord

Parts: Multimeter

Computer power cord

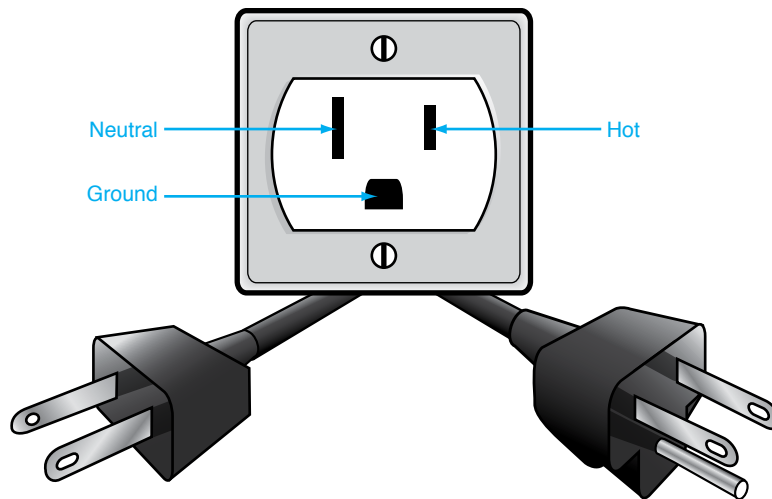
Caution: Exercise extreme caution when working with AC voltages!

Procedure: Complete the following procedure and perform the accompanying activities.

1. Set the multimeter to AC VOLTAGE. (Refer to the meter's manual if you are unsure about this setting.)

Warning: Using a current or resistance setting could destroy the meter.

2. Power on the multimeter. Locate an AC power outlet. Refer to Lab Figure 5.1 for the power connections.

**LAB FIGURE 5.1** AC outlet

3. Insert the meter's black lead into the round (ground) AC outlet plug.
4. Insert the meter's red lead into the smaller flat (hot) AC outlet plug. The meter reading should be around 120 volts. Use Lab Table 5.1 to record the reading.
5. Move the meter's red lead into the larger flat (neutral) AC outlet plug. The meter reading should be 0 volts. Use Lab Table 5.1 to record the reading.

LAB TABLE 5.1 Wall outlet AC checks

Connection	Expected voltage	Actual voltage
GND to hot	120VAC	
GND to neutral	0VAC	
Hot to neutral	120VAC	

6. Remove both leads from the wall outlet.
7. Insert the meter's black lead into the smaller flat (hot) AC outlet plug.
8. Insert the meter's red lead into the larger flat (neutral) AC outlet plug. The meter reading should be around 120 volts. Use Lab Table 5.1 to record the reading.
9. Plug the computer power cord into the AC wall outlet that was checked using steps 3 through 8.
10. Verify that the other end of the power cord is not plugged into the computer.
11. Perform the same checks you performed in steps 3 through 8, except this time check the power cord end that plugs into the computer. Use Lab Table 5.2 to record the reading.

LAB TABLE 5.2 Power cord AC checks

Connection	Expected voltage	Actual voltage
GND to hot	120VAC	
GND to neutral	0VAC	
Hot to neutral	120VAC	

12. If the voltage through the power cord is correct, power off the meter. Notify the instructor of any incorrect voltages.

Instructor initials: _____

Lab 5.9 Checking Device DC Voltage

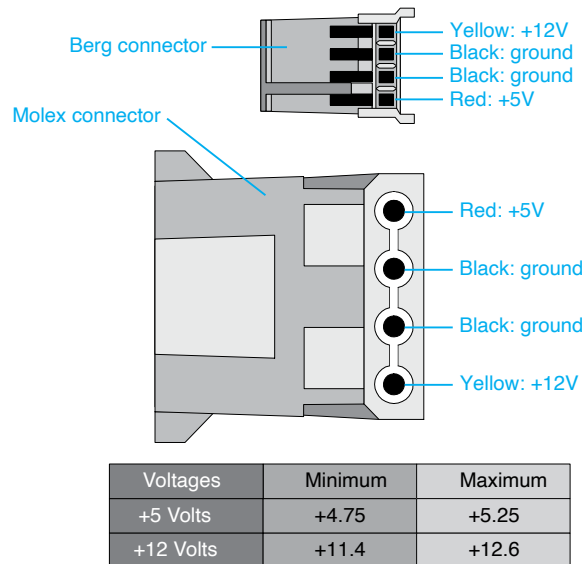
Objective: To check the power supply voltages sent to various devices

Parts: Multimeter

Computer

Procedure: Complete the following procedure and perform the accompanying activities.

1. Set the multimeter to DC VOLTAGE. (Refer to the meter's manual if unsure about the setting.)
2. Power on the multimeter.
3. Power off the computer.
4. Remove the computer case.
5. Locate a Molex or Berg power connector. If one is not available, disconnect a power connector from a device.
6. Power on the computer.
7. Check the +5 volt DC output from the power supply by placing the meter's *black* lead in (if the connector is a Molex) or on (if the connector is a Berg) one of the grounds* (a black wire). Place the meter's *red* lead on the +5 volt wire (normally a red wire) in or on the connector. Consult Lab Figure 5.2 for the layout of the Molex and Berg power supply connections. Lab Figure 5.2 also contains a table with the acceptable voltage levels.



LAB FIGURE 5.2 Molex and Berg power connectors

Write the voltage level found for the +5 volt wire in Lab Table 5.3.

LAB TABLE 5.3 +5 volt check

Voltage being checked	Voltage found
+5 volts	

8. Check the +12 volt DC output by placing the meter's *black* lead in (if the connector is a Molex) or on (if the connector is a Berg) one of the grounds. Place the meter's *red* lead on the +12 volt wire in or on the connector. See Lab Figure 5.2 for the layout of the Molex and Berg power supply connections. The figure also contains a table with acceptable voltage levels. Write the voltage level found or the +12 volt wire in Lab Table 5.4.

* Use and check both ground connections (black wires going into the connector); do not check all the voltages using only one ground connection.

LAB TABLE 5.4 +12 volt check

Voltage being checked	Voltage found
+12 volts	

9. Notify the instructor of any voltages that are out of the acceptable range.
10. Power off the meter.

Instructor initials: _____

11. Power off the computer.

Lab 5.10 Using a Power Supply Tester

Objective: To check voltage levels using a power supply tester

Parts: Power supply tester
Working computer

Caution: Be sure you have the connector firmly attached to the power supply tester before applying power to the computer.

Procedure: Complete the following procedure and perform the accompanying activities.

1. Power on the computer and ensure that it works and boots to the operating system.
2. Power off the computer.
3. Access the interior of the computer. Remove the 24-pin motherboard power connector (the largest connector that goes from the power supply to the motherboard).
4. Attach the 24-pin motherboard power connector to the power supply tester.

Note: All voltage inside the computer is DC voltage (except for some parts inside the power supply, of course).

5. Power on the computer. The LCD output should show each voltage level and/or give you an indication of whether the power output is okay. This varies between power supply testers.

Does it appear that the power provided to the motherboard is accurate according to the power supply tester's output? [Yes | No]

What indication do you have on the power supply tester about the power going to the motherboard connector?

6. Power off the computer. Remove the 24-pin motherboard power connector from the power supply tester and reattach it firmly into the motherboard.
7. Attach a SATA power connector to the power supply tester. Note that you may not have an available one and may have to remove it from the optical drive or hard drive.
8. Power on the computer. The SATA connector provides +12V, +5V, and +3.3V to an internal SATA device. The power supply tester should provide some indication of whether these voltage levels are within acceptable ranges.

Does it appear that the power provided to an internal SATA device is accurate according to the power supply tester's output? [Yes | No]

What indication do you have on the power supply tester about the power going to the SATA power connector?

9. Power off the computer.
10. Detach the SATA power connector from the power supply tester and reattach it, if necessary.
11. Power on the computer and ensure that all devices are accessible and that the computer still boots.

Instructor initials: _____

12. Either using the instructions printed on the power supply tester or documentation found on the internet, determine how the power supply tester indicates an abnormal voltage level.

What indication do you have on the power supply tester that a particular power supply voltage is not within an acceptable voltage range?

Lab 5.11 Understanding the Windows 10/11 Power Options

Objective: To be able to control power options via BIOS/UEFI and Windows 10/11

Parts: Computer with Windows 10 or 11 loaded

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and ensure that it boots properly before taking any further steps.
2. Reboot the computer and access BIOS Setup.

List the BIOS/UEFI options related to power management.

Can ACPI be disabled via BIOS/UEFI?

3. Exit the BIOS/UEFI Setup program without saving any settings. Boot to Windows.
4. Access the current power settings by using the *Power Options* Control Panel or the *System > Power & sleep* Settings link.

What is the current power plan?

5. Select the *Create a Power Plan* link on the left or *Additional power settings* if using Windows Settings. Type a unique name in the *Plan Name* textbox. Click *Next*.
6. Use the various options to select specific power plans. Not all platforms have all options, but document your settings in Lab Table 5.5.

LAB TABLE 5.5 Power plan options

Option	Minutes selected
Display	
Display brightness (mobile devices)	
Computer sleep	

7. When you are finished configuring, click the *Create* button. Notice that your new plan appears in the list of preferred plans. Also notice that the *Show additional plans/Hide additional plans* reveal arrow is available.

What global ACPI state do you think this plan would assign? Look back through the chapter to review.

8. Click the *Change plan settings* link under or beside the plan you just created. Select the *Change advanced power settings* link.

List at least three devices for which you can have power controlled through this section of the Control Panel.

Instructor initials: _____

9. If available and possible, expand the USB section and the *USB selective suspend* setting.

What is the current USB selective suspend setting?

10. Expand the *Processor power management* setting, if possible.

What is the minimum processor state?

11. Expand the *Desktop background settings > Slide show* setting, if possible.

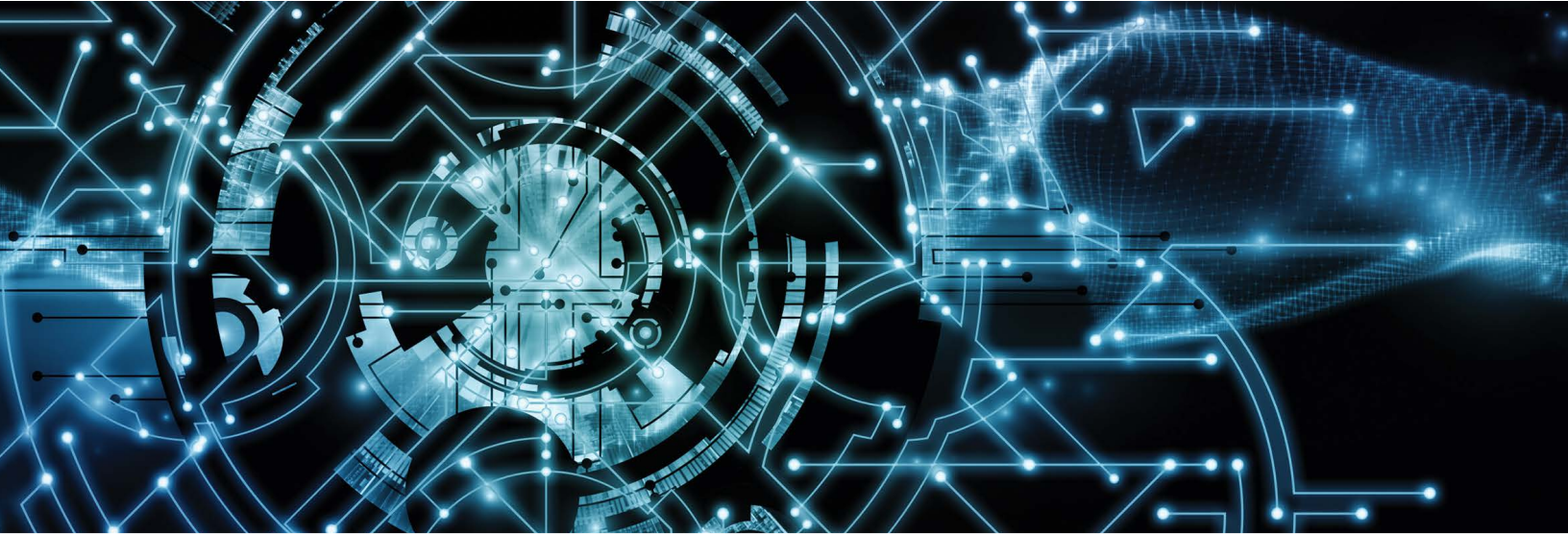
What setting or settings are configured with this option?

12. Click the *Cancel* button to return to the Change Settings window. Click the *Cancel* button again.

13. To delete a power plan you created (the default ones cannot be deleted), select the radio button for the original power plan. Refer to step 4, if necessary. Under the plan you created, select the *Change plan settings* link. Select the *Delete this plan* link and click *OK*. The plan should be removed from the power options list.

6

Memory Labs



Lab 6.1 Examining Memory Resources Using Device Manager in Windows 10/11

Objective: To be able to view memory resources currently being used by Windows 10 or 11

Parts: A computer with Windows 10 or 11 installed and rights to use Device Manager

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and verify that Windows loads. Log on to Windows using the known user ID and password or one provided by the instructor or lab assistant.
2. Use the *Search* textbox, type **device** and select *Device Manager* from the resulting list.
3. Select the *View* menu option > select *Resources by Type* > expand *Memory* by clicking the arrow beside the option.

List at least one range of memory addresses that are used by the system board? Note that you may have to scroll to the bottom to find *System board* and not motherboard.

-
4. Right-click the first system board memory address range shown and select *Properties*.

What tabs are shown in the window?

-
5. Select the *Resources* tab. All memory resources used by the function selected are shown.

Can you select one of the memory resources using the *Change Setting* button? [Yes | No]

6. Close the *Properties* window and the *Device Manager* window.

Lab 6.2 Using the System Information Tool in Windows 10/11 to View Memory

Objective: To be able to view memory resources currently being used by Windows 10 or 11

Parts: A computer with Windows 10 or 11 installed and rights to use the System Information Tool

Procedure: Complete the following procedure and answer the accompanying questions.

1. Use the *Search* textbox to locate and select the *System Information* app. The questions can be answered by scrolling through the information found on the *System Summary* main page.

How much physical RAM is installed?

How much physical RAM is available?

How much total virtual memory does the machine have?

How much available virtual memory does the machine have?

What are the location and size of the page file?

2. Close the *System Information* window.

Lab 6.3 Using Windows 10/11 Task Manager to View Memory

Objective: To be able to use the Task Manager tool to view memory resources currently being used by Windows 10 or 11

Parts: A computer with Windows 10 and 11 installed and rights to use Task Manager

Procedure: Complete the following procedure and answer the accompanying questions.

1. After logging on to a Windows 10/11 computer, search for and select the *Task Manager* tool.
2. Access the *Performance* tab. Note that you might have to select the *More details* link to see the *Performance* tab. To answer the questions, you will have to select different options on the left.

What percentage of the CPU is being used?

How much RAM (memory) is available?

How many RAM slots are used?

What speed of memory modules is used?

3. Click the *Open Resource Monitor* link and select the *Overview* tab.

What is the percentage of used physical memory?

4. Expand the *Memory* section.

List three executable (.exe) files running in memory.

5. Open an application such as the Calculator app. Then locate the application in the Open Resource Monitor window in the *Memory* section.

Which app did you choose?

How many kilobytes are shown for the application in the *Commit* column?

How many kilobytes are shown for the application in the *Working Set* column?

How many kilobytes are shown for the application in the *Shareable* column?

How many kilobytes are shown for the application in the *Private* column?

6. Select the *Memory* tab. Ensure the *Physical Memory* section is expanded.

How much memory is reserved for hardware, if any?

7. Hold the mouse pointer over the colored bar portion of physical memory that represents the amount of memory *In Use*. A description of this portion of the bar appears.

What is the exact purpose of the *In Use* section?

8. Close the *Resource Monitor* window.

9. In the Task Manager window, select the *Details* tab.

List three executable (.exe) files running in memory.

10. From the *Details* tab, locate the app you opened in step 5.

What is the status of the app? [Running | Suspended | Idle]

11. Select the *Processes* tab.

Which app is using the most memory?

How many background processes are running in memory?

Are any Windows processes running but taking 0 MB of memory? If yes, list one of them.

12. Select the *Performance* tab and select *Memory*. Locate the memory composition graph. Hold the mouse pointer over the colored bar that shows how the *Standby* portion of physical memory is being used.

What is the exact purpose of the *Standby* section?

Determine the exact purpose of the *Free* section. Document your findings.

13. Close the *Task Manager* window.

Lab 6.4 Installing RAM

Objective: To be able to install RAM

Parts: A computer or motherboard
RAM that matches the computer or motherboard

Procedure: Complete the following procedure and answer the accompanying questions.

1. If using a computer, open the side to see how many expansion slots are available.
2. Ask your instructor or lab assistant if dual- or triple-channeling is required.

Do you need to plan for dual- or triple-channeling?

3. Determine the capacity of the chips that go in each bank. Document what chip(s) and what memory slot you plan to use in the space provided. Use motherboard documentation or information provided by the instructor or lab assistant. Draw a diagram, if needed.

Document your memory installation plan.

4. Ensure that the memory slot(s) where you are going to install the DIMM(s) has/have the retaining tabs pushed outward away from the memory slot. Using the DIMM(s) provided, use antistatic procedures and insert the DIMM into the expansion slot, aligning the notch on the DIMM with the notch on the memory slot. Press downward, using even pressure, until the DIMM is firmly into the memory slot and the retaining tabs are firmly clasped into the DIMM. Note: Do not force the DIMM into the slot. Check the notch alignment again.
5. Power on the computer. Note that you may receive a BIOS/UEFI error. This is normal when you have just changed the configuration. You may be required to go into BIOS and confirm the amount of memory installed.

Did you get a BIOS/UEFI error or beep? [Yes | No]

6. Ensure that the machine boots properly and the operating system loads if a computer is being used.

Is the memory installed correctly? [Yes | No]

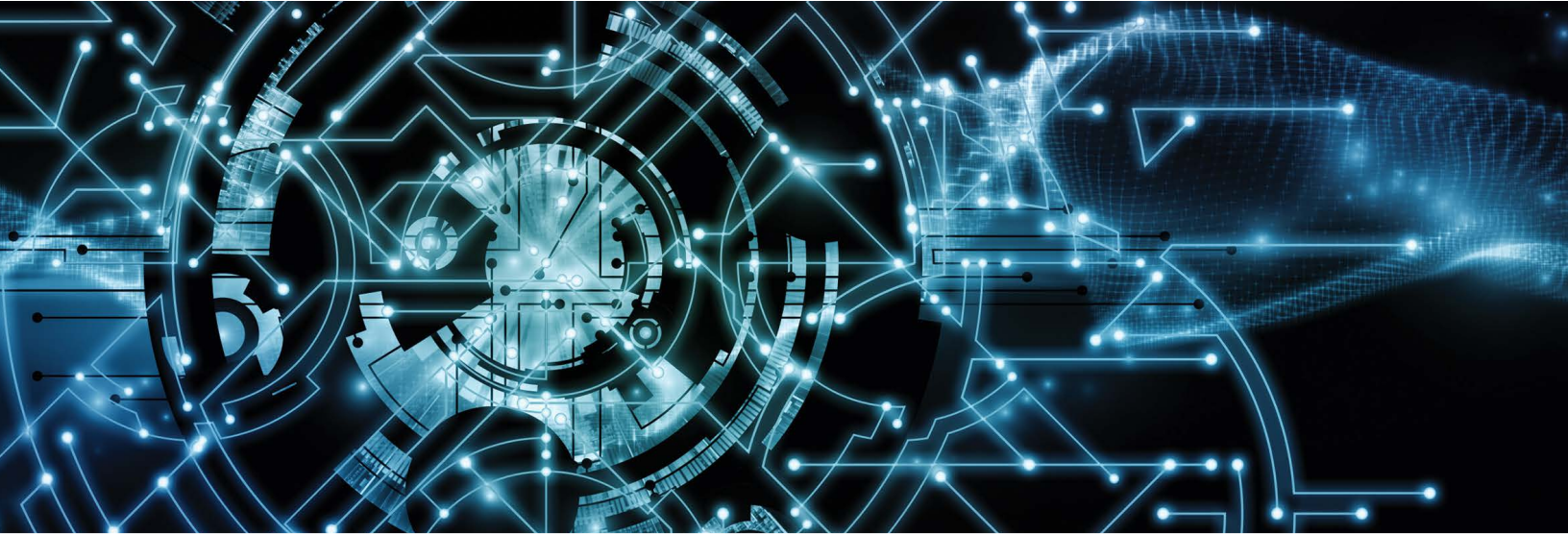
Instructor initials: _____

7. Power off the computer. Remove the memory. Power on the computer and ensure that it boots without any errors.

Is the computer working again? (Just write “not applicable” if you were just using a motherboard.)

7

Storage Devices Labs



Lab 7.1 Installing a Second PATA Hard Drive and Creating Two Volumes

Objective: To be able to install, configure, and manage a second hard drive using the Windows Disk Management console

Parts: Windows computer with an available PATA connection on the motherboard or an available PATA cable connection on an existing PATA connection to the motherboard
Power connector

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: Use proper antistatic and gentle handling procedures when dealing with hard drives.

You must be a user who has administrator rights to configure hard drives.

If an optical drive is installed, it can be replaced with the new hard drive to perform this lab.

1. Power on the computer and log in.
2. There are several ways to get to the window used to manage hard drives. Practice using all of them:
 - (a) Click the *Start* button, type `compmgmt.msc` in the Search box, and press .
 - (b) In Windows Explorer/File Explorer, right-click *Computer* (Windows 7) or *This PC* (Windows 8/10/11) and select *Manage*.
 - (c) Access the *Administrative Tools* Control Panel > *Computer Management*.
3. In the console tree shown in the left pane, select the *Disk Management* option. Note that the Disk Management tool can also be directly accessed by using the `diskmgmt.msc` command. The disks and volumes already installed in the computer display in a graphical manner on the right.
4. Right-click the drive partition labeled C: and select *Properties*.

Which type of file system is being used? [FAT16 | FAT32 | exFAT | NTFS]

What is the drive number shown in the right panel? [0 | 1 | 2 | 3]

What is the amount of free space?

5. Shut down the computer and remove the power cord.
6. Access the interior of the computer. Locate an available PATA port on the motherboard or an available PATA cable connector. Determine which port this is by looking at the motherboard's labeling or by using documentation.

Are you using a PATA port that has nothing attached or an available PATA cable connector that has another device attached?

7. If another device is installed on the same cable, remove the drive and determine whether it uses cable select or master/slave jumpers. Handle the drive carefully. If you removed a PATA device to check the drive settings, reinstall it into the machine and reconnect the power and data cables.

If this is the only device that will connect to a motherboard PATA port, connect the PATA cable to the motherboard.

If another device is present, does the device use the cable select, master, or slave jumper? If you are not using a cable that has another device present, choose not applicable as the answer.

[cable select | master | slave | _____ (different setting) | not applicable]

If a PATA port that has nothing attached is being used, which motherboard PATA port is being used?

If you are installing the drive as a second device on the same cable, choose not applicable as the answer. [primary | secondary | tertiary | quaternary | not applicable]

8. On the hard drive given to you by the instructor, configure the drive to the appropriate setting: cable select, master, or slave. Mount the drive, attach the data cable, and attach a power cable.

Which drive setting did you choose?

[cable select | master | slave | _____ (different setting) | not applicable]

9. Reinstall the computer power cord and power on the computer.
10. Using previously described procedures, open the *Disk Management* tool. Locate the drive in the bottom section of the window. If you are unsure about which drive is to be partitioned, contact the instructor or lab assistant.

Note that the drive you were given may have been partitioned already and assigned a drive letter. If the drive was already partitioned and a drive letter has been assigned, locate the drive in the bottom window and right-click the partition. Select *Delete Volume* and click *Yes*. Also note that you may have to delete multiple partitions.

If the drive shows the status as *Invalid* in the bottom section (left side), right-click the drive in that left section and select the *Convert to Basic Disk* option.

At this point, the drive should show all space as unallocated.

Was the drive already partitioned? [Yes | No]

Was the drive already assigned a drive letter? [Yes | No]

11. Right-click the new drive you just installed and select *New Simple Volume*. The New Simple Volume Wizard appears. Click *Next*.

What is the difference between a simple volume and a spanned volume?

What is the minimum number of drives required to create a striped volume?

12. Enter a partition size that is less than 32 GB and still leaves room on the hard drive. Notice that the partition size is shown in megabytes. Click *Next*.

Which partition size did you choose?

13. Select a drive letter (normally, this is the next drive letter available; take note of all the options) and then click *Next*.

How many drive letters are available as options?

Which file systems are supported when you use this tool?

Are any file systems supported by Windows that are not shown? If so, what are they?

14. Select the *NTFS* option. Assign a volume label that is constructed from a couple letters from each lab partner's last name. Note that there is a 32-character maximum for NTFS partitions. Select (enable) the *Perform a Quick Format* checkbox and click *Next*. Click the *Finish* button.

How can you tell from the information in the Disk Management window whether a partition is NTFS or another file system?

15. In the Disk Management window, right-click the free space for the drive you installed. Using the same process, create an NTFS simple volume, add a unique volume label, and perform a quick format.

Instructor initials: _____

Lab 7.2 Installing a Second SATA Hard Drive and Creating Two Volumes

Objective: To be able to install, configure, and manage a second hard drive using the Windows Disk Management console

Parts: Windows computer with an available SATA connection on the motherboard
Power connector

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: Use proper antistatic and gentle handling procedures when dealing with hard drives.
You must be a user who has administrator rights to configure hard drives.

1. Power on the computer and log in.
2. There are several ways to get to the window used to manage hard drives. Practice using all of them:
 - (a) Click the *Start* button, type `compmgmt.msc` in the Search box, and press `[Enter]`.
 - (b) In Windows Explorer/File Explorer, right-click *Computer (Windows 7)/This PC (Windows 8/10/11)* and select *Manage*.
 - (c) Access the *Administrative Tools* section of the Control Panel > *Computer Management*.

3. In the console tree shown in the left pane, select the *Disk Management* option. Note that the *Disk Management* tool can also be directly accessed by using the `diskmgmt.msc` command. The disks and volumes already installed in the computer display in a graphical manner on the right.
4. Right-click the drive partition labeled C: and select *Properties*.
Which type of file system is being used? [FAT16 | FAT32 | exFAT | NTFS]
What is the drive number shown in the right panel? [0 | 1 | 2 | 3]
What is the amount of free space?

5. Shut down the computer and remove the power cord.
6. Access the interior of the computer. Locate an available SATA port on the motherboard. Determine which port this is by looking at motherboard labeling or by using documentation.
Which SATA port should you use to install the second hard drive?

7. Power off the computer and access System BIOS/UEFI. If you do not know what keystroke is used to access BIOS/UEFI, watch the boot screen. If you still cannot tell, research the computer model on the internet.
Which keystroke did you use to access BIOS/UEFI?

8. Access the section of BIOS that controls the SATA port. The section you must enter varies from computer to computer. Make notes about where you went to get there in the question below. Ensure that the SATA port you located and identified in step 6 is enabled.
Was the port enabled in BIOS already, or did you have to enable it?
[already enabled | I had to enable it]
Document the BIOS steps you took to ensure that the SATA port was enabled.

9. Save the BIOS/UEFI settings if changes were made.
10. Note that if you power on the computer with nothing attached to the SATA port, you may get an error message. That is okay because the drive has not been installed yet. Power down the computer, remove the power cord, and access the interior of the computer.
11. Mount the SATA hard drive in an available drive bay, attach the SATA data cable, and attach the hard drive power connector to the drive.
12. Reinstall the computer power cord and power on the computer.
13. Using previously described procedures, open the *Disk Management* tool. Locate the drive in the bottom section of the window. If you are unsure which drive is to be partitioned, contact the instructor or lab assistant.

Note that the drive you were given may have been partitioned already and assigned a drive letter. If the drive was already partitioned and a drive letter has been assigned, locate the drive in the bottom window and right-click the volume. Select *Delete Volume* and click *Yes*. Also note that you may have to delete multiple volumes.

If the drive shows the status as *Invalid* in the bottom section (left side), right-click the drive in that left section and select the *Convert to Basic Disk* option.

At this point, the drive should show all space as unallocated.

Was the drive already partitioned? [Yes | No]

Was the drive already assigned a drive letter? [Yes | No]

14. Right-click the new drive you just installed and select *New Simple Volume*. The New Simple Volume Wizard appears. Click *Next*.

What is the difference between a simple volume and a spanned volume?

What is the minimum number of drives required to create a striped volume?

15. Enter a partition size that is less than 32 GB and still leaves room on the hard drive. Notice that the partition size is shown in megabytes. Click *Next*.

Which partition size did you choose?

16. Select a drive letter (normally, this is the next drive letter available; take note of all the options) and then click *Next*.

How many drive letters are available as options?

Which file systems are supported when you use this tool?

Are there any file systems supported by Windows that are not shown? If so, what are they?

17. Select the *NTFS* option. Assign a volume label that is constructed from a couple letters from each lab partner's last name. Note that there is a 32-character maximum for NTFS partitions. Select (enable) the *Perform a Quick Format* checkbox and click *Next*. Click the *Finish* button.

How can you tell from the information in the Disk Management window whether a partition is NTFS or another file system?

18. In the Disk Management window, right-click the free space for the drive you installed. Using the same process, create an NTFS simple volume, add a unique volume label, and perform a quick format.

Instructor initials: _____

Lab 7.3 Installing an External Hard Drive and Creating Two Volumes

Objective: To be able to install, configure, and manage a second hard drive using the Windows Disk Management console

Parts: Windows computer with an available external connection

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: Use proper antistatic and gentle handling procedures when dealing with hard drives. You must be a user who has administrator rights to configure hard drives.

1. Power on the computer and log in.
2. There are several ways to get to the window used to manage hard drives. Practice using all of them:
 - (a) Click the *Start* button, type `compmgmt.msc` in the Search box, and press .
 - (b) In Windows Explorer/File Explorer, right-click *Computer (Windows 7)/This PC (Windows 8/10/11)* and select *Manage*.
 - (c) Access the *Administrative Tools* section of the Control Panel > *Computer Management*.
3. In the console tree shown in the left pane, select the *Disk Management* option. Note that the *Disk Management* tool can also be directly accessed using the `diskmgmt.msc` command. The disks and volumes already installed in the computer display in a graphical manner on the right.
4. Right-click the drive partition labeled C: and select *Properties*.

What type of file system is being used?
 [FAT16 | FAT32 | exFAT | NTFS]

Which is the drive number shown in the right panel? [0 | 1 | 2 | 3]

What is the amount of free space?

5. Locate an available external port that can be used for the hard drive provided.

Which type of external port did you identify?
 [USB | eSATA | IEEE 1394 | Other (please identify: _____)]
6. Attach the external drive to the identified external port. Attach an external power brick/cord if necessary. Turn on power to the drive if necessary. The system should install the proper drivers and allow the drive to be recognized by the operating system.
7. Using previously described procedures, open the *Disk Management* tool. Locate the drive in the bottom section of the window. If you are unsure which drive is to be partitioned, contact the instructor or lab assistant.
8. Note that the drive you were given may have been partitioned already and assigned a drive letter. If the drive was already partitioned and a drive letter assigned, locate the drive in the bottom window and right-click the volume. Select *Delete Volume* and click *Yes*. Also note that you may have to delete multiple volumes.
9. If the drive shows the status as *Invalid* in the bottom section (left side), right-click the drive in that left section and select the *Convert to Basic Disk* option.

At this point, the drive should show all space as unallocated.

Was the drive already partitioned? [Yes | No]

Was the drive already assigned a drive letter? [Yes | No]

10. Right-click the new drive you just installed and select *New Simple Volume*. The New Simple Volume Wizard appears. Click *Next*.

What is the difference between a simple volume and a spanned volume?

What is the minimum number of drives required to create a striped volume?

11. Enter a partition size that is less than 32 GB and still leaves room on the hard drive. Notice that the partition size is shown in megabytes. Click *Next*.

What partition size did you choose?

12. Select a drive letter (normally, this is the next drive letter available; take note of all the options) and then click *Next*.

How many drive letters are available as options?

Which file systems are supported when you use this tool?

Are there any file systems supported by Windows that are not shown? If so, what are they?

13. Select the *NTFS* option. Assign a volume label that is constructed from a couple letters from each lab partner's last name. Note that there is a 32-character maximum for NTFS partitions. Select (enable) the *Perform a Quick Format* checkbox and click *Next*. Click the *Finish* button.

How can you tell from the information in the Disk Management window whether a partition is NTFS or another file system?

14. In the Disk Management window, right-click the free space for the drive you installed. Using the same process, create an NTFS simple volume, add a unique volume label, and perform a quick format.

Instructor initials: _____

Lab 7.4 Installing a PATA/SATA Hard Drive with the Windows 7/8/10/11 Disk Management Tool, `diskpart`, and `convert`

Objective: To be able to configure and manage a hard drive using the Windows Disk Management console

Parts: Windows computer with an available PATA connection on the motherboard, an available PATA cable connection, motherboard SATA port, USB port, or eSATA port
Internal or external PATA or SATA hard drive
Available power connector for an internal hard drive

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: Use proper antistatic and gentle handling procedures when dealing with hard drives.
 You must be a user who has administrator rights to configure hard drives.
 If an optical drive is installed, it can be replaced by the new hard drive to perform this lab.

1. Power on the computer and log in.
2. There are several ways to get to the window used to manage hard drives. Practice using all of them:
 - (a) Click the *Start* button, type `compmgmt.msc` in the Search box, and press [Enter](#).
 - (b) In Windows Explorer/File Explorer, right-click *Computer (Windows 7)/This PC (Windows 8/10/11)* and select *Manage*.
 - (c) Access the *Administrative Tools* Control Panel > *Computer Management*.
3. In the console tree shown in the left pane, select the *Disk Management* option. Note that the *Disk Management* tool can also be directly accessed by using the `diskmgmt.msc` command. The disks and volumes already installed in the computer display in a graphical manner on the right.
4. Right-click the drive partition labeled C: and select *Properties*.

What type of file system is being used? [FAT16 | FAT32 | exFAT | NTFS]

What is the total capacity of the drive?

What is the amount of free space?

5. Shut down the computer and remove the power cord.

Note: Three sections follow. Use the appropriate section, depending on whether you are installing an internal PATA, internal SATA, or external drive. Proceed to step 9 when you are finished with your respective section.

PATA Installation (Use This Section Only if a PATA Drive Is Being Installed)

6. Access the interior of the computer. Locate an available IDE PATA port on the motherboard or an available PATA cable connector. Determine which port this is by looking at motherboard labeling or by using documentation.
7. Determine whether the other device on the same cable (if installed) uses cable select or master/slave jumpers by removing the drive and examining it. Handle the drive carefully. If you removed a PATA device to check the drive settings, reinstall it into the machine and reconnect the power and data cables.

If a PATA drive is being installed, is there a second device on the same cable? [Yes | No]

If so, does the device use the cable select, master, or slave jumper?

8. On the hard drive given to you by the instructor, configure the drive to the appropriate setting: cable select, master, or slave. Mount the drive, attach the data cable, and attach a power cable. Reinstall the computer power cord and power on the computer.

SATA Installation (Use This Section Only if a SATA Drive Is Being Installed)

6. Access the interior of the computer. Locate an available motherboard SATA port. Determine which port this is by looking at motherboard labeling or by using documentation.

If a SATA drive is being installed, which SATA port will be used for the new drive?

7. Mount the hard drive (provided by the instructor or lab assistant). Attach the data cable and attach a power cable.
8. Reinstall the computer power cord and power on the computer. Enter BIOS/UEFI Setup and ensure that the SATA port is enabled and the drive is recognized.

External Drive Installation (Use This Section Only if an External Hard Drive Is Being Installed)

6. Locate an available port to be used.
7. Attach the power cord to the drive, if necessary. Attach the drive to the appropriate port. Optionally, power on the drive. If the drive does not have a power switch, it is powered by the port.

Which type of port is being used for the new drive?

8. Power on the computer. Install device drivers if required.

For All Drive Types

9. Using previously described procedures, open the *Disk Management* tool. Locate the drive in the bottom section of the window. If you are unsure about which drive is to be partitioned, contact the instructor or lab assistant.

Note that the drive you were given may have been partitioned already and assigned a drive letter. If the drive was already partitioned and a drive letter assigned, locate the drive in the bottom window and right-click the partition. Select *Delete Volume* and click *Yes*. Also note that you may have to delete multiple partitions.

If the drive shows the status as *Invalid* in the bottom section (left side), right-click the drive in that left section and select the *Convert to Basic Disk* option. At this point, the drive should show all space as unallocated.

Was the drive already partitioned? [Yes | No]

Was the drive already assigned a drive letter? [Yes | No]

10. Right-click the new drive you just installed and select *New Simple Volume*. The New Simple Volume Wizard appears. Click *Next*.

What is the difference between a simple volume and a spanned volume?

What is the minimum number of drives required to create a striped volume?

11. Enter a partition size that is less than 32 GB and still leaves room on the hard drive. Notice that the partition size is shown in megabytes. Click *Next*.

What partition size did you choose?

12. Select a drive letter (normally, this is the next drive letter available; take note of all the options) and then click *Next*.

How many drive letters are available as options?

What file systems are supported when you use this tool?

Are there any file systems supported by Windows that are not shown? If so, what are they?

13. Select the *FAT32* option. Assign a volume label that is constructed from a couple letters from each lab partner's last name. Note that there is an 11-character maximum for FAT32 partitions and a 32-character maximum for NTFS partitions. Select (enable) the *Perform a Quick Format* checkbox and click *Next*. Click the *Finish* button.

How can you tell from the information in the Disk Management window whether a partition is FAT32 or NTFS?

14. In the Disk Management window, right-click in the unallocated drive space on the drive you just installed and select *New Simple Volume*. The New Simple Volume Wizard appears. Click *Next*.
15. Select a partition size less than 32 GB but that still leaves some space on the drive. Click *Next*.

What amount of space did you choose for the logical drive size?

16. Accept the default drive letter assignment and click *Next*.
17. Change the file system type to FAT32.
18. Make the volume label a unique name.

Write the volume label chosen.

19. Select (enable) the *Perform a Quick Format* checkbox. Click *Next*, review the settings, and click *Finish*.
20. In the Disk Management window, right-click the free space for the drive you installed. Using the same process, create an NTFS simple volume (but leave some space on the drive), add a unique volume label, and perform a quick format.

Instructor initials: _____

21. You can change a FAT16 or FAT32 partition to the NTFS file system by using the `convert` command at a command prompt. After a partition is changed, you cannot go back to a previous file system type. Also, data is preserved (but should be backed up before the conversion, just in case problems occur). Look to the left of the colored sections to see the disk number assigned (Disk 0, Disk 1, and so on).

In the Disk Management console, which disk number is used for the newly installed drive?

[0 | 1 | 2 | 3]

Write the drive letter of the first FAT32 primary partition on the newly installed drive. Note that this drive letter will be used in the coming steps.

Write the volume label used for the first FAT32 partition. This label is case sensitive, so write it carefully.

22. Windows 7: Click the *Start* button. Locate the *Command Prompt* menu option. Normally, it is located in Accessories. Right-click the *Command Prompt* menu option and select *Run as Administrator*. Click *Yes*.

Windows 8/10/11: Type **command** in the *Search* textbox > right-click on *Command Prompt* > select *Run as Administrator*.

23. Type **convert /?** to see a list of options. These options tell you what to type as an option after the **convert** command.

Which option is used to run **convert** in verbose mode?

Which option is used to convert a volume to the NTFS file system?

24. Type **convert x: /fs:ntfs** (where **x:** is the drive letter you wrote in step 21). For example, if the drive letter written in step 21 is **d:**, type **convert d: /fs:ntfs**. Notice the space between the drive letter and **/fs:ntfs**. **/fs:ntfs** is used to convert the existing file system (exFAT, FAT16, or FAT32) to NTFS. You are prompted for the volume label for the drive. Enter the volume label you documented in step 21 and press **↵Enter**. Do not forget that the volume label is case sensitive. The partition is converted and can never be returned to a previous type of file system, such as FAT32, unless the drive is reformatted.

Instructor initials: _____

25. Use the same process to convert the second FAT32 partition to NTFS. Look up the volume label and the drive letter before starting. Close the command prompt window. Have the Disk Management Window open to verify the file system.
26. Close the command prompt window. In the Disk Management window, right-click the last partition on the newly installed hard drive.
27. Select the *Shrink Volume* option. Reduce the amount of hard drive space and click *Shrink*.

What was the result in the Disk Management console?

28. Right-click the second partition on the newly installed drive. Select *Extend Volume*. A wizard appears. Click *Next*. Use the maximum space available on the same drive and click *Next* and then *Finish*.

What message appears?

According to the information in the dialog box, do you think changing this volume to a dynamic disk will matter?

29. Click *No* and return to the Disk Management console. Review the disks and determine the disk number and drive letter of the boot volume.

Write the disk number of the boot volume. [0 | 1 | 2 | 3]

Write the drive letter of the partition that holds the boot volume.

30. Right-click the second partition of the newly installed drive and select *Delete Volume*. Click *Yes*.

31. Partitions can be created from the Disk Management console, and they can also be created by using the `diskpart` command utility. Open another command prompt window.
32. At the command prompt, type `diskpart` and press `[Enter]`. You may have to click *Yes* to allow access to the tool.
- How does the prompt change?
-
33. Type `help` and press `[Enter]`. Use the `help` command to determine which commands are available.
- Which command is used to make a new volume?
-
- Which command can be used to assign a drive letter to a drive partition?
-
34. Type `create ?` and press `[Enter]`.
- Which two options can be used with `create`?
-
-
35. Type `create partition ?` and press `[Enter]`.
- What types of partitions can be created?
-
-
36. Press the `[Up]` key once. The same command appears. Use the `[Backspace]` key and replace the question mark with the word `primary` so the command reads `create partition primary`. Press `[Enter]`.
- What does the feedback say?
-
- Based on what you see in Help, what command do you think would be used to select a drive?
-
-
37. Type `select disk x` (where `x` is the disk number documented in step 21) and press `[Enter]`. A prompt says the disk is selected.
38. Retype the `create partition primary` command or press the `[Up]` key until that command appears. Press `[Enter]`.
39. Look back to the Disk Management console and notice that the part of the drive previously marked as free space is now a partition.
40. At the command prompt, type `detail disk` and press `[Enter]` to see the partition you just created.
- Based on the command output, what drive letters are currently used?
-
-
41. At the command prompt, type `assign` and press `[Enter]`.
- Look in the Disk Management console window to determine what drive letter was assigned. Write the drive letter.
-
- What volume label, if any, was assigned?
-
-
42. (Skip this step if on a Windows 7 computer.) On a Windows 8/10/11 machine, when you are prompted to apply high-level formatting to the drive, click *Cancel* and then *OK*.
43. On all versions of Windows computers, at the command prompt type `exit` and press `[Enter]` to leave the `diskpart` utility.

44. Type **help** at the command prompt and press `(Enter)` to look for a command to help with the high-level formatting of the drive. The commands scroll quickly, so type **help | more** and press `(Enter)`. (The `()` keystroke is made by holding down the `(Shift)` key and pressing the key above the `(Enter)` key.) One page at a time is shown. Press the `(Spacebar)` once to see the next page of commands.
45. The next step requires you to fill in the following parameters. Let's review them here and then you must replace the italicized part of the command with values when you get to the section of this step that tells you to "Type the command...":

x:—The drive letter documented in step 41.

/v:name—Where *name* is a unique volume name with up to 32 characters.

/fs:ntfs—To tell the system to use the NTFS file system. (Other options could be */fs:fat*, */fs:fat32*, or */fs:exfat*, but this lab uses NTFS.)

/q—To do a quick format.

Type the command **format *x*: /fs:ntfs /v:name /q** and press `(Enter)`. An example of this command is `format x: /fs:ntfs /v:Goofy /q`. Remember that *x* is the drive letter documented in step 41.

Note: If you get a message saying that the arguments are not valid, you did not exit the `diskpart` utility and did not do steps 42, 43, and 45. Go back and do them. When asked to proceed, press `(Y)` and then press `(Enter)`.

46. View the results in the Disk Management console. The last partition should be a partition that has a drive letter, that has a volume name assigned, and that uses the NTFS file system.
47. Using whatever method you like, copy one file to each of the three partitions you have created. Call the instructor over and show the instructor the three files and the Disk Management console. Do not proceed unless you have completed these parameters.

Instructor initials: _____

48. Close the command prompt window.
49. Starting with the partition on the far right in the Disk Management console for the newly installed drive, right-click each partition and delete each volume. Call the instructor over when the drive shows as one block (black bar across the top) of unpartitioned hard drive space.

Instructor initials: _____

50. Shut down the computer. Remove the computer power cord. Remove the data cable from the newly installed hard drive. Remove the power cord from the newly installed hard drive (optional on the external drive). Remove the hard drive. If necessary, reinstall the optical drive, data cable, and power cord. Reinstall the computer cover and power cord.
51. Boot the computer. Open *Windows Explorer* (Windows 7)/*File Explorer* (Windows 8/10/11) and select *Computer* (Windows 7)/*This PC* (Windows 8/10/11). Ensure that the optical drive is recognized. If it is not, redo step 50.
52. Show the instructor the optical drive in the Windows Explorer/File Explorer window and give the hard drive and any cable back to the instructor/lab assistant.

Instructor initials: _____

Lab 7.5 Striping and Spanning Using Windows

Objective: To be able to configure and manage a striped volume or a spanned volume on a hard drive using the Windows Disk Management console

Parts: Windows computer
Motherboard or adapter that supports RAID 0
Two IDE PATA or SATA hard drives

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: Use proper antistatic and gentle handling procedures when dealing with hard drives.
You must be a user who has administrator rights to configure hard drives.
This lab assumes that you can install and configure two or more SATA or PATA hard drives so that they are recognized in the Disk Management console.

1. Power on the computer and log in. In *File Explorer* right-click *My PC* > *Manage* > select the *Disk Management* option. The two newly installed hard drives should be visible in the Disk Management console. Initialize the drives, if necessary, by right-clicking each one of them and selecting *Initialize Disk*.

What disk numbers are assigned to the newly installed hard drives?

2. Within the Disk Management console, right-click in the unallocated space of the newly installed drive with the lowest-numbered disk. Select *New Spanned Volume*. A wizard appears. Click *Next*.
3. In the *Available* pane, select the second drive number written as the answer in step 1 and click *Add* to move the drive to the *Selected* pane. At least two drives should be listed in the *Selected* pane. Click *Next*.
4. Select a drive letter to assign to the spanned volume. Click *Next*.
5. Select *NTFS* from the drop-down menu and add a volume label. Select (enable) the *Perform a quick format* checkbox. Click *Next*. Click *Finish*.
6. When a message appears to convert a basic disk to a dynamic disk, click *Yes*. Verify that the spanned volume appears.

When using the Disk Management tool, how can you tell which two drives are a spanned volume?

7. Show the instructor the spanned volume.

Instructor initials: _____

8. Use Windows Explorer/File Explorer to view the drive letters assigned and the total capacity of each of the two drives.

What drive letter was assigned to the spanned volume?

What is the total capacity of the spanned volume?

Which RAID level is spanning, if any?

9. In the Disk Management console, right-click in the newly created spanned volume space and select *Shrink Volume*. Select a smaller amount of space in the *Enter the amount of space to shrink in MB* textbox.

How does the Disk Management tool change?

10. Show the instructor the shrunken volume.

Instructor initials: _____

11. In the Disk Management console, right-click in the spanned volume and select *Delete Volume*. When asked if you are sure, click *Yes*.
12. To create a striped volume from within the Disk Management console, right-click the lowest-numbered disk of the two newly installed drives and select *New Striped Volume > Next*.
13. In the *Available* pane, select the second newly installed disk and click the *Add* button to move the drive to the *Selected* pane. Click *Next*.
14. Select a drive letter or leave the default. Click *Next*.
15. Leave the default system as NTFS and select (enable) the *Perform a quick format* checkbox. Click *Next*. Click *Finish*. Click *Yes*.

How do the disks appear differently than the spanned volumes in the Disk Management console?

16. Open Windows Explorer or File Explorer.

How many drive letters are assigned to a RAID 0 configuration?

17. Copy a file to the RAID 0 drive. Show the instructor the file and the Disk Management console.

Instructor initials: _____

18. Right-click in the healthy volume space of either RAID 0 drive.

Can a RAID 0 volume be shrunk? [Yes | No]

19. Select the *Delete Volume* option. Click *Yes*. Show the instructor the unallocated space.

Instructor initials: _____

20. Power down the computer, remove the power cord, and remove the two newly installed drives.

21. Power on the computer and, if necessary, return the BIOS/UEFI settings to the original configuration. Ensure that the computer boots normally. Show the instructor that the computer boots normally.

Instructor initials: _____

Lab 7.6 Windows 8/10/11 Hard Disk Tools

Objective: To be able to use the tools provided with Windows 8 or 10 to manage the hard disk drive

Parts: Windows 8 or 10 computer and administrator rights

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: The defragmentation and error checking (Check Now) process can take more than 60 minutes on large hard drives.

1. Power on the computer and log on using a user ID and password that has administrator rights.
2. Open Windows *File Explorer*. Locate the C: drive in the left pane. You may have to expand *This PC*. Right-click on the C: drive and select *Properties*.

On the *General* tab, what is the name of the volume?

What is the drive capacity?

What does the option *Allow files on this drive to have contents indexed in addition to file properties* do?

- Click *Disk Cleanup*. The Disk Cleanup window appears. Ensure that *only* the following checkboxes are checked (enabled) for purposes of this lab:

Temporary Internet Files

Recycle Bin

Temporary Files

Game Statistics Files (if available)

Click the *OK* button. When prompted if you are sure, click the *Delete Files* button.

What message, if any, is given to you at the end of the process?

- Access the Disk Cleanup window again. Select the *Clean up system files* option. The Disk Cleanup window appears, and the related file sections are automatically checked. Click any one of the options that has an enabled (checked) checkbox. Click on the option itself (not the checkbox). Click *View Files*.

If no files appear, then you might be viewing an option that takes up no hard drive space. If you think this is the case, return to the *View Files* window, select another checked option, and click *View Files* again; or enable the viewing of files by clicking on the *View* menu option > *Options* down arrow > *Change folder and search options* > *View* tab > enable (click on) *Show hidden files, folders, and drives* > disable (ensure the option is unchecked) *Hide protected operating system files (Recommended)* > *Yes* (to the warning prompt) > *OK*. The files that are to be deleted appear.

- Close the window. Return to the Disk Cleanup window. Click *OK* to delete unused system files. Click *Delete Files*. When finished, access the Disk Cleanup window again by clicking on *Disk Cleanup*.
- Select the *More Options* tab. You may have to click on the *Clean up system files* option again to access this tab.

What are the two sections shown in the window that allow for more disk cleanup?

What do you think would be a disadvantage to using the Clean Up button for Programs and Features?

- Click *Cancel*. Click the *Tools* tab. Note that the Tools tab contains two tools: *Error-checking* and *Optimize and Defragment Drive*.
- Click *Check*. Click *Scan Drive*.

What message appears?

- Click *Close*. Click on *Optimize*.

What percentage of the C: drive is fragmented? ____%

Is scheduled optimization turned on or off so that drives are automatically optimized? [On | Off]

10. Click on *Analyze*.
Did the percentage of fragmented drive space change? [Yes | No]
 11. Click on *Optimize*. Click on *Close* when the process is done.
In the corporate environment, do you think that any of these processes are done on a regular basis?
Explain your answer.
-
-

Lab 7.7 Windows 8/10/11 Storage Spaces

Objective: To be able to use the tools provided with Windows 8, 10, or 11 to manage the hard disk drive

Parts: Windows 8, 10, or 11 computer and administrator rights
One or more of the following already installed and accessible through Windows Disk Management tool: internal hard drive, external hard drive, SSD, or SSHD

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on using a user ID and password that has administrator rights.
2. Access the *Storage Spaces* Control Panel.
3. Select the *Create a new pool and storage space* link > click *Yes* if asked permission to continue.
4. Enable (click in the checkbox to select) the drive(s) to be used > *Create pool* button.
5. In the resulting window, name the storage space, optionally select a drive letter and file system, and select the resiliency type.

What resiliency types are available? (Choose all that apply.)

[simple | complex | extended | parity | no parity | two-way mirror | three-way mirror]

What resiliency type is the default?

[simple | complex | extended | parity | no parity | two-way mirror | three-way mirror]

What file systems are available?

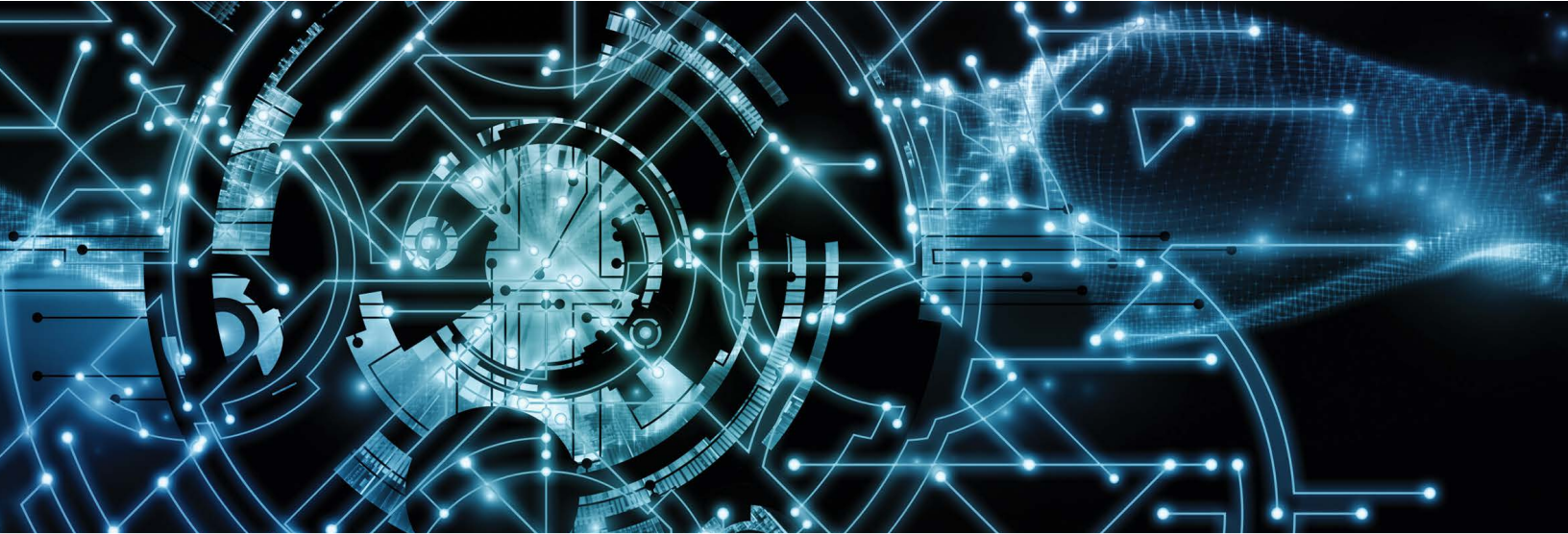
6. Select the pool size.
 7. Select *Create storage space*. The storage space appears in File Explorer.
Which drive letter did you choose?
-

Instructor initials: _____

8. To remove a storage space, access the *Storage Spaces* Control Panel again.
9. Locate *Storage Spaces* > *Change settings* > *Delete pool* link located on the right side > *Delete storage space* button.

8

Video and Multimedia Devices Labs



Lab 8.1 Managing Sound and Optical Drives in Windows

Objective: To be able to use the tools provided with Windows to manage sound devices and optical media drives

Parts: A computer with Windows 7 or higher loaded, with an optical drive installed, and that has internet access

Procedure: Complete the following procedure and answer the accompanying questions.

Note: Parts of this lab may be completed differently, depending on the hardware installed and the version of Windows installed.

1. Power on the computer and log in to Windows.
2. Access the *Sound* Control Panel.

Which tabs are shown in the window?

Which device is the default playback device?

3. With the default playback device selected, click the *Configure* button.

Which audio channels are available?

4. Click the *Test* button.

What was the result?

5. Click the *Cancel* button and ensure that the *Playback* tab is selected. Click *Properties*. The *Speakers Properties* window opens.
What jack information is displayed?

6. Click *Properties*.
What is the device status?

7. Select the *Driver* tab.
What is the driver version?

What is the purpose of the *Roll Back Driver* button?

Can the audio be disabled from this window?

8. Click *Cancel*. On the *Speakers Properties* window, click the *Advanced* tab.
How many bits are used for sampling?

What is the frequency response?

9. Click *Cancel*. Select the *Recording* tab.
What is the default recording device?

10. Select the *Sounds* tab. In the *Program* (Windows 7)/*Program Events* (Windows 8/10/11) window, select any task that has a speaker icon to the left of it. Listening to these sounds is an easy way to check for issues without having to download a sound file. Click *Test*.
Did sound emit? [Yes | No]
11. Select the *Sound Scheme* drop-down menu.
What options are available?

What is the checkbox used for in this section?

12. Click *Cancel*. Close the *Control Panel* window.
13. Open *Windows Explorer* (Windows 7)/*File Explorer* (Windows 8/10/11) and select *Computer* (Windows 7)/*This PC* (Windows 8/10/11) from the left panel. In the right panel, right-click the optical drive. Notice the *Eject* option, which can be used to eject a stuck disc.
14. Point to the *Share With* option and select *Advanced Sharing*. The optical drive *Properties* window opens. The *Sharing* tab allows you to share a disc with others.

15. If you closed the optical drive *Properties* window, go back into it and select the *Hardware* tab. In the *All Disk Drives:* window, select the optical drive. Click *Properties*.

What is the device status?

16. In the *Properties* window, select the *DVD Region* tab if a DVD drive is installed.

What is the DVD region code? Write *Not applicable* as your answer if a CD drive is installed.

17. Select the *Driver* tab.

Which version of the driver is installed?

What is the date of the driver?

18. Use the internet to determine whether a newer device driver is available. Show this driver to the instructor or lab assistant.

Instructor initials: _____

19. In the device's *Properties* window, click *Cancel*.

20. In the original optical drive *Properties* window, select the *Customize* tab.

What types of things can be customized from this tab?

21. Click the *Cancel* button. Close the *Windows Explorer (Windows 7)/File Explorer (Windows 8/10/11)* window.

Lab 8.2 Installing an Optical Drive

Objective: To install, configure, and test an optical drive

Parts: A computer with Windows loaded

An antistatic wrist strap or glove

An optical drive with accompanying cable and mounting equipment, if necessary

Procedure: Complete the following procedure and answer the accompanying questions.

1. Obtain an optical drive designated by the instructor or student assistant.

Which type of drive is this?

[CD-ROM | CD-R | CD-RW | DVD-R | DVD+R | DVD±RW | DVD-R DL | DVD+R DL | BD-R | BD-RE]

List the drive manufacturer and model number.

If possible, determine whether a driver is available and list the website on which you located this information.

Which type of interface does the optical drive use? [PATA IDE | SATA | SCSI | Parallel | USB]

2. Power off the computer, remove the power cord, open the computer, and determine whether a cable and interface are available to install the drive. If not, obtain them from the lab supplies area, instructor, or lab assistant.

3. Configure the drive as necessary for the type of interface being used.

Which drive settings did you select, if any?

4. If appropriate, install the drive into the computer and attach power.
5. If an external device is being installed, a device driver may need to be installed at this point. Always refer to the device installation instructions. Whether the drive is internal or external, attach the correct interface cable to the drive.
6. Power on the computer, load a device driver (if necessary), and ensure that the operating system recognizes the drive. Troubleshoot as necessary until the drive works.

Which tests did you perform to ensure that the drive works?

7. Tell the instructor when the drive is successfully installed.

Instructor initials: _____

8. Remove the drive and reinstall the computer cover. Power on the computer and ensure that BIOS/UEFI errors do not appear.

Instructor initials: _____

Lab 8.3 Using DirectX for Diagnostics in Windows

Objective: To be able to use the DirectX tool provided with Windows 7 or higher

Parts: A computer with Windows 7, 8, or 10 loaded and with administrator rights and internet access

Procedure: Complete the following procedure and answer the accompanying questions.

Note: This lab may be completed differently depending on the equipment installed and the Windows version and service pack.

1. Power on the computer and log in to Windows.
2. Click the *Start* button and in the *Search Programs and Files* textbox, type `dxdiag`, and press or select the `dxdiag` link. The DirectX tool may ask you if you want to check that the drivers are digitally signed and/or to allow an internet connection for an update. Click *Yes*.

After the tool is shown and the *System* tab is displayed, which DirectX version is running?

How much RAM is installed in the computer?

What is the size of the page file?

How much of the page file is currently used?

3. Click the *Next Page* button. The next tab displays.

What notes, if any, appear on the tab?

4. Ensure that you are on the *Display* tab.

How much RAM is on the video adapter?

Are any DirectX features enabled? If so, which ones?

Research the words *RAM*, *video adapter*, and *DirectX* on the internet to help with this answer and give a brief description of the features.

5. Ensure that the *Sound* tab is selected.

What is the device type used?

What is WDM, and what does it stand for? If you do not know, research it on the internet.

Which driver file is used?

What does the WHQL logo mean? If you do not know, research this term on the internet.

6. Click the *Input* tab.

List any direct input devices displayed.

7. Expand any USB devices in the *Input Related Devices* section.

List any USB devices that are considered to be input devices.

8. Close the DirectX Diagnostics window.

Lab 8.4 Installing a Sound Card and Speakers in Windows

Objective: To install and configure a sound card

Parts: A computer with Windows 7 or higher loaded and an available expansion slot

Sound card with drivers or internet access

Optional audio disc

Procedure: Complete the following procedure and answer the accompanying questions.

1. Before powering on the computer, determine the current audio capabilities.

How many sound ports are integrated into the motherboard?

Draw each port and state its purpose. If you do not know, use the internet to research the computer model.

2. Connect power to the speakers and attach the speakers to the computer, if necessary.

3. Power on the computer and log in to Windows. Access the *Hardware and Sound* section of the Control Panel. Select the *Sound* link.
On the Playback tab, how many playback devices are listed?

4. Right-click the icon that represents the enabled speaker(s) and select *Properties*.
Which name is currently assigned to the output device?

5. Click in the *General Tab* textbox and change the name to something more meaningful.
List the name assigned.

Which output jacks are available for this output device?

What controller is controlling the speakers?

6. Click the speaker controller *Properties* button.
Which driver version is installed?

7. Close the Properties window. Back in the Speakers Properties window, select the *Levels* tab.
Which settings can you control on this tab?

The tabs that are available vary depending on the speakers installed. Which tabs are available for the speakers on your computer?

8. Select the *Advanced* tab. Test the quality of the sound output by clicking the *Test* button. Troubleshoot the system if the speakers do not emit a sound.
How many bits are used in converting analog sounds into digital audio?

9. Select the *Default Format* drop-down menu. Note that this is the window where you allow applications to control or change the speaker settings.
List two other available formats, if possible.

10. Click *Cancel* twice to close the Speaker Properties windows. Power off the computer.
11. Power on the computer and enter the BIOS/UEFI Setup program.
Which key or process did you use to enter Setup?

12. Locate and disable the integrated sound ports. Save the settings and exit BIOS/UEFI Setup.
13. Log in to Windows.
14. Using any method you would like, ensure that the speakers do not emit sound.
Which method did you use?

15. Shut down the computer and remove the power cord.

16. Access the computer expansion slots and, if necessary, remove any slot covers or retention bars.
17. Install the sound adapter into an empty expansion slot and ensure it fits snugly into the slot. Reinstall any retention bar as necessary.
18. Attach the power cord and power on the computer. The computer should detect that a new device has been installed. You may be prompted for a device driver and to restart the computer in order to use the new adapter. If you don't have a device driver, go to a computer that has internet access and download the appropriate driver for the sound card you installed. Note that you may have to power down the computer and look at the sound card (and possibly remove it) in order to get the appropriate model required to download the correct driver.
19. Attach the speakers to the appropriate ports on the newly installed sound card.
20. Using any method, including previously demonstrated methods or by playing an audio disc, test the new sound card.
21. Access *Device Manager* and expand the *Sound, Video and Game Controllers* section.
22. Right-click the newly installed sound card and select *Properties*.

Which I/O address does the adapter use?

What is the device status?

Instructor initials: _____

23. Power down the computer and remove the power cord.
24. Unplug the speakers from the sound card. Remove the sound card and attach any slot covers.
25. Power on the computer and access BIOS/UEFI Setup.
26. Enable the integrated sound ports and save the settings.
27. Attach the speakers to the motherboard speaker port.
28. Attach the power cord. Boot the computer and log in to Windows again. Test the speakers.
29. Return all parts to the proper location.

Lab 8.5 Installing a USB Scanner

Objective: To be able to install a USB scanner and driver on a Windows-based computer

Parts: USB scanner, USB cable, scanner driver, scanner software/utilities, computer with Windows loaded

Procedure: The procedures outlined below are guidelines. Refer to the scanner's installation instructions for exact procedures.

Installing the Scanner Driver

1. Insert the scanner driver media into the drive. Sometimes you must also select which type of interface connection is going to be used. If this is the case, select *USB*. The software installer sometimes includes additional software programs that can be used to control the scanner and to manipulate scanned images. Many drivers require the computer to be restarted when the installation process is complete.

Connecting the Scanner

2. A scanner may ship with a carriage safety lock. If this is the case, remove the safety lock.
3. With the computer powered on, connect one end of the USB cable to the scanner's USB port and attach the other end to a USB computer port or a USB hub port.
4. If necessary, attach the power cable to the scanner. Attach the other power cable end to an electrical outlet.
5. Power on the scanner.

- Optionally, if the scanner has a calibrate routine, execute it.

Using the Scanner

- If the scanner software program(s) did not install during driver installation, install the scanner software program(s) now.
- Insert a document to be scanned.
- Access the scanner software program by clicking the *Start* button and scan the document.

Instructor initials: _____

Lab 8.6 Changing the Drive Letter of an Optical Drive by Using Disk Management and the `diskpart` Utility

Objective: To reassign the optical drive letter

Parts: Windows computer with administrator rights

Procedure: Complete the following procedure and answer the accompanying questions.

- Using Windows/File Explorer, determine the current optical drive letter.
What drive letter is being used by the optical drive?

- In Windows 7, from the Start button menu in the Search Program and Files textbox, type **Disk Management** and press `[Enter]`. In Windows 8/10/11, open the *Disk Management* tool.
- Locate the optical drive in the bottom half of the Disk Management window. Note that you may have to scroll to the bottom of the drives in the lower half of the screen.
- Right-click or tap and briefly hold the drive icon in the left side of the panel where the drive letter is located and select *Change Drive Letter and Paths*.
- Select *Change* and use the *Assign the following drive letter:* drop-down menu to select a different drive letter.
What drive letter did you choose?

- Click *OK* and click *Yes* to the notification that some programs might not work properly.
- At a command prompt, type **diskpart** and press `[Enter]`. Type **list volume** and press `[Enter]`. Look down the Type column for an optical drive and locate the drive to be changed. Ensure that the drive letter in the Ltr column is the same drive letter written down in step 5.
Write the volume number that is listed in the same row as the optical drive.

- At a command prompt, type select volume x (where x is the number you wrote in step 7). A message appears, stating that the volume is selected. If the message does not appear, recheck your steps, starting from the beginning of the lab.
- Type **assign letter=x** (where x is the newly assigned drive letter). A message appears, stating that the drive letter assignment was successful. If this message does not appear, redo the exercise.
- Use *Windows Explorer* (Windows 7)/*File Explorer* (Windows 8, 10, or 11) to verify the reassignment, refreshing the screen if necessary. Show the instructor or lab assistant your reassigned drive letter.

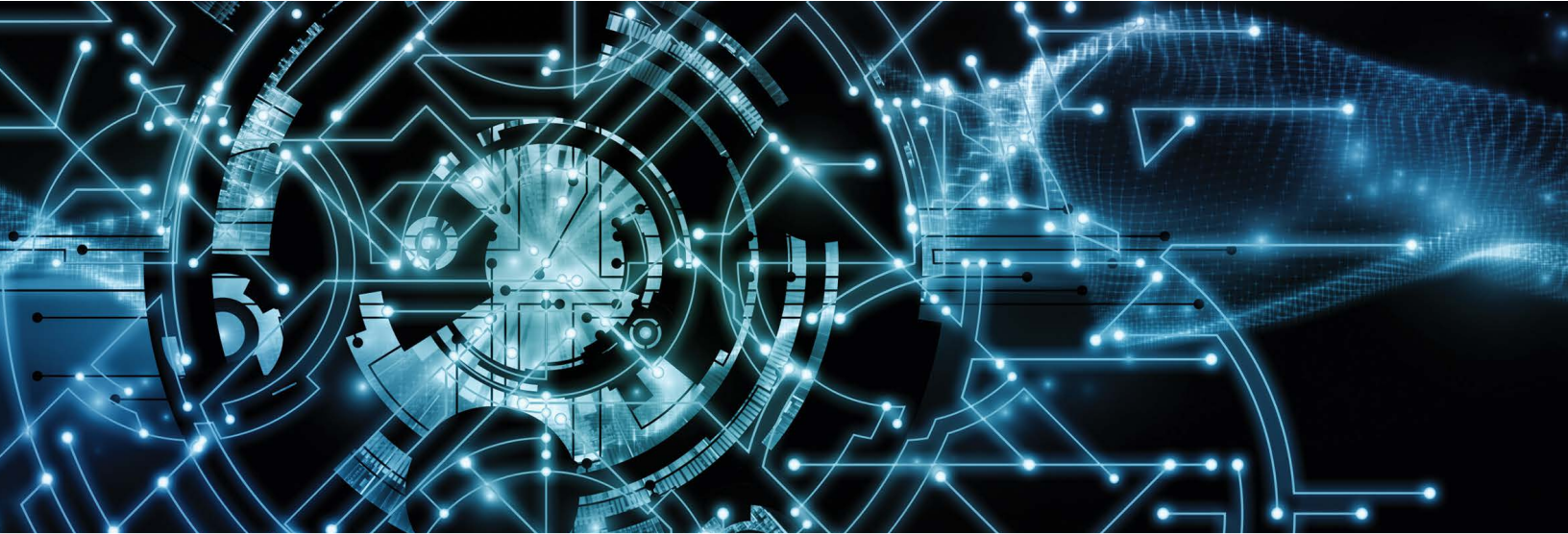
Instructor initials: _____

- In the `diskpart` utility or the Disk Management window, return the drive to the original drive letter. Refer to the answer to the question in step 1 if you do not remember the original drive letter. Use Windows Explorer/File Explorer to show the instructor or lab assistant that the drive letter has been reassigned.

Instructor initials: _____

9

Printers and Multifunction Devices Labs



Lab 9.1 Installing a Generic/Text-Only Print Driver on a Windows 7, 10, or 11 Computer

Objective: To install a generic print driver on a Windows computer and examine printer properties

Parts: Computer with Windows 7, 10, or 11 installed

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: A printer is not required to be attached to the computer for this lab to be executed.

In order to install a printer, you must have the specific permission to install a printer and install a device driver.

1. Power on the computer and log on using the user ID and password provided by the instructor or lab assistant.

Is a printer attached to the PC? If so, does it attach wirelessly or using the USB port?

2. In Windows 7: Click the *Start* button > *Control Panel* > *Hardware and Sound* > *Devices and Printers* > *Add a Printer* link > *Add a Local Printer* > ensure that the *Use an Existing Port* radio button is selected and the *LPT1: (Printer Port)* option is selected (even if a printer attaches to the PC already; you will not be printing from this print driver) > *Next* > in the *Manufacturer* column, select *Generic* > in the *Printers* column, select *Generic/Text Only* > *Next* > in the *Printer name* textbox, type **Class Printer** > *Next* > ensure that the *Do Not Share This Printer* radio button is enabled > *Next* > ensure that the *Set as the Default Printer* checkbox is unchecked > *Finish*.

In Windows 10/11: Search for **printers** and select *Printers and scanners* from the resulting list > *Add a printer or scanner* link > when the system starts searching for printers, *The printer that I want isn't listed* link > enable (select) the radio button for *Add a local printer or network printer with manual settings* > *Next* > if on a higher version of Windows, you should select the *Do not share this printer* radio button > ensure that the *Use an existing port* radio button is selected and the *LPT1: (Printer Port)* option is selected (even if a printer attaches to the PC already; you will not be printing from this print driver) > *Next* > in the *Manufacturer* column, select *Generic* > in the *Printers* column, select *Generic/Text Only* > *Next* > in the *Printer Name* textbox, type **Class Printer** > *Next* > ensure the *Set as the Default Printer* checkbox is unchecked > *Finish*.

- From the *Devices and Printers* section of the Control Panel > right-click the *Class Printer* icon > *Properties*.

Which tabs are available with the generic print driver?

- Click *OK* > right-click the *Class Printer* icon > *Printer properties*.

Which tabs are available through this option?

Use Lab Table 9.1 to list what is important about each tab or why a technician might use the tab.

LAB TABLE 9.1 Generic printer *Properties* window tabs

Tab	Notes
General	
Sharing	
Ports	
Advanced	
Color Management	
Security	
Device Settings	
Printer Commands	
Font Selection	

On the Ports tab, what do you think printer pooling is?

Which button on the General tab do you think would be useful to a technician when troubleshooting a printing problem?

Instructor initials: _____

- Close the window. Right-click on *Class Printer* and select *Printing Preferences*. In the *Orientation* section, select the *Landscape* option.

How does this change printing?

- Select the *Paper/Quality* tab. Click the *Paper Source* drop-down menu.

Which options are available, even with a generic print driver?

Instructor initials: _____

7. Select the *Advanced* button.

List three paper size options.

8. Click *Cancel*; click *Cancel* again. Then access the *Printer Properties* window.
9. Click the *Ports* tab. Notice that LPT1 is checked. If you made a mistake during installation and selected the wrong port, you can change it here. Notice that File: and XPS are options.
10. Access the *Advanced* tab. Select the *Printing Defaults* button. Through this option, you can select the default quality and orientation the printer uses to print. Users must change the settings if they want something other than this. Click *Cancel*. Click the *Separator Page* button.

What is the purpose of a separator page?

11. Click *Cancel*. Click *OK*.
12. To rename the Class Printer driver, right-click on *Class Printer* in the Control Panel > *Printer Properties*. On the *General* tab, change the name of the printer in the first textbox to *IT Printer* > *OK*.
13. To delete the IT Printer, right-click on *IT Printer* > *Remove Device* > *Yes*.

Lab 9.2 Installing a Local Printer on a Windows 7, 8, 10, or 11 Computer

Objective: To install a local printer on a Windows 7, 8, or 10 computer

Parts: A computer with Windows 7, 8, or 10 installed and a printer physically attached to an LPT, COM, or USB port

An appropriate printer driver for the operating system (with internet connectivity or a printer driver provided)

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: Refer to the printer installation guide when installing a new printer. A printer may have its own CD and installation wizard that installs the driver and software.

In order to install a printer, you must log on as an administrator (or use a user ID that belongs to the Administrators group).

1. Power on the computer and log on using the user ID and password provided by the instructor or lab assistant.
2. Use the internet to research and download the printer driver appropriate for the printer and operating system version installed. Otherwise, use the driver provided by the instructor or lab assistant.

Which version of the printer driver did you download or do you have?

3. Attach the printer cable to the correct computer port. Attach the power cord to the printer, if necessary, and insert the other end into a wall outlet. Power on the printer.
4. Windows normally detects a plug-and-play printer and may complete all the installation steps automatically.

Does Windows automatically detect and install the printer?

5. If Windows cannot find the driver, browse for a printer driver when you are prompted to do so.

- 6. When the driver is installed, print a test page to ensure communication between the computer and the printer.

Did the printer print correctly? If not, delete the printer and complete the installation again.

Instructor initials: _____

Lab 9.3 Exploring a Windows 7, 8, or 10 Printer

Objective: To explore printer options available through Windows 7, 8, or 10

Parts: A computer with Windows 7, 8, or 10 installed and an installed printer
 Optionally, access to the internet for researching the latest printer driver

Procedure: Complete the following procedure and answer the accompanying questions.

Note: This process depends on the printer manufacturer. You may need to modify the initial steps to find the details for the specific printer.

- 1. Power on the computer and log in to Windows.
- 2. Access the *Devices and Printers* section of the Control Panel or the *Printers & scanners* Settings option. Right-click on the installed printer and select *Printing Preferences*.

What is the default print quality mode for this printer?

Is this the most cost-efficient mode available? If not, what is?

- 3. Using various options or links, answer the following questions.
 - a. List one instance in which a technician might use the *Pause Printing* option. If you do not know for sure, research the answer on the internet.

- b. List the steps necessary to share this printer with other computers.

- c. Which printer option would you use to see how many documents have been sent to the printer?

- d. List information that might be important for business documentation purposes.

- e. What information is provided for troubleshooting printing problems?

- f. To what port does the printer attach?

- g. Which print spooler option is used?

h. Which security options are currently used?

i. If the printer is shared, does the printer have the option to render print jobs on client computers?

Instructor initials: _____

4. Close any open windows.

Lab 9.4 Exploring a Windows 11 Printer

Objective: To explore printer options available through Windows 11

Parts: A computer with Windows 11 installed and an installed printer
 Optionally, access to the internet for researching the latest printer driver

Procedure: Complete the following procedure and answer the accompanying questions.

Note: This process depends on the printer manufacturer. You may need to modify the initial steps to find the details for the specific printer.

1. Power on the computer and log in to Windows.
2. Access *Settings > Bluetooth & devices > Printers & scanners >* select a printer. The printer settings options display.
3. Open the print queue. Even though there are no documents, the printer can be controlled as in previous versions of Windows.
4. Access the *Printer* menu ribbon option. Notice that you can set a printer to the default printer using this menu item.

List three other options that are available.

Based on the information you learned in the chapter, what is the purpose of the *Sharing...* option?

5. Explore the *Printing Preferences* and *Properties* options, if available.

Describe the difference between the settings that can be changed through the *Printing Preferences* option and the *Properties* option. If one of them is not available, state which one and just describe the option that is available.

When the print queue window is open, which menu item would you use to pause printing?

[Printer | Document | View]

When the print queue window is open, which menu item would you use to select and continue printing a document after a paper jam is cleared?

[Printer | Document | View]

When the print queue window is open, which menu item would you use if a new print job comes into the queue? [Printer | Document | View]

When the print queue window is open, which menu item would you use to cancel all print jobs?

[Printer | Document | View]

When the print queue window is open, which menu item would you use to select and cancel a particular document that has a lot of pages that the user sent by mistake? [Printer | Document | View]

6. Use the *Print test page* option to test the printer.

Did a document print? If so, describe the information found on the test page. If it didn't print, describe why you think the test page did not output.

7. Select the *Run the troubleshooter* option. Select the *View detailed information* link.

List at least three potential issues that were checked.

8. Access the *Printer properties > General* tab.

Which button do you think a technician would use if there were a paper jam on the final page of a multipage print job and there were no more pages to come through?

Instructor initials: _____

9. Select the *Hardware properties* option > *General* tab for the particular printer being used.

What is the device status?

Instructor initials: _____

10. Close all *Printer settings/Settings* windows.

10 Mobile Devices Labs



Lab 10.1 Backing Up an iOS Device to a PC or Mac by Using iTunes

Objective: To be able to use the iTunes application to back up the operating system and settings on an iOS device

Parts:
An iOS-based device
A PC or Mac computer
A USB cable to connect the iOS device to the PC or Mac
An Apple ID and password

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the PC or Mac and the iOS device. Log in as required.
2. Ensure that the PC or Mac has iTunes installed. If the application is not installed, download and install it. Open iTunes.
3. Attach the USB cable from the iOS device to the computer.
4. On the Mac or PC, the iOS device should display, or you can choose it from the top left, where the music notes icon is located. Note that you may have to click *Continue* > *Get Started* if this device has never been connected before.

What iOS version does iTunes show is on the iOS device?

What is the iOS serial number shown in iTunes?

5. In the *Backups* section, select the *This Computer* radio button.

Looking at the screen, does this Mac or PC have the ability to encrypt the backup file where the backup is to be stored?

[Yes | No]

How do you know?

- Click the *Back Up Now* button.

What information displays under the *Latest Backup* section?

What option on the screen would you use if you needed to reinstall the iOS operating system?

Lab 10.2 Determining Memory Resources in an iOS-Based Device

Objective: To be able to use the Apple iOS operating system to determine the amount of memory

Parts: An Apple iPhone or iPad

Procedure: Complete the following procedure and answer the accompanying questions.

- Ensure that the Apple device is powered on.
- Access the *Home* screen (by pressing the *Home* screen button or swiping up from the bottom). Tap the *Settings* option. Note that you may have to swipe your finger to access the *Settings* option if multiple pages of icons are present.
- Tap the *General* option. Tap the *About* option. Locate the *Capacity* option, which shows the total amount of memory installed.

How much memory is available on the device?

- Locate the *Available* option, which shows the amount of memory that is not being used.

How much memory is free?

- Return to the *Home* screen.

Lab 10.3 Determining Memory Resources in an Android-Based Device

Objective: To be able to use the Android operating system to determine the amount of memory

Parts: An Android-based device

Procedure: Complete the following procedure and answer the accompanying questions.

Note: The Android operating system is an open source operating system. Options vary from device to device, but most configuration options are similar.

- Ensure that the Android device is powered on.
- Access the *Home* screen by tapping the *Home* icon. Tap the *Settings* option. Note that you may have to swipe your finger to access the *Settings* option if multiple pages of icons are present.
- Tap the *Storage* option. Locate the total amount of storage.

How much memory is available on the device?

- Locate how much memory is available (that is, not being used).

How much memory is free?

How much memory is being used by applications?

Does this device have external storage? If so, how can you tell?

- Return to the *Home* screen.

Lab 10.4 Managing Files on a Mobile Device

Objective: To be able to copy files or send files using an Android or Apple iOS-based device


Parts: Android device or Apple iOS device

Procedure: Complete the following procedure and answer the accompanying questions.

Android

1. If working on an Apple device, please go to step 16. Power on the Android device.
2. Access the Camera app by touching the *Camera* icon on the *Home* screen.
3. Normally in the Camera app, there is an icon of a camera or a circle that you touch to take the picture. Take a picture. You may hear a camera shutter sound effect.
4. Return to the *Home* screen by touching the *Home* icon. If the *Home* icon is not showing, touch the screen where it normally appears (bottom left, center icon).
5. Locate and tap the *File Manager* app.
6. Unless the settings have been changed, most photos are stored by default on internal storage. Tap the *Internal Storage* option. The internal storage folders are listed to the right.
7. Locate and tap the *DCIM* folder.
8. Locate and open the *Camera* folder.
9. To open a picture, touch the filename. Frequently there are options such as rotating or cropping the photo found by touching just outside the photograph.

What photo options are available?

10. Return to the file listing by using the *Return* button (the button on the screen that is a return arrow that looks like this: ). If the *Return* button is not shown, you can touch the bottom left of the screen, and the *Return* arrow should appear.
11. Enable the checkbox next to the name of the photograph by touching the checkbox.
12. Options either appear or you can touch an icon normally located in the upper-right or upper-left corner to allow options to appear. Locate the options that include the copy function.
13. Go to another folder located in your internal storage. Select the *Paste* option.

Instructor initials: _____

14. Delete the original and copied photographs.

Instructor initials: _____

15. Power off the device.

Apple

16. If working on an Android device, please go to step 1. Power on the Apple device.
17. Access the Camera app by tapping the *Camera* icon on the *Home* screen.
18. Tap the icon of the camera to take the picture. Take a picture. You may hear a camera shutter sound effect.
19. Notice that a small image of the photograph is available in the lower-left corner. Tap the graphic of the photo. Note that you can also access the photograph by using the *Photos* home screen icon.
20. Options are available in the top-right corner. If these options have disappeared, just tap the photo.

Describe three options available at the top of a photograph.

21. Select the option that has a box with an arrow in it. Select *Email Photo*.
22. In the *To:* textbox, type a valid email address such as your own by tapping inside the blank space to the right of *To:*. See the instructor if you don't know of an email address to use.
What email address did you use?

23. In the *Subject* textbox, type *Class Photo*. Notice that the photo is already attached to the email.
24. Tap the *Send* button in the top-right corner of the email.
25. Take another photograph.
26. Either using the *Camera* app or the *Photos* app, locate the original photograph.
27. Tap the photo to bring up the options in the right corner if they are not showing. Select the *Slideshow* icon.
28. Select a type of transition by tapping the *Transitions* option.
What transition did you choose?

29. Select *Start Slideshow*. Stop the slideshow by tapping on the screen.
Instructor initials: _____
30. Delete the two photographs.
Instructor initials: _____
31. Power off the device.

Lab 10.5 Connecting a Mobile Device to a Wi-Fi Network

- Objective:** To be able to connect an Android or Apple iOS-based device to an IEEE 802.11 Wi-Fi network
- Parts:** Android device or Apple iOS device
- Procedure:** Complete the following procedure and answer the accompanying questions.
- Note:** Android is an open source operating system. The operating system may be modified by the vendor. Android simulators are available for free and can be used for the Android portion of this lab.

Android

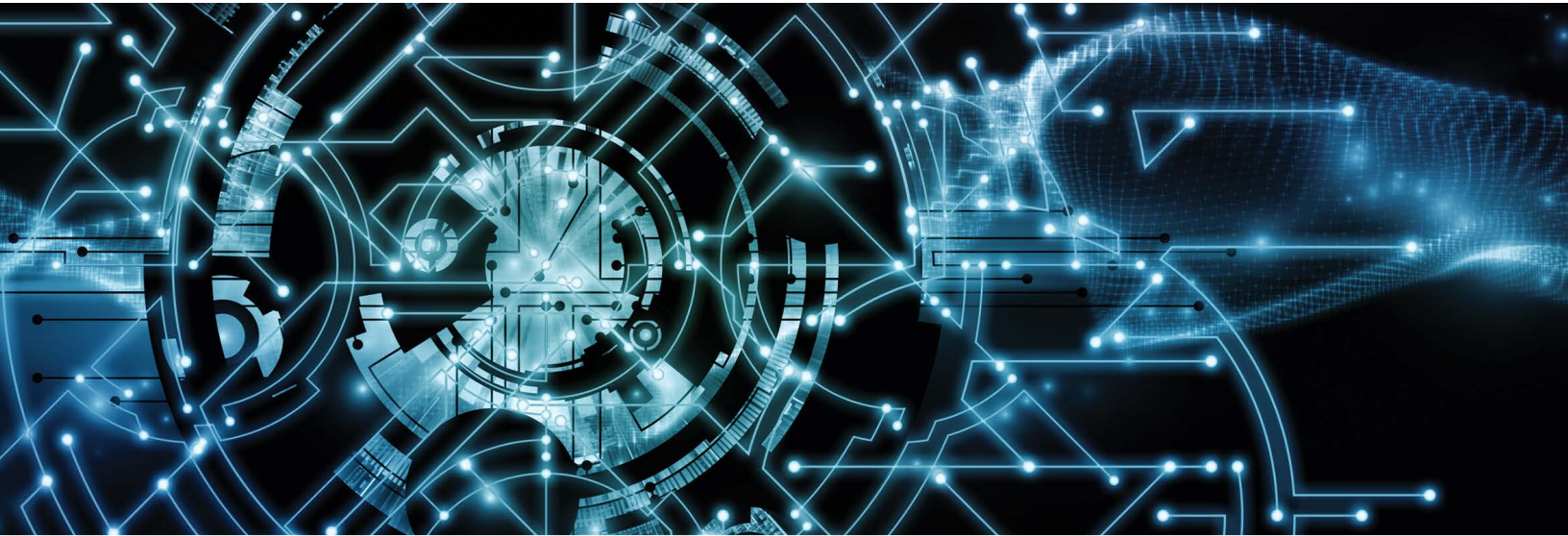
1. If working on an Apple device, please go to step 7. Power on the Android device.
2. Access the *Home* screen by pressing the *Home* button. Locate the *Settings* option by swiping, if necessary.
3. Tap the *Settings* option > optionally *Wireless and Network* > *Wi-Fi/Wi-Fi Settings*.
4. Tap the Wi-Fi network you want to join. Enter the security credentials if needed > *Connect*. Note that if the Wi-Fi network is not shown because the wireless access point is not broadcasting the SSID (see Chapter 14, "Introduction to Operating Systems," for more information), you can tap the *Add Wi-Fi Network* option at the bottom of the page and enter the relevant SSID and security credentials.
5. Verify that the wireless symbol appears at the top of the mobile device.
6. To disconnect from the network, tap the connected network > *Forget*.

Apple

7. If working on an Android device, please go to step 1. Power on the Apple device.
8. Access the *Home* screen by pressing the *Home* button or swiping up from the bottom. Locate the *Settings* option by swiping, if necessary.

9. Tap the *Settings* option > *Wi-Fi*. Ensure that Wi-Fi is enabled by tapping the button to the far right of the option to the enabled (right) side.
10. Tap the Wi-Fi network you want to join. Enter the security credentials if needed > *Join*. Note that if the Wi-Fi network is not shown because the wireless access point is not broadcasting the SSID (see Chapter 13, “Networking” for more information), you can tap the *Other* option at the bottom of the page and enter the relevant SSID and security credentials.
11. Verify the wireless symbol appears at the top of the mobile device.
12. To disconnect from the network, tap the connected network > *Forget This Network*.

11 Computer Design and Troubleshooting Review Labs



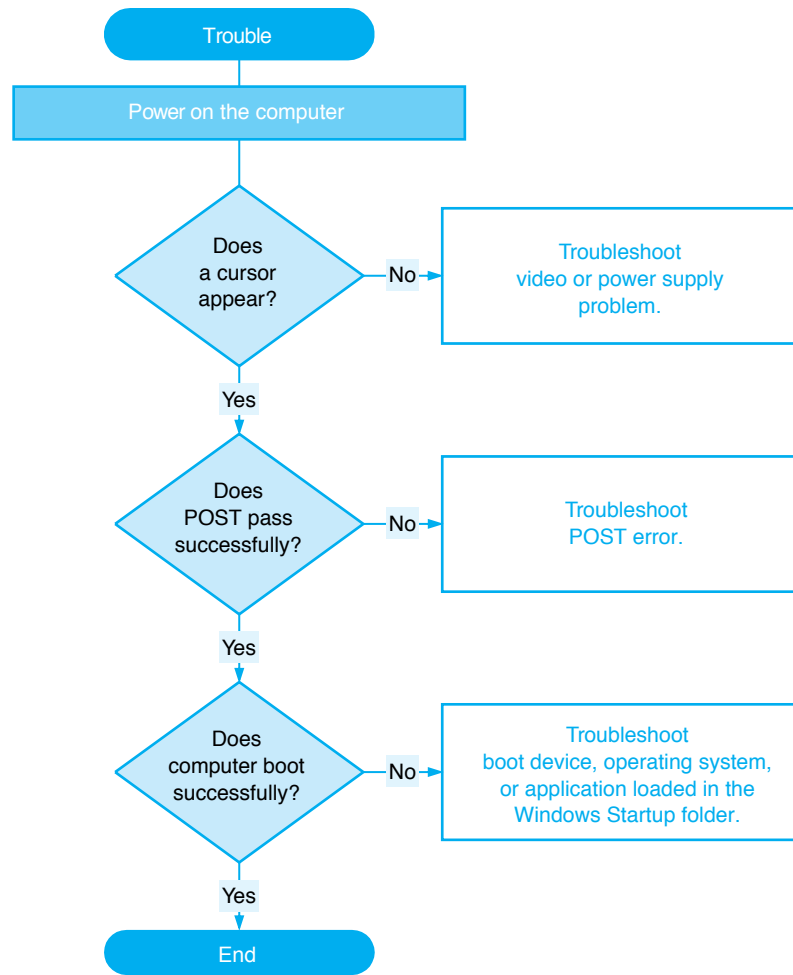
Lab 11.1 Approaching Troubleshooting Logically

Objective: To use logic to solve a computer problem

Parts: Computer

Procedure: Complete the following procedure and answer the accompanying questions.

1. In teams of two, one person leaves the room, while the other person inserts a problem in the machine and powers it down.
2. The person who left the room powers on the computer with the problem and performs troubleshooting. Use the flowchart shown in Lab Figure 11.1 and answer the questions that follow. When the problem is solved, swap roles.



LAB FIGURE 11.1 Lab troubleshooting flowchart

Do you hear any audio clues? If yes, list the symptoms.

Do any POST errors appear? If so, list them.

Are there any startup errors? If so, list them.

Are there any application-specific problems? If so, list them.

List any possible techniques to test. Test them one at a time. Document the solution.

Lab 11.2 Designing a Computer Subsystem

Objective: To design an upgrade for a particular subsystem

Parts: Computer

Procedure: Complete the following procedure and answer the accompanying questions.

1. Look at a particular computer within the classroom or that you have seen in your own home or a friend's home. Think of the computer in terms of one of the following subsystems. Note that the instructor may assign a particular subsystem.
 - > Motherboard and case
 - > Power supply and case
 - > Storage
 - > Audio
 - > Display

Can the subsystem be upgraded? Why or why not? [Yes | No]

Is the system a proprietary one? In other words, are you limited in your upgrade options because the system is sold by a particular manufacturer? [Yes | No] Describe the limitations, if any.

2. Before you design an upgrade for that particular subsystem, remove the parts for the subsystem in order to see the particulars about the parts. Document your findings.

3. Design an upgrade for the subsystem. Write a proposal for a prospective customer on what the parts would cost and what you would charge them to upgrade the chosen or assigned subsystem.

4. In three or more complete sentences, describe the challenges associated with designing for a particular subsystem rather than designing an entire computer system that serves a specific purpose.

12 Internet Connectivity, Virtualization, and Cloud Technologies Labs



Lab 12.1 Installing and Configuring the Mozilla Firefox Browser

Objective: To be able to download, install, and configure Firefox

Parts: A computer with Windows installed
Administrative privileges to install and configure software

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on using the user ID and password provided by the instructor or lab assistant.
2. Open a web browser and go to *mozilla.org*.
3. From the *Firefox Browsers* menu ribbon option, select the appropriate environment you are using. Ask the instructor or lab assistant if unsure.
4. Click the *Download Firefox* button. For the purpose of this lab, select the option to just download the browser.
5. Click the *Save File* button and note the location where the file is saved. If you are using the Chrome browser, if the file appears at the bottom, you can click on the arrow and select *Show in folder*. If you are using Microsoft Edge, you can click on the three dots in the right corner and select *Downloads* and click on the folder to see where the Firefox *installer.exe* file was downloaded.

To what folder/location was the executable file for the Firefox browser downloaded?

-
6. Click on the Firefox browser *.exe* downloaded file. If you see a prompt that you are trying to install an app that is not Microsoft verified, click *Install anyway*. You may have to provide credentials for a user ID that has administrator rights or select the ID you used to log in if you have the proper rights. Click *OK*. If asked if you want to make changes to this device, select *Yes*.
 7. Enter **comp~~t~~ia.org** into the address textbox at the top of the browser and press *Enter*. Scroll up and down the page until you get a pop-up. Then close the tab by clicking on the *x* in the tab for CompTIA (not the entire browser).
 8. Click the *Open Application Menu* (three horizontal lines) icon in the upper-right corner > *Settings*.

In the *Browser Privacy* section, what is the current setting for privacy?

[Standard | Strict | Custom]

9. Locate the *Cookies and Site Data* section.

List one instance where you think the *Delete cookies and site data when Firefox is closed* option would be a good option for a technician to select for a user?

10. Click the *Clear Data* button.

What type of data will be cleared by default? (Choose all that apply.)

[cached web content | cookies and site data | downloaded data | recorded data | spam]

What is the total amount of hard drive space saved by deleting this data?

11. Click *Clear*.

Based on the feedback given, what is a drawback to clearing all the data?

12. Click *Clear Now*.

Look at the various settings to determine if, by default, Firefox automatically autofills credit card information. Does Firefox autofill credit card information by default? [Yes | No]

13. Go to the *Settings > History* section and click the *Clear History* button.

List three types of browser history.

What type of data history could be removed?

Which time ranges are available from the drop-down menu? (Choose all that apply.)

- a. Last 30 minutes
- b. Last hour
- c. Last two hours
- d. Last four hours
- e. Last eight hours
- f. Last twelve hours
- g. Today
- h. Today and yesterday
- i. Everything

14. Select one of the time ranges and click *OK*.

15. In the *Settings > Permissions* area, locate the *Block pop-up windows* checkbox.

Is the option enabled or disabled by default? [Enabled | Disabled]

16. Click the *Exceptions* button to the right.

17. In the address of website textbox, enter the URL of your school. If you don't know your school's web address, enter **fscj.edu**. Click the *Allow* button, and the website appears in the window below.

This is how you configure a website to legitimately allow pop-up information and windows to appear. Click the *Save changes* button.

Instructor initials: _____

18. Notice in the *Permissions* section there is an option to warn the user if a website tries to install an add-on. This is a good security option to enable. Scroll down to the *Security* section.
- What two options related to deceptive and dangerous content are enabled by default? (Choose two.)
- Provide information when dangerous content is shown
 - Block dangerous downloads
 - Block all advertisers
 - Block known phishers
 - Warn you about unwanted and uncommon software
19. In the *Certificates* section, click the *View Certificate* button. Because you have not gone to many websites yet, you might not have any listed.
20. Select the *Authorities* menu ribbon option. You can scroll through the certificate authorities that are prepopulated.

Instructor initials: _____

21. Close the certificate manager window.
22. Select the *General settings* option on the left menu. Scroll to the *Files and Applications* section. As a technician, you might be asked by the user to always put the files in the Downloads folder or another folder of the user's choosing. The other option they might want is to be asked where the downloaded file goes.

What is the default option for file downloads?

[Save files to Downloads | Always ask you where to save files]

23. Scroll down to the *Applications* section.
- What is the default action taken for PDF files?
- [Open in Acrobat Reader | Open in Firefox | Open in Edge | Open in Word]
24. Select either *Use other* and select *Adobe Acrobat* or if *Use other* is not available, leave the default value.
25. Close the *Settings* tab by clicking on the *x* in the upper-right corner of the tab (not the *x* that closes the browser). Open a new tab by clicking the plus sign (+) at the top of the browser window.
26. Enter **azureforeducation.microsoft.com** into the browser address textbox. This is a website for free Microsoft operating system and application downloads for students. Notice the **https** at the beginning of the address once the page loads; this indicates that the site is using more security than a normal website.
27. Select on the lock to the left of the address > *Connection secure* > *More information*. Ensure that the *Security* menu ribbon option is selected.

What is the total amount of hard drive space on the computer that is being used by this website?

Based on the information shown in the window, was the page encrypted?

[Yes | No]

Based on the information shown in the window, when does this certificate expire?

28. Click the *View Certificate* button. Scroll through the information to see the type of information that is included in order to validate that this information is from a legitimate source.

Instructor initials: _____

29. Close the certificate window.

30. Select the *Open Application Menu* (three horizontal lines icon in the upper-right corner) icon > *New private window*.

What visual indication(s) do you have that you are using private browsing?

Based on information from the chapter or from information that Firefox provides, what is a benefit of using a private window?

Instructor initials: _____

31. Select the *Open Application Menu* (three horizontal lines) icon in the upper-right corner > *Settings > Extensions & Themes > Extensions*.

Based on your chapter reading, what is the purpose of a browser extension?

List up to three extensions that are currently installed.

List up to three extensions that are recommended for you.

32. Select the *Plugins* option.

List any plug-in that is installed. Enter none if there are no plug-ins.

33. Close all browser tabs.

34. Check with the instructor about whether the Firefox browser is to be uninstalled and uninstall it if needed.

Lab 12.2 Getting to Know the Internet Options Control Panel

Objective: To become familiar with basic Internet *Options* Control Panel

Parts: Windows computer

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and ensure that it boots properly.
2. Open the *Internet Options* Control Panel.

What tabs are available with this Control Panel? (Choose all that apply.)

[General | Home | Security | Policy | Privacy | Certificates | Content | Connections | Internet | Programs | Advanced]

While looking at the *General* tab, which URL is listed as the home page?

Is the *Delete browsing history on exit* option enabled or disabled?

[Enabled | Disabled]

Which startup radio button is enabled? [Start with tabs from the last session | Start with home page]

List one corporate scenario for which you think the business security policy would require the *Delete browsing history on exit* option be enabled.

Instructor initials: _____

3. Click the *Settings* button in the *Browsing history* section.

How often does the browser check to see if there is a newer version of a web page?

Which drive currently holds temporary internet files?

If the drive that currently holds temporary internet files is an SSD, would it be better to change this to a different folder? Why or why not?

Instructor initials: _____

4. Access the *History* tab from within the *Website Data Settings* window.

What is the number of days the web browsing history is kept?

5. Access the *Caches and databases* tab from within the *Website Data Settings* window.

How much drive space can be used before the user is notified that a website cache or database exceeds that amount?

6. Click the *Cancel* button to close the *Website Data Settings* window. Click the *Tabs* button in the *Tabs* section.

[T | F] To enable tabbed browsing when it has been disabled, you must close all Internet Explorer windows and then reopen Internet Explorer to activate the change.

Based on the configured options, what currently happens when a new tab is opened?

Based on the information in the *Tabbed Browsing Settings* window, what do you think would be the most secure pop-up setting for a corporate environment, and why do you think this?

From the choices provided, what is your favorite way of handling program links provided in a website?

7. Click *Cancel*. Click the *Colors* button located in the Appearance section.
Is the *Use Windows colors* option enabled or disabled? [Enabled | Disabled]
8. Disable the *Use Windows Colors* option. Select the *Use Hover Color* option.
Based on what you see as the default settings, which option might you change for a person who is red/green colorblind?

What color is the default hover color?

9. Click *Cancel*. Click the *Languages* button.
What two prefix and suffix options are available? (Choose two.)
[Do not add 'www' to the beginning of typed web addresses | Use English as the default language | Do not default to the home page | Specify the suffix that should be added to typed web addresses when you press Ctrl + Shift + Enter]
10. Click *Cancel*. Click the *Fonts* button.
What is the current font setting for web pages?

11. Click *Cancel*. Click the *Accessibility* button.
List one example of when you might use the formatting options presented in a home computer environment.
-
-

12. Click *Cancel* twice and close the *Internet Properties* window.

Lab 12.3 Getting to Know Microsoft Edge Browser Configuration

Objective: To become familiar with basic Microsoft Edge configuration options

Parts: Windows computer

Procedure: Complete the following procedure and answer the accompanying questions.

- Power on the computer and ensure that it boots properly.
- Open the Microsoft Edge browser. From the *Settings and more* (three dots) icon in the upper right corner, point to *Help and feedback* > *About Microsoft Edge* to determine the Edge version.

Which version of Edge is being used?

- Click the *Settings* options list to the left. Select *Default browser* to make Microsoft Edge the default browser that opens when a URL link is presented and selected.
- Select *Start, home, and new tabs*.

In the *When Edge starts* section, which option is currently enabled?

[Open the new tab page | Open tabs from the previous session | Open these pages:]

In the *Home button* section, which URL is listed as the home page, if any?

5. Select *Privacy, search, and services* option from the *Settings* list on the left.
 In the *Tracking prevention* section, which option is selected, if any?
 [Basic | Balance | Strict | this option is not turned on]
 Is the *Always use "Strict" tracking prevention when browsing InPrivate* enabled or disabled?
 [Enabled | Disabled]

Instructor initials: _____

6. In the *Clear browsing data* section, click the *Choose what to clear* button in the *Clear browsing data now* row.
 Which time ranges are available from the drop-down menu? (Choose all that apply.)
 - a. Last 30 minutes
 - b. Last hour
 - c. Last eight hours
 - d. Last 24 hours
 - e. Last 48 hours
 - f. Last 7 days
 - g. Last 4 weeks
 - h. All time
 - i. Everything

Which browsing data options are enabled by default?
 [Browsing history | Download history | Cookies and other site data | Cached images and files | Passwords | Autofill form data (includes forms and cards) | Site permissions | All data from the previous version of Microsoft Edge | Media Foundation data]

7. Click *Clear now*. Notice that you also have an option to specify what is cleared automatically every time you close the browser.
 List one corporate scenario for which you think the business security policy would require everything to be deleted every time the browser is closed.

Instructor initials: _____

8. Locate the *Privacy* section.
 Is the *Send Do Not Track* requests option enabled or disabled? [Enabled | Disabled]
 Is the *Allow sites to check if you have payment methods saved* option enabled or disabled?
 [Enabled | Disabled]

Instructor initials: _____

9. Locate the *Security* section and access *Manage certificates*.
Are any certificates listed under the *Personal* tab? [Yes | No]
-
10. Look in the *Intermediate Certificate Authorities* tab and *Trusted Root Certification Authorities* to view where common certificates are issued. Use the *Untrusted Publishers* tab to view any that might appear there. You can also use the *Intended purpose* drop-down menu to see only the certificates issued for client authentication or as secure emails.
11. The *Security* section also contains the *Microsoft Defender SmartScreen* option, which, when enabled, will warn you if a website is a potential phishing site or is a known untrusted source for software. Downloaded files and apps are also checked and warnings provided if any are suspected malware or suspicious.
- Is the *Microsoft Defender SmartScreen* option enabled or disabled?
[Enabled | Disabled]
- Do you think the *Microsoft Defender SmartScreen* option should be enabled or disabled in the corporate environment?
[Enabled | Disabled]
- Explain why you selected either enabled or disabled for the recommendation for the *Microsoft Defender SmartScreen* option.
-
-

Instructor initials: _____

12. Locate the *Block potentially unwanted apps* option within the *Security* section.
Is the *Block potentially unwanted apps* option enabled or disabled?
[Enabled | Disabled]
- What do you think is the difference between the *Block potentially unwanted apps* option and the *Microsoft Defender SmartScreen* option?
-
-
13. The last option in the *Security* section is the one related to secure DNS. Domain Name System (DNS) translates an internet address like *www.pearson.com* to an IP address so the correct web server can be found. If you ever can't get to *www.pearson.com*, but you can get to the web server address 23.222.24.141 from a browser, then the DNS server you use isn't working. DNS servers are frequent targets for attack, and this is the section where you can choose to use secure DNS and even specify the IP address of a server you want to use.
- What is the current setting for the *Use secure DNS to specify how to lookup the network address for websites* option? [Enabled | Disabled]
- What do you think the *Use current service provider* option does?
-
-

- Use the *plus sign (+)* on the top line of the browser to open a new tab. Close the *Settings* tab by clicking the *x* on the tab, taking care not to close the entire browser. From the *Settings and more* (three dots) icon in the upper-right corner, point to *New InPrivate window*.

How does this browser page look different from the browser page/tab you just had open?

Instructor initials: _____

- From the *Settings and more* (three dots) icon in the upper-right corner, point to *Extension*. Based on your chapter reading or the information found on the screen, what is the purpose of a browser extension?

List up to three extensions that are currently installed.

- Close all tabs and the Microsoft Edge browser window.

Lab 12.4 Getting to Know Google Chrome Browser Configuration

- Objective:** To become familiar with basic Chrome browser configuration options
- Parts:** Windows computer
- Procedure:** Complete the following procedure and answer the accompanying questions.

- Power on the computer and ensure that it boots properly.
- Open the Google Chrome browser. From the *Customize and control Google Chrome* (three dots) icon in the upper-right corner, select *Settings > On startup option*.

List the three choices that can be selected to occur when Chrome is launched.

- Select the *Default browser* option from the left menu. This is where you can configure the browser to be the one that opens when any URL link is selected or used.
- Select the *Search engine* option from the left menu. This is where you can configure what app is used to search the internet.

Using the drop-down menu, list three options that could be used to search within the Chrome browser.

- Select the *Appearance* option from the left menu.
 - Is the *Show home button* option enabled or disabled? [Enabled | Disabled]
 - Is the *Show bookmarks bar* option enabled or disabled? [Enabled | Disabled]
 - What font size is currently chosen?

What is the current page zoom percentage?

Instructor initials: _____

- 6. Select the *Privacy and security* option from the left menu.

What is the purpose of the Safety check section?

- 7. Locate the *Privacy and security* section and access *Clear browsing data*.

Which time ranges are available from the drop-down menu? (Choose all that apply.)

- a. Last 30 minutes
- b. Last hour
- c. Last 8 hours
- d. Last 24 hours
- e. Last 48 hours
- f. Last 7 days
- g. Last 4 weeks
- h. All time
- i. Everything

Which browsing data options are enabled by default?

[Browsing history | Download history | Cookies and other site data | Cached images and files | Passwords and other sign-in data | Autofill form data | Site Settings | Hosted app data]

List one corporate scenario for which you think the business security policy would require everything to be deleted every time the browser is closed.

Instructor initials: _____

- 8. Click the *Clear data* button.
- 9. Select the *Cookies and other site data* option from within the *Privacy and security* section.

Is the *Allow all cookies* option enabled or disabled? [Enabled | Disabled]

List one example of when you think the *Allow all cookies* option should be enabled.

- 10. Expand the *Block third-party cookies in Incognito* section by selecting the arrow to the right so more information is shown.

Based on the information shown, what is one disadvantage to enabling this option?

Is the *Clear cookies and site data when you close all windows* option enabled or disabled? [Enabled | Disabled]

List one example of when you think the *Clear cookies and site data when you close all windows* option should be enabled.

Is the *Send a “Do Not Track” request with your browsing traffic* option enabled or disabled?

[Enabled | Disabled]

11. Select the *See all cookies and site data* option. Once you have seen all of the information, use the arrow to return to the previous section. Use the arrow again to return to the *Privacy and security* settings sections.
12. Within the *Privacy and security* section, locate and select the *Security* option.

Which *Safe Browsing* option is selected?

[Enhanced protection | Standard protection | No protection]

Domain Name System (DNS) translates an internet address like www.pearson.com to an IP address so the correct web server can be found. If you ever can't get to [pearson.com](http://www.pearson.com), but you can get to the web server address 23.32.251.173 from a browser, then the DNS server you use isn't working. DNS servers are frequent targets for attack, and this is the section where you can choose to use secure DNS and even specify the IP address of a server you want to use. Is the *Use secure DNS* option enabled or disabled?

[Enabled | Disabled]

13. Select the *Manage certificates* option.

Are any certificates listed under the *Personal* tab? [Yes | No]

14. Look in the *Intermediate Certificate Authorities* tab and at *Trusted Root Certification Authorities* to view where common certificates are issued. Use the *Untrusted Publishers* tab to view any certificates that might appear there. You can also use the *Intended purpose* drop-down menu to see only the certificates issued for client authentication or as secure emails.

Instructor initials: _____

15. Scroll back to the top and use the left arrow to return to the previous screen. Select the *Site Settings* option within the *Privacy and security* section. In the *permissions* section, select the *Location* option.

What is the default behavior for websites being able to ascertain your current location?

[Sites can ask for your location | Don't allow sites to see your location]

List one reason you think someone would want a website to be able to ask for your location.

16. Scroll to the top and use the left arrow to return to the previous screen. In the *Permissions* section, select *Camera*.

What is the default behavior for websites being able to access the camera?

[Sites can ask to use your camera | Don't allow sites to use your camera]

List one reason why you think someone would want a website to be able to ask to use the camera.

17. Scroll to the top and use the left arrow to return to the previous screen. In the *Permissions* section, select *Background sync*.

What is the default behavior for websites being able to continue to send or receive data after you are no longer accessing the website?

[Recently closed sites can finish sending and receiving data |
Don't allow closed sites to finish sending or receiving data]

18. Scroll to the top and use the left arrow to return to the previous screen. Locate the *Content* section and select *JavaScript*.

What is the default behavior for allowing JavaScript?

[Sites can use JavaScript | Don't allow sites to use JavaScript]

19. Scroll to the top and use the left arrow to return to the previous screen. In the *Content* section, select *Pop-ups and redirects*.

What is the default behavior for pop-ups?

[Sites can send pop-ups and use redirects | Don't allow sites to send pop-ups or use redirects]

20. In the left *Settings* menu, select *Extensions*.

Based on your chapter reading or the information found on the screen, what is the purpose of a browser extension?

List up to three extensions that are currently installed. If none are installed, write none.

21. From the *Customize and Control Google Chrome* (three dots) icon in the upper-right corner, select *New Incognito window*.

How does this browser page look different from the browser page/tab you just had open?

When in Incognito mode, what happens if you bookmark a site?

When in Incognito mode, what happens if you download a file?

Would your activity still be visible to your employer if you are using a corporate machine and using Incognito mode?

Instructor initials: _____

22. Close all tabs and the Google Chrome browser window.

Lab 12.5 Verifying Computer Support for Microsoft Hyper-V Virtualization

Objective: To determine if a Windows computer can use the Microsoft Hyper-V virtualization tool

Parts: Windows computer

Internet access if BIOS/UEFI research is needed

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and ensure that it boots properly.
2. Access the BIOS/UEFI. Locate and enable the virtualization extensions. These are commonly found in either the Chipset, Processor, or Security menu option. Look for Intel Virtualization Technology, Intel VT, AMD Virtualization, AMD-V, or Virtualization extensions. Research the computer on the internet for BIOS/UEFI options.

Which option did you enable?

3. Also enable hardware-enforced data execution prevention (DEP). On an Intel-based system, this is the execute disable (XD) bit. On an AMD-based system, this is called the no execute (NX) bit.

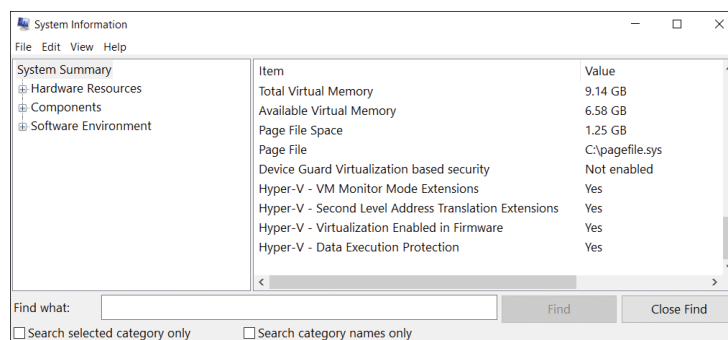
Where did you find the DEP option to enable within the BIOS/UEFI?

4. Save and exit the BIOS/UEFI.
5. Once Windows starts, launch the *System Information* Windows tool.
6. Look for the Hyper-V requirements, as detailed in Lab Table 12.1 and as shown in Lab Figure 12.1. Note that there should be a Yes next to each requirement, or Hyper-V cannot be used on the computer.

Do all four options show as Yes? Only if they all show as Yes can Hyper-V be used on the computer.

LAB TABLE 12.1 Hyper-V Requirements Explanation

Requirement	Description
Processor	64-bit
Processor nested paging	Also known as second-level address translation (SLAT) extensions. Intel provides this through the extended page table (EPT) in Core i9, i7, i5, and i3 processors. AMD calls this nested page tables (NPT) or rapid virtualization indexing (RVI).
Processor support for virtualization (VM Monitor Mode extension)	Intel lists this as Virtualization Technology (VT); VT-x, such as VT-c or VT-d. AMD lists it as AMD-V.
RAM	4 GB or higher
BIOS/UEFI support	Enable virtualization and hardware-enforced data execution prevention.



LAB FIGURE 12.1 Windows System Information Hyper-V requirements

Lab 12.6 Installing Another Operating System Within Microsoft Hyper-V

Objective: To create a virtual machine using Microsoft Hyper-V

Parts: Windows 10 computer
Any other operating system ISO file
Internet access if an ISO file needs to be downloaded

Note: Additional steps may be needed for installation of the operating system.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and ensure that it boots properly.
2. Download or otherwise obtain an ISO operating system image.
3. Ensure that the computer has BIOS/UEFI virtualization options enabled. See Lab 12.5 or the Tech Tip in the “Virtualization Basics” section of Chapter 12, “Internet Connectivity, Virtualization, and Cloud Technologies.”
4. Access the *Turn Windows Features On or Off* Control Panel. Ensure that the following two Hyper-V options are enabled: *Hyper-V Management Tools* and *Hyper-V Platform* > *OK*. Reboot the computer by selecting *Restart Now*.
5. Access the *Hyper-V Manager* app. Use the *Action* menu option to select *New > Virtual Machine*. Note that if this option is not available, you may need to select the item immediately under the *Hyper-V Manager* in the left window. Click *Next*.

6. Name the virtual machine.
What name did you select?

7. Select the default location to store the virtual machine > *Next* > leave the default of *Generation 1* > *Next* > select the proper amount of RAM for the operating system you are going to install.

How much RAM did you select?

Are you sure this is at least the minimum RAM required for the operating system that will be installed? If not, research on the internet the minimum required before proceeding. [Yes | No]

8. Click *Next* only after you are sure you have at least the minimum amount of RAM required for the operating system to be installed.
9. For the networking portion, select *Not Connected* > *Next*. For the virtual hard disk, in the *Size* option, ensure that you select the minimum hard drive space required for the operating system.

How much hard drive space did you select?

Are you sure this is at least the minimum hard drive space required for the operating system that will be installed? If not, research on the internet the minimum required before proceeding. [Yes | No]

10. Leave all the other defaults and click *Next* in the virtual hard disk window. In the *Installation Options* section, select the *Install an Operating System from a Bootable CD/DVD-ROM* option > select the *Image File (.iso)* radio button > select the path where the ISO file is located by using the *Browse* button > *Next* > *Finish*.
11. From within the *Hyper-V Manager* window under *Virtual Machines* > right-click the newly created device > *Connect* > *Start* (Power) button.
12. Install the operating system. Steps will vary based on the operating system chosen.

Instructor initials: _____

Lab 12.7 Getting to Know Amazon AWS Cloud

Objective: To become familiar with cloud technologies using AWS

Parts: Windows computer

Notes: A credit card is required but is not charged unless you exceed the AWS Free Tier limits. Vendors frequently change their online products, so although the examples shown in this lab were relevant at the time of press, they may not be relevant when you work through this lab.

The AWS Educate website, at awseducate.com, is available for use with reduced functionality.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and ensure that it boots properly. Open a web browser and use the following URL to access Amazon Web Services (AWS): <https://aws.amazon.com>.
2. Create an account, if necessary, and log in. Note that if you do not have a credit card and are so directed by your instructor, skip to the note in step 9.
3. From the *Products* menu, select *Amazon EC2*. The AWS Free Tier includes 750 hours of Linux and Windows usage. Select the *Try Amazon EC2 for Free* button if this is your first time using it.
4. Select the *Launch a Virtual Machine* option from within the *Build a Solution* section.

Which version of Amazon Linux AMI is shown?

Which root device type is the Microsoft Windows Server 2016 Base with Containers?

Which virtualization type is used with the Deep Learning AMI (Microsoft Windows Server 2016)? Note that if the server version is not available, the answer should be the answer for another version.

Does the Windows Server 2008 SP2 base allow you to choose whether you use a 32-bit or a 64-bit version?

How many machine images are available?

5. Enable the *Free Tier Only* checkbox.

How many machine images are available within the free tier?

6. Click the *Cancel* and *Exit* link at the top right. Click on the letters *aws* in the top-left corner to return to the home page.
7. Select the *Backup and Recovery* option from within the *Learn to Build* section.
8. Locate the *Explore with Tutorials and Labs* section and click the *Introduction to Amazon Simple Storage Service (S3)* self-paced lab. Note that you will just be watching the introductory 3-minute video and not doing the full 45-minute lab. In the *Overview* section, select the link *Here Is a 3-Minute Introductory Video*.
9. If you did not create an account within AWS, then use the internet to access www.youtube.com. Search for the *Introduction to Amazon Simple Storage Service (S3) - Cloud Storage on AWS* video. This is the same video you would watch if you had an account.

According to the video, what are two drawbacks of building your own storage repository? (Choose two.)

[Time-consuming | Technically difficult | Space invasive | Expensive | Unsecure]

According to the video, what must you also have if you have your own storage repository?

- a. PATA hard drives
- b. Lots and lots of space
- c. Different manufacturers (and often incompatible) products
- d. Racks and racks of hardware and software

According to the video, guessing how much capacity you need in your own storage repository is _____.

[pretty easy | usually easy | sometimes tedious | difficult]

According to the video, is S3 secure? [If you pay for it | Yes | No]

If you used Amazon S3 Cloud Storage, what are the two steps required to store data? (Choose two.)

- a. Select a type of drive.
- b. Choose the region.
- c. Create a bucket.
- d. Select a drive.
- e. Select the capacity needed.

How does S3 ensure that your data is not lost?

Which Amazon plan would be used for data that is kept for archival purposes?

[S3 Prime | S3 Standard | Amazon Glacier | S3 Standard Infrequent Access]

Lab 12.8 Installing VMware Workstation

Objective: To install VMware Workstation 15 Pro in preparation for future VMware Workstation labs

Parts: Windows computer with administrator rights to install software
Internet access to download a 30-day trial of VMware Workstation Pro

Procedure: Complete the following procedure and answer the accompanying questions.

1. If VMware Workstation Pro is not already downloaded on the computer, go to <http://www.vmware.com> and download the software.

Is VMware Workstation already installed on the computer?

Is the same version of VMware Workstation downloaded for 32-bit Windows as 64-bit Windows? If you do not know, research this on the internet.

2. Start the VMware installer. Accept the end-user agreement. When the Customer Setup window appears, keep the default location selection unless directed otherwise.
3. Leave the *Check for Product Updates on startup* option enabled and click *Next*.
4. Either enable or disable the *Join the VMware Customer Experience Program* checkbox.

-
5. Leave the shortcut checkboxes enabled and click *Next*. Click *Install*.
 6. Either enter a license key provided by the instructor or lab assistant or click the *Finish* button. Note that no key is needed for the 30-day trial.
 7. When the installation is complete, the VMware Workstation icon appears on the desktop. Note that you may be prompted to restart the computer before using the software.

Instructor initials: _____

Lab 12.9 Installing Windows and Ubuntu as a VMware Workstation Virtual Machine

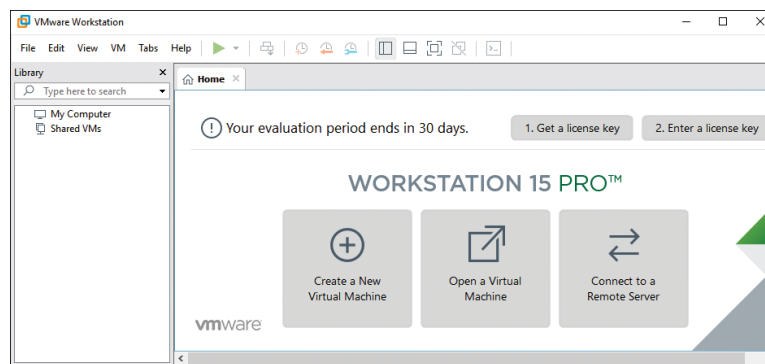
Objective: To install a version of Windows 7 and Ubuntu as a VMware Workstation virtual machine

Parts: Windows computer with administrator rights that has VMware Workstation installed

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: This lab does not require .iso discs but uses the integrated guest operating systems simply to expose the student to the environment.

1. Double-click the *VMware Workstation* icon on the desktop or access the software from the *Start* button menu. VMware Workstation opens. If this is the first time starting VMware Workstation, you will be prompted to enter a license key or you can select the *I want to try VMware Workstation 15 for 30 days* radio button. Make your selection and click *Continue > Yes > Finish*. Lab Figure 12.2 shows the VMware Workstation area.



LAB FIGURE 12.2 VMware Workstation

2. On the *Home* tab, select the *Create a New Virtual Machine* option.
3. Select the *Typical (Recommended)* radio button and click *Next*.
4. Select the *I will install the operating system later* radio button and click *Next*.
5. Select the *Microsoft Windows* radio button. Set the version to *Windows 7* and click *Next*. Answer the questions based on what you see on the screen.

Were a username and password selected as part of this installation process?

[Yes | No] If so, document the username and password.

6. Enter a name for the machine (or leave the default) and select a hard drive location to store the virtual machine file. Click *Next* after you have answered the questions.

What name did you use for the virtual machine?

Document the path to the folder that contains the virtual machine file.

7. Keep the default disk size and accept the default *Split virtual disk into multiple files* radio button. Click *Next*.
8. Look over the virtual machine settings to answer the questions.

What is the default amount of RAM?

What type of network adapter is installed?

What other devices are automatically installed?

9. Click *Finish*. Notice that the virtual machine is within its own tab. Right-click the tab that contains your new virtual machine.

Document at least four menu options that are available when you right-click the virtual machine tab.

10. Locate the VM in the Library panel on the left. The virtual machine name is under *My Computer* and is a name that you assigned. Right-click the virtual machine you just created.

Are the options the same as the ones you saw when you right-clicked the virtual machine tab?

[Yes | No]

11. Ensure that the VM is still selected in the left panel. In the right panel, select the *Edit virtual machine settings* link. Ensure that *Memory* is selected in the Device column.

Based on what is shown, what is the maximum recommended memory?

What is the recommended memory amount?

What is the guest OS recommended minimum?

12. Select *Processors* in the left window.

What is the default number of processors for the VM?

What is the default number of cores per processors for the VM?

What is the maximum number of processors that can be selected for the VM?

How many processor cores are available on each processor?

13. Select the *Hard Disk* option.

Which drive interface is used by default? [PATA | SAS | SATA | SCSI]

Which disk utilities are available for this drive? (Choose all that apply.)

[Mark as active | Convert to GPT | Map | Defragment | Compact | Compress |

Expand | Disconnect | Partition]

14. Click the *Advanced* button. Look in the mode section. If the *Independent* option was selected, you are allowed to select either the persistent or nonpersistent mode. With persistent mode, any changes you make take effect immediately. Nonpersistent mode means that you can make changes to the VM, but when you power the VM off, the changes are not kept. Click *Cancel*.

15. Select *Network Adapter* from the device list on the left. An important part of virtualization is how you configure the NIC.

What are the types of network connections? (Choose five.)

[Bridged | Custom | Disconnected | Host-only | LAN segment | NAT | PAT]

Which network connection type is the default?

[Bridged | Custom | Disconnected | Host-only | LAN segment | NAT | PAT]

Looking at the other devices, is a printer detected by default? [Yes | No]

16. Click *Cancel* to return to the main VM Workstation window.
17. Using the process you just learned, return to the *Home* tab and create a new VM using the guest OS of *Ubuntu*.

What is the default amount of memory allocated to this VM?

Is the hard drive interface the same that was used for the Windows 7 VM?

[Yes | No]

Which network connection is the default for the Ubuntu VM?

[Bridged | Custom | Disconnected | Host-only | LAN segment | NAT | PAT]

Instructor initials: _____

18. Ensure that one of your VMs is selected in the left window. Select the *VM* menu option. Notice the *Snapshot* option. A snapshot is used to create an image or a backup of the VM in its current state. This is good when making changes or trying something new so that you can revert back to the VM at a particular point in time if something happens or you do not like the results of a particular change.
19. Right-click on the *Windows 7* VM. Select *Remove* > click the *Remove* button.
20. Right-click on the *Ubuntu* VM. Select *Remove* > click the *Remove* button.
21. Close the *VMWare Workstation* window.

Lab 12.10 Installing VirtualBox

Objective: To download and install VirtualBox on a Windows 10 computer

Parts: Windows computer with administrator rights
Access to the internet or a disc/drive with the VirtualBox installer file

Procedure: Complete the following procedure and answer the accompanying questions.

1. VirtualBox is software that allows you to create virtual machines. Inside a virtual machine, you can run multiple guest operating systems. If you need to download the VirtualBox installer, access the www.virtualbox.org > *Downloads* page. Download the binary version for Windows hosts.
2. From the location where you downloaded the VirtualBox installer or disc that has the file, launch the executable file by double-clicking it.
3. Click *Next*. Most people accept the default features and location where VirtualBox is to be installed, but your instructor may have specific requirements. If the instructor has not provided any specifics, click *Next* > select the options to be installed or accept the default > *Next*. Note that the installation process disables the network connection temporarily. Click *Yes* > *Install*. Click *Yes* to install. Make sure you click *Install* in any security window that pops up, depending on which options are to be installed.
4. Click *New* to create a new virtual machine (VM).

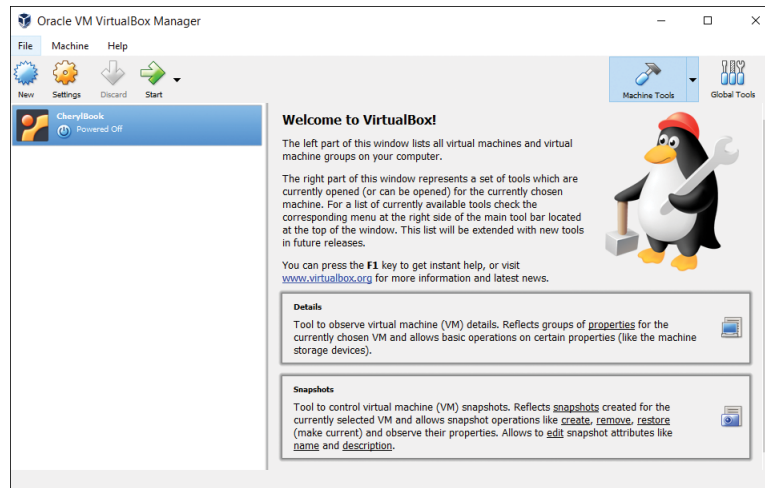
List three types of VMs supported by VirtualBox.

If you selected the macOS X operating system, what versions are available?

5. In the *Name* textbox, type a name for the VM, select the Linux operating system from the *Type* drop-down menu, and select *Ubuntu (32-bit)* from the *Version* drop-down menu > *Next*.

What is the maximum memory that can be used for the VM?

6. For *Memory Size*, leave the default and click *Next*. Leave the default *Create a Virtual Hard Disk Now* > *Create*. Leave the default hard disk file type set to *VDI* > *Next*. Leave the default storage type as *Dynamically Allocated* > *Next*. For *File Location and Size*, leave the default > *Create*. Lab Figure 12.3 shows the Oracle VM VirtualBox Manager window with the new VM installed.



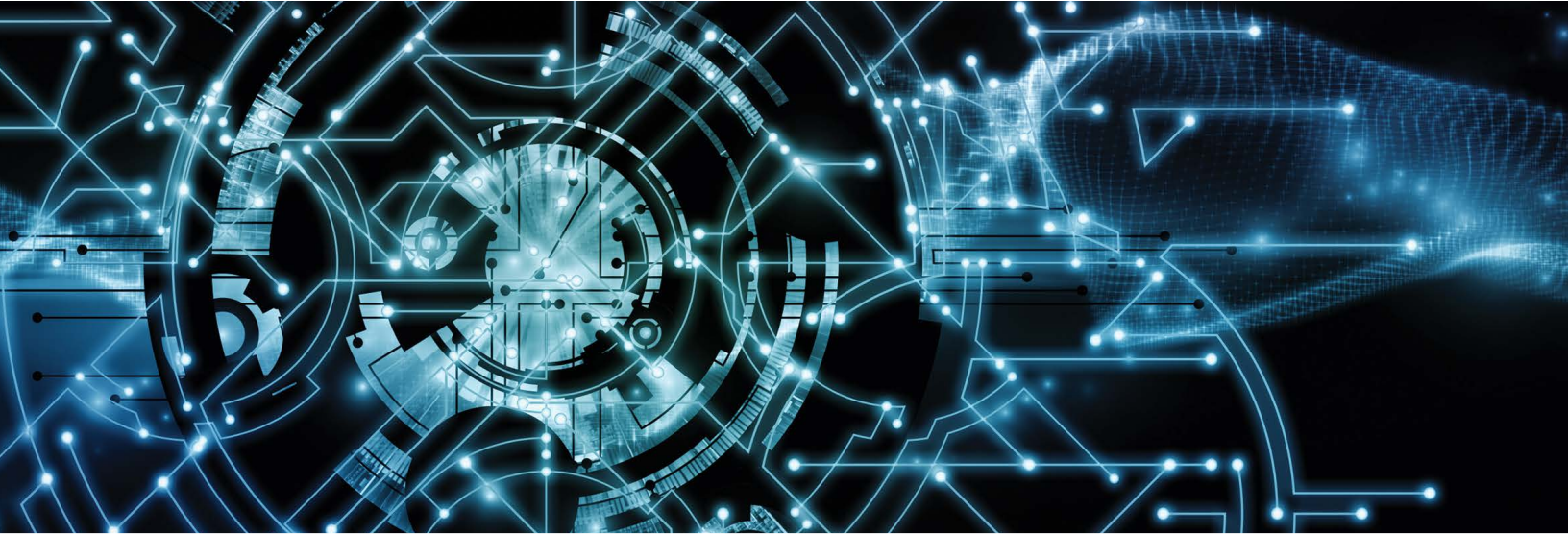
LAB FIGURE 12.3 Oracle VM VirtualBox Manager

Is the VM powered on or off by default? [On | Off]

Instructor initials: _____

7. With the name of the VM highlighted in the left window, select the *Settings* icon. Use the menu options on the left to answer the following questions.
- How many CPUs are allocated to the VM by default? [1 | 2 | 4 | 8 | 16]
- How much video memory is allocated to the VM by default?
[None | 4 MB | 8 MB | 16 MB | 64 MB | 128 MB]
- Is video capture available? [Yes | No]
- On which type of hard drive is the VM built by default?
[IDE | PATA | SATA | USB]
- Is the network adapter enabled by default? [Yes | No]
- Which USB controllers are supported? Select all that apply.
[1.1 | 2.0 | 2.2 | 3.0 | 3.1]
8. Click *OK*. With the VM name still highlighted in the left window, select the *Start* menu icon. The VM powers on. Notice that the VM requires a startup disk or an operating system. Either browse to an ISO or click *Cancel* to close the VM.

13 Networking Labs



Lab 13.1 Creating a Straight-Through Cat 5, 5e, or 6 Network Patch Cable

Objective: To create a functional Cat 5, 5e, or 6 UTP network cable

Parts:
UTP cable
RJ45 connectors
Stripper/crimper tool
UTP cable tester

Note: Standard Ethernet networks are cabled with UTP cable. In this exercise, you create a standard cable for use with Ethernet networks connected through a central hub or switch.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Category 5 and higher UTP cable consists of four twisted pairs of wires, color coded for easy identification. The color-coded wires are colored as follows:

Pair 1: White/orange and orange

Pair 2: White/blue and blue

Pair 3: White/green and green

Pair 4: White/brown and brown

2. Using the stripper/crimper tool, strip approximately 1/2 inch (1 centimeter) of the protective outer sheath to expose the four twisted pairs of wires. Most wire strippers have a strip gauge to help you strip the proper length. See Lab Figure 13.1.

Note: To make it easier to sort the wire pairs, the sheathing can be stripped farther than 1/2 inch (1 centimeter), and the wires can be sorted properly and then trimmed to the proper length.



LAB FIGURE 13.1 Strip the cable sheathing

3. Untwist the exposed wire pairs. Be careful not to remove more twist than necessary. Sort the wires as follows:

Wire 1: White/orange

Wire 2: Orange

Wire 3: White/green

Wire 4: Blue

Wire 5: White/blue

Wire 6: Green

Wire 7: White/brown

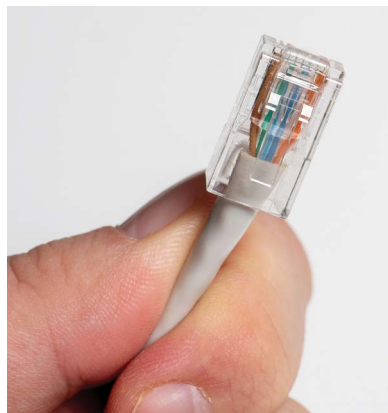
Wire 8: Brown

Ethernet cable utilizes wires 1, 2, 3, and 6. Using the preceding wiring scheme means that the cable will use the white/orange-orange and white/green-green wire pairs.

[Will both ends of the cable need to follow the same wiring schematic?](#)

[Yes | No]

4. Insert the sorted and trimmed cable into an RJ45 connector. The RJ45 connector tang should face downward with the open end toward you while you insert the wires. Verify that all eight wires fully insert into the RJ45 connector and that they are inserted in the proper order. See Lab Figure 13.2.



LAB FIGURE 13.2 Push wires firmly into the RJ45 connector in the correct color order

5. Insert the cable-connector assembly into the stripper/crimper tool and crimp the connector firmly. See Lab Figure 13.3.



LAB FIGURE 13.3 Crimp the RJ45 connector firmly

6. Remove the cable/connector assembly from the stripper/crimper tool and verify that the wires fully insert into the connector and that they are in the proper order.
7. Repeat steps 2 through 6 for the other end of the CAT 5 or higher UTP cable.
Can the cable be used at this point? [Yes | No]
8. Before using the cable, you should test it with a cable tester to verify that you have end-to-end continuity on individual wires and proper continuity between wire pairs. Insert the RJ45 connector into the proper cable tester receptacle and verify that the cable is functional. See Lab Figure 13.4.



LAB FIGURE 13.4 Network cable tester

Instructor initials: _____

Lab 13.2 Creating a Cat 5, 5e, 6, or 6a Crossover Network Cable

Objective: To create a functional UTP crossover cable

Parts: UTP cable
RJ45 connectors
Stripper/crimper tool
UTP cable tester

Note: In normal situations, straight-through UTP cable is used to connect to a central hub or switch. In this exercise, you create a crossover cable for use when directly connecting two network devices (computers *without* using a central hub or switch).

Procedure: Complete the following procedure and answer the accompanying questions.

1. Category 5, 5e, 6, 6a, and 7 UTP cable consists of four twisted pairs of wires that are color coded for easy identification. The color-coded wires are as follows:

Pair 1: White/orange and orange

Pair 2: White/blue and blue

Pair 3: White/green and green

Pair 4: White/brown and brown

2. Using the stripper/crimper tool, strip approximately 1/2 inch (1 centimeter) of the protective outer sheath to expose the four twisted pairs of wires. Most tools have a strip gauge to help you strip the proper length.

Note: To make it easier to sort the wire pairs, the sheathing can be stripped farther than 1/2 inch (1 centimeter). The wires can then be sorted properly and then trimmed to the proper length.

3. Untwist the exposed wire pairs. Be careful not to remove more twist than necessary. Sort the wires as follows:

Wire 1: White/orange

Wire 2: Orange

Wire 3: White/green

Wire 4: Blue

Wire 5: White/blue

Wire 6: Green

Wire 7: White/brown

Wire 8: Brown

Ethernet networks utilize wires 1, 2, 3, and 6. Using the above wiring scheme means the cable will use the white/orange-orange and white/green-green wire pairs.

When making a crossover cable, will both ends of the cable need to follow the same wiring schematic? [Yes | No]

4. Insert the sorted and trimmed cable into an RJ45 connector. The RJ45 connector tang should face downward with the open end toward you while you insert the wires. Verify that all eight wires fully insert into the RJ45 connector and that they are inserted in the proper order.
5. Insert the cable-connector assembly into the stripper/crimper tool and crimp the connector firmly.
6. Remove the cable/connector assembly from the stripper/crimper tool and verify that the wires are fully inserted into the connector and that they are in the proper order.

7. To create the crossover cable, the wire pairs must be put in a different order. To accomplish this, repeat steps 2–6 on the *opposite* end of the cable, but when sorting the wire pairs, use the following color codes:
- | | |
|----------------------|---------------------|
| Wire 1: White/green | Wire 5: White/blue |
| Wire 2: Green | Wire 6: Orange |
| Wire 3: White/orange | Wire 7: White/brown |
| Wire 4: Blue | Wire 8: Brown |
8. Verify both ends of the cables, ensuring that the tang is downward and the colored wires are in the correct order. You can also check the ends of the connectors to see if you see the tip of the copper wire pushed against the end. See Lab Figure 13.5.

Can the crossover cable be used at this point? [Yes | No]



LAB FIGURE 13.5 Verify the color codes on both connectors

9. Before using the crossover cable, you should test it with a cable tester to verify that you have end-to-end continuity on individual wires and proper continuity between wire pairs. Insert the RJ45 connector into the proper cable tester receptacle and verify that the cable is functional.

Note: Your cable tester must have the capability to test crossover cables.

Instructor initials: _____

Lab 13.3 Exploring NIC Properties with the Windows 7, 8, 10, or 11 Control Panel

Objective: To examine and modify NIC properties, including manually setting IP address information

Parts: Computer with Windows 7, 8, 10, or 11 installed

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on to Windows, if necessary.
2. Access the *Network and Sharing Center* section of the Control Panel.
3. Select the *Change adapter settings* link.
4. Double-click the wired or wireless connection that is currently used to connect the computer to the network.
5. Select the *Details* button. Use Lab Table 13.1 to document key pieces of information assigned to this NIC. For any property that is not shown, simply write *not applicable* for that setting.

LAB TABLE 13.1 NIC lab documentation

Property	Setting
Physical (MAC) Address	
DHCP Enabled	[Yes No]
IPv4 Address	
IPv4 Subnet Mask	
Leased Obtained	
Lease Expires	
IPv4 Default Gateway	
IPv4 DHCP Server	
IPv4 DNS Server	
IPv6 Address	
IPv6 Default Gateway	

6. Close the *Network Connection Details* window. In the *Status* window, notice that you can disable the NIC. You can also do this by right-clicking on the NIC icon. Click the *Disable* button.

What indication do you have that the NIC is actually disabled?

7. Right-click on the NIC icon and select *Enable*. Double-click the NIC icon again.

How many bytes have been sent?

How many bytes have been received?

8. Select the *Properties* button. The *Properties* window opens. Select the *Configure* button. The properties for the specific NIC card appear. The tabs at the top of the window are manufacturer specific, but most manufacturers tend to have the same basic tabs.

Which company manufactured the NIC?

Which data bus does the card use? [PCI | PCIe | _____]

What key information in the *Device Status* window would be important to the tech?

Using the various tabs, determine the following information:

Which driver version is installed?

Are any power management options enabled? If so, which ones?

Which tab can be used to disable the device?

9. Access the *Advanced* tab. Locate and select the option that allows you to manually set the NIC speed (and optionally the duplex).

What default value is shown?

10. Click the down arrow in the *Value* option.

List the available options.

If you were to manually configure this NIC for speed and/or duplex, which option would be best?

In your opinion, why do you think that a 1.0 Gbps option shows only full duplex?

11. Leave the speed at the original setting and return to looking at the specific properties.

Look through the advanced property options and list which ones relate to Wake on LAN. Note that you may have to access the option and look at the values to answer this completely.

12. Select *Cancel > Close*.

Lab 13.4 Exploring and Configuring NIC Properties with Windows 10/11 Settings

Objective: To examine and modify NIC properties, including manually setting IP address information

Parts: One computer with Windows 10 or 11 installed

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on to Windows, if necessary.
2. Access *Windows Settings > Network & internet* link.
3. Within the *Network status* section, or the section that has the active network connection shown, select the *Properties* button for the network card being shown.

Within the *Network profile* section, is the device configured as being on a public network or a private network? [Public | Private]

Within the *Metered connection* section, is the device configured as having a metered connection option turned on or off? [On | Off]

4. Locate the *IP settings* section.
Does the device have the IP address information manually configured, or is the device receiving IP addressing information from a DHCP server?
[Manually configured | DHCP server]
5. Locate the *NIC Properties* section. Use Lab Table 13.2 to document key pieces of information assigned to this NIC. For any property that is not shown, simply write *not applicable* for that setting.

LAB TABLE 13.2 NIC lab documentation

Property	Setting
Physical (MAC) Address	
IPv4 address	
IPv4 Subnet Mask	
Link Speed	
Lease Expires	
IPv4 Default Gateway	
IPv4 DHCP Server	
IPv4 DNS Server	
IPv6 Address	
IPv6 link-local address	
IPv6 DNS servers	
NIC manufacturer	
NIC driver version	

6. In the *IP settings* section (Windows 10) or *IP assignment* section (Windows 11), click the *Edit* button. Ensure that the drop-down menu option is set to *Manual*. Within the *IPv4* section, ensure that the option is turned to *On* by clicking in the space to the right. The option turns to *On*, and option boxes appear.
What are the option boxes available when manually configuring a Windows 10/11 computer for IP addressing information? (Choose all that apply.)
[MAC address | IP address | Default gateway | Gateway | Preferred DNS | DNS server | Alternate DNS]
Why would a technician configure an Ethernet network device for two DNS addresses?
7. Click the *Cancel* button and ensure that the *IP settings* section is back the way it was originally. Refer to the answer provided in step 4 if you are unsure. Close the *Settings* window.

Lab 13.5 Networking with Windows 7, 8, or 10

- Objective:** To put two Windows 7, 8, or 10 computers into a network workgroup
- Parts:** Two computers with Windows 7, 8, or 10 installed
One crossover cable *or* two straight-through cables and a hub or switch
- Procedure:** Complete the following procedure and answer the accompanying questions.

1. Power on the first computer and log on to Windows, if necessary. Do one of the following: (1) Connect a crossover between the two computers' NICs or (2) connect a straight-through cable from each computer to the hub or switch and power on the hub or switch. (Note that the computer may already be on a wired network.) Then either you or a fellow classmate should log in to the second computer.
2. Ensure that each computer has a user created that is the same user and password on both computers. See Chapter 16, "Advanced Windows," for directions on how to create a user account. Log in with that username on both computers.

Document the username that is the same on both computers and used to log in before doing any remaining steps: _____

3. Use any and all of the following to discover the computer name/device name as well as the domain or workgroup name.
 - > *System Control Panel*
 - > *PC Settings* link
 - > *System Settings* link > *About*
 - > *Advanced system settings* link (*System Properties* window)

Document the current settings. Write None if the information is not shown:

Original Computer 1 name: _____

Original Computer 2 name: _____

Original Full computer 1 name: _____

Original Full computer 2 name: _____

Is Computer 1 on a workgroup or domain? [Workgroup | Domain]

Is Computer 2 on a workgroup or domain? [Workgroup | Domain]

Original workgroup/domain name for Computer 1: _____

Original workgroup/domain name for Computer 2: _____

4. Use the *System Control Panel* to select the *Advanced system settings* link (located in the left menu). Use the *Computer name* tab > *Change* button and locate the *Member of* section in order to select the *Workgroup* radio button. Name the workgroup something unique and remember that both computers must be within the same workgroup. Select *OK* and/or *Close* until prompted to *Restart Now*. Do the same steps on the second computer.

Document the new workgroup name:

New workgroup name for both Computer 1 and 2: _____

What message appears once you selected OK?

5. When both computers have rebooted, the current IP addresses need to be documented. Open the command prompt and type `ipconfig /all`.

On Computer 1, what is the IPv4 address on the Ethernet adapter?

On Computer 1, what is the IPv6 link-local address on the Ethernet adapter?

On Computer 1, what is the IPv4 subnet mask?

On Computer 1, what is the default gateway?

On Computer 1, what is the MAC address?

On Computer 2, what is the IPv4 address on the Ethernet adapter?

On Computer 2, what is the IPv6 link-local address on the Ethernet adapter?

On Computer 2, what is the IPv4 subnet mask?

On Computer 2, what is the default gateway?

On Computer 2, what is the MAC address?

Who is the network adapter manufacturer for Computer 2?

How many hexadecimal characters are shown in the Computer 1 IPv6 address?

How many bits does this represent?

6. On both computers, close the *Command Prompt* window. Access the *Network and Sharing Center* Control Panel > access the *Change advanced sharing settings* link in the left pane. Expand the profile that shows as the “(current profile)” so you can see the sharing options. Also explore the *All Networks* section and expand it as well to answer the questions that follow.

Document the current Sharing and Discovery settings for both computers. Note that all options may not be available in Windows Home versions, but the lab still works. You may also have to expand some sections to find them in the particular type of network currently being used.

	Computer 1	Computer 2
Network discovery	_____	_____
File sharing	_____	_____
Printer sharing	_____	_____
Password protected sharing	_____	_____
Media sharing/streaming	_____	_____
Public folder sharing	_____	_____

7. On both computers, click *Cancel*. From the *Network and Sharing Center Control Panel*, select *Change adapter settings* link in the left panel. Right-click *Local Area Connection* or the *Ethernet* adapter option > *Properties*. In the center window, locate and select *Internet Protocol Version 4 (TCP/IPv4)* > *Properties* button.

Document the settings for Computer 1 and Computer 2: _____

Is Computer 1 configured with an IP address, mask, and default gateway OR is Computer 1 configured to obtain an IP address automatically?

Is Computer 1 configured with preferred and alternate DNS server(s) IP addresses OR does Computer 1 obtain DNS server address information automatically?

Is Computer 2 configured with an IP address, mask, and default gateway OR is Computer 2 configured to obtain an IP address automatically?

Is Computer 2 configured with preferred and alternate DNS server(s) IP addresses OR does Computer 2 obtain DNS server address information automatically?

8. On Computer 1, select the *Use the following IP address* radio button and type in the following information:

IP address: 192.168.1.1

Subnet mask: 255.255.255.0

Default gateway: 192.168.1.254

Click the *OK* button. Click the *OK/Close* button at the bottom of the *Local Area Connection Properties* screen.

9. On Computer 2, select the *Use the following IP address* radio button and type in the following information:

IP address: 192.168.1.2

Subnet mask: 255.255.255.0

Default gateway: 192.168.1.254

Click the *OK* button. Click the *OK/Close* button at the bottom of the *Local Area Connection Properties* or *Ethernet Properties* window.

From the information that has been entered on Computer 1 and Computer 2, what IP address is entered on the device such as a router that is connected to the same network as these two computers? Note that this information is derived from the chapter reading.

What is the purpose of the default gateway address? Note that this information is derived from the chapter reading.

10. On both computers, using previously described procedures, open a command prompt and use the **ipconfig** command to verify that the IPv4 address has been applied. Note that you may have to scroll up to see the IPv4 address assigned to the Ethernet adapter.

11. At a Computer 1 command prompt, type `ping 192.168.1.2`.

What was the response? Note that the default Windows Firewall behavior is to deny pings. When File and Print Sharing is enabled, the firewall automatically allows ICMP messages that include pings.

Sharing and Accessing a Shared Folder

Note: This section can take a little patience, depending on the type of network the computer uses. Also note that in some settings, the network status cannot be changed to a private network in Step 12. If you do not have these, options, just make a note that it shows as a public network and make sure you use that network type to configure the settings in Step 13.

12. To set the computer as a private network, use the *Network & Internet* Settings option. Ensure that the status shows as a private network. To change it, click the *Properties* button and in the *Network profile* section, ensure that the *Private* radio button is selected. If the link cannot be selected, just make a note of the type of network as that is the profile area you need to be in for the next step.

13. On both computers, access the *Network and Sharing Center* Control Panel > *Change advanced sharing settings* link. Configure the following settings in the appropriate profile area:

Network discovery: Turn on Network Discovery

File and print sharing: Turn on File and Print Sharing

Click the *Save Changes* button. Do the same on the second computer.

14. At a Computer 1 command prompt, type `ping 192.168.1.2`.

What was the response? Note that the ping should be successful, and you should get the message “Reply from 192.168.1.2” with a specific number of bytes and a time value. If you do not receive a successful ping, redo the lab starting at Step 8.

Instructor initials: _____

15. On Computer 1, using *Windows Explorer* (Windows 7) or *File Explorer* (Windows 8/10), create a subfolder of the Documents folder called ABC, create a text file called `Surprise.txt` within the ABC folder, and place this message in the text file:

Technology makes it possible for people to gain control over everything, except over technology. -John Tudor

16. On Computer 1, right-click or tap to select the ABC folder > *Properties* > *Sharing* tab > *Share* button > access the down arrow and choose *Everyone* > *Add* button so the *Everyone* user appears as a name > *Share* button.

Notice that the full path is shown in the window. An example is `\\DESKTOP-26NITHP\Users\student\Documents\ABC`. This full path can be emailed or given to someone so they can access the documents contained within the ABC folder.

What is the full path for your shared folder? Click the *Done* button > *Close* button when finished.

17. On Computer 2, there are several ways to view the share, depending on the type of network the computer is on. Note that not all options will be available; the options available depend on the type of network configured. If necessary, ask the instructor or student assistant what type of network is used and then select the option that best suits your network environment:

> Use *File Explorer* > *Network* option from the left panel > double-click the name of Computer 1

> If using OneDrive, access it through *Windows Explorer/File Explorer* or a web browser.

> If using the older method of folder sharing, use *Windows Explorer/File Explorer* to select the *Network* option from the left pane. In the right pane, double-click the *Computer 1 Name*.

Note: If Computer 1 does not appear in the right pane (it can take quite a few minutes to do so), do what many IT personnel do and access the computer by using its UNC. In a command prompt or Search textbox, type the following: `\\computer_name\share_name` (where `computer_name` is the name of Computer 1, and `share_name` is ABC, the name of the share). An example would be `\\Cheryl-PC\ABC`. You can also type the full path documented in step 16.

Note: If no passwords are assigned to the existing user account, a password will have to be applied to the account on both machines.

18. Access the *ABC* folder. Open the *Surprise.txt* document. Try modifying the text inside and saving it on Computer 1.

Were you successful? [Yes | No]

Instructor initials: _____

19. Close the *Surprise.txt* document on both computers.

Instructor initials: _____

20. Place both computers back in the original workgroup/domain. Refer to step 3 for the original settings.
21. Configure both computers to the original Sharing and Discovery settings. Refer to step 6 for the original settings.
22. Return both computers to the original IPv4 IP address, mask, default gateway, and DNS settings. Refer to steps 5 and 7 for the original settings.
23. Remove the cable and return the computers back to the original cabling configuration. Ensure that each computer works and has the same access as it had before you began this lab.

Instructor initials: _____

Lab 13.6 Connecting to a Windows 10 Shared or Networked Printer

Objective: To properly share a printer and use a shared or networked printer using Windows 10

Parts: Two networked computers with a printer attached to one and Windows 10 installed

Procedure: Complete the following procedure and answer the accompanying questions.

Sharing a Printer on the Network

1. Power on the computer that has the printer attached. If necessary, log on to Windows, using the appropriate user ID and password/PIN.
2. Access the *Network and Sharing Center* Control Panel. Ensure that *File and printer sharing* is enabled through the *Change advanced sharing settings* link.
3. Using the *Devices and Printers* Control Panel, locate the *Printers* section. Locate the printer to be shared. Right-click the printer icon > *Properties*.
4. Click the *Sharing* tab. (If the *Sharing* tab is not available, return to the *Devices and Printers* Control Panel, right-click the printer icon > select *Printer Properties*.)
5. Select the *Share this printer* radio button/checkbox. (If the option is grayed out, go back to the *Network and Sharing Center* Control Panel and ensure that sharing options are enabled. Make changes as necessary. Then continue with the rest of this step.) Ensure that the *Render print jobs on client computers* checkbox is enabled.

6. In the *Share Name* textbox, type in a unique printer name, limited to eight characters, if possible. It is important that this name be unique.

What name was assigned to the printer? _____

7. Click the *OK* button.

Printing to a Shared or Networked Printer in Windows 10

8. On the Windows 10 computer that does not have the printer attached, use *Settings > Devices > Printers & Scanners*.
9. Select the *Add a printer* or scanner option.
10. The printer should be listed in the window. Click *Next* if the printer is there and then click the *Install Driver* button.

If the printer is missing, click *The printer that I want isn't listed*. Four methods can be used to find a shared or networked printer:

- > *Method 1:* Select the *My printer is a little older. Help me find it link > Next*.
- > *Method 2:* Select the *Share printer by name* radio button. Either type the name of the printer using the format `\\computer_name\printer_share_name` or browse the network for the printer name, click the *Next* button, select the printer, and click *Next*. Note that this is sometimes the quickest method for a shared printer as it directly accesses the printer across the network. To locate the computer name, use the *System* Control Panel. The printer share name was issued and documented in step 6.
- > *Method 3:* Select the *Add a printer using a TCP/IP address or hostname* radio button and click *Next*. Type the hostname or IP address. Click *Next*.
- > *Method 4:* Select the *Add a Bluetooth, wireless or network discoverable printer* radio button.

11. Select one of these options and locate the shared printer. Print a test page to the shared printer.

Does the test page print properly? If not, perform appropriate printer troubleshooting. [Yes | No]

Lab 13.7 Installing a Wireless NIC

Objective: To install a wireless NIC into a computer and have it attach to an access point

Parts: A computer with access to the internet and permission to download files

A wireless NIC

An access point that has already been configured by the instructor or lab assistant

Note: To verify that a wireless NIC works after it is installed, it must have another wireless device such as another computer with a wireless NIC installed or an access point. This lab assumes that an access point is available and allows attachment of wireless devices. Students will need any security information such as WEP key or WPA2/WPA3 password before they begin. Each student will download the installation instructions and driver for the wireless NIC. Frequently, these files may be in zipped or PDF format. The computer they use may need to have Adobe's Acrobat Reader and/or a decompression software package loaded.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Determine which type of wireless NIC is being installed.

What type of wireless NIC is being installed?

[USB | PCI | integrated | PCIe]

Who is the manufacturer of the wireless NIC?

What operating system is used on the computer in which the wireless NIC will be installed?

- Using the internet, determine the latest version of wireless NIC driver for the operating system being used and download the driver.

What is the latest driver version?

- Using the internet, download the installation instructions for the wireless NIC being used.

What is the name of the installation document?

- Open the document that details how to install the wireless NIC.

- Follow the directions and install the wireless NIC.

Does the wireless NIC automatically detect a wireless network?

List any specifications given to you by the instructor/lab assistant.

Lab 13.8 Configuring a Wireless Network

Objective: To configure a wireless AP (access point) or router and attach a wireless client

Parts: One wireless access point or router

A computer with an integrated wireless NIC or a wireless NIC installed as well as an Ethernet NIC

One straight-through cable

Procedure: Complete the following procedure and answer the accompanying questions.

- Obtain the documentation for the wireless AP or router from the instructor or the internet.
- Reset the wireless AP or router as directed by the wireless device manufacturer.

Document the current Ethernet NIC IPv4 settings. [DHCP | Static IP address]

If a static IP address is assigned, document the IP address, subnet mask, default gateway, and DNS configuration settings.

- Attach a straight-through cable from the computer Ethernet NIC to the wireless AP or router.
- Power on the computer and log on, if necessary.
- Configure the computer NIC with a static IP address or DHCP, as directed by the wireless device manufacturer.
- Document the current settings first. Then open a web browser and configure the wireless AP or router with the following parameters:
 - > Change the default SSID.
 - > Leave SSID broadcasting enabled for this lab.

- > Do not configure wireless security at this time.
- > Change the default password used to access the wireless AP/router.

Document the current settings:

SSID: _____

Password for wireless device access: _____

7. Save the wireless AP or router configuration.
8. Disconnect the Ethernet cable.
9. Enable the wireless NIC and configure it for the appropriate SSID.
10. Configure the wireless NIC for a static IP address or DHCP, as directed by the wireless AP or router manufacturer.
11. Open a web browser and access the wireless AP or router. If access cannot be obtained, troubleshoot as necessary or reset the wireless AP or router to default configurations and restart the lab.

What frequency (channel) is used by the wireless AP or router and the wireless NIC for connectivity?

12. Show the instructor the connectivity.

Instructor initials: _____

13. Reset the wireless AP or router to the default configuration settings.
14. Reset the computer(s) to the original configuration settings.

Lab 13.9 Using an FTP Server and Client

Objective: To transfer files from one network device to another, using an FTP server and client software

Parts: An application or freeware application that provides the FTP server service
An application or freeware application that provides the FTP client service

Procedure: Complete the following procedure and answer the accompanying questions.

FTP Server

1. Download, install, and open an FTP server freeware application such as Home FTP Server or FileZilla. This lab has directions specifically for Home FTP Server, but the steps for other applications are similar.
2. Start the FTP server. You may need to start the FTP server or the FTP server service. In the Home FTP Server application, click the *FTP Server* tab > *Start Server*.
3. Some FTP server applications allow anonymous users or anyone who connects to the server to download files. Also, some applications allow you to specify what the anonymous user can do, such as download, upload, and delete files and directories. To enable anonymous logins within Home FTP Server, click the *FTP Server* tab > enable *Allow Anonymous Users (Allow All Active)* checkbox. This same tab can be used to enable specific permissions for creation and deletion of files and directories.

Write down where the default anonymous directory is located.

4. FTP server applications frequently allow web connectivity. To enable the web interface within Home FTP Server, select the *Web Interface* tab > enable the *Web Interface Enabled* checkbox.

What is the default port number used for the FTP server?

What is the IP address of the FTP server?

5. Copy some files into the default anonymous directory on the FTP server.

FTP Client

6. Download, install, and open an FTP client freeware application. This lab has directions specifically for the SmartFTP client, but the steps for other applications are similar.
7. Usually, a client requires the following configuration:

- > Address of the FTP server
- > User login ID and password *or* anonymous login selected

In the SmartFTP client, type in the FTP server IP address in the *Address* textbox > click the *Anonymous* button (option) > click the green arrow to connect. The FTP client displays the files that were copied into the anonymous directory.

Instructor initials: _____

Tightening Security

8. Create a user on the FTP server. In Home FTP Server, click the *New Member* button > *General* tab > type a name in the *User Name* textbox > type **class999** in the *Password* textbox.

Make a note of the home directory and permissions for this user.

9. Click *Apply*. Test the user account from the FTP client application by creating a new entry with the appropriate user ID and password. In SmartFTP, click the *File* menu option > select *Disconnect* to disconnect the previous login session. Click the *File* menu option > *New Remote Browser* > in the *Host* textbox, type the FTP server IP address > in the *User Name* textbox, type the *exact* username that was typed in the FTP server application > in the *Password* textbox, type **class999** > in the *Name* textbox, type **FTP with login** > *OK*. The client connects to the FTP server.

Instructor initials: _____

10. Within the client application, close the FTP session. For the SmartFTP client, use the *Close* button in the upper-right corner of the *FTP with Login* tab. Close all tabs and sessions.
11. Delete FTP client entries. From within SmartFTP client, click the *Favorites* menu option > *Edit Favorites Quick Connect* option in the left pane > click once on the FTP server IP address in the right pane > *Edit* menu option > *Delete* > *Yes*. Delete the FTP with login option using the same technique.

Instructor initials: _____

14 Introduction to Operating Systems Labs



Lab 14.1 Windows Basic Usage: Working with the Traditional Desktop and Control Panel Utilities

Objective: To work effectively with the Windows 10 traditional desktop and the Windows 11 desktop, including accessing Control Panel utilities; managing the display through the Control Panel; performing file, folder, and computer searches; and accessing programs

Parts: Two computers with Windows 10/11 and a user account with administrator rights

Note: This lab could actually be done with one computer; in that case, only steps 17 and 18 cannot be completed.


Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on to Windows, if necessary. The desktop appears. The traditional Windows 10 desktop has a *Start* button in the lower-left corner, a taskbar along the bottom, and a notification area in the lower-right corner. In the default Windows 11 desktop, the *Start* button is at the left of a group of buttons centered on the taskbar.

Searching for Files, Folders, Applications, and Computers

Note: Windows Search can find files, folders, applications, contacts, emails, and other items on a computer. It can also return results from the internet. In Windows 10, it normally appears as a *Type here to search* textbox or as a *Search* icon to the right of the *Start* button. Windows 11 only has the *Search* icon. In both Windows 10 and Windows 11, the *Type here to search* textbox appears after you click the *Search* icon. Throughout the rest of this lab, we refer to the *Type here to search* textbox as the *Search* box or the *Search* function.

2. If you don't see the *Search* textbox or icon in Windows 10, right-click on an empty space within the taskbar > select *Search > Show search icon* or *Show search box*. In Windows 11, right-click on an empty space within the taskbar and toggle the *Search* switch to *On*.
3. Type **msconfig** in the *Search* box and select *System Configuration* from the resulting list. (Note that the `msconfig` command is an important one for technicians because it launches the System Configuration utility.)
4. Click *Cancel* to close the System Configuration window.

5. Search for the *WordPad* application and launch it. Type the following message:
The function of education... is to teach one to think intensely and to think critically. But education which stops with efficiency may prove the greatest menace to society. The most dangerous criminal may be the man gifted with reason, but with no morals. - Dr. Martin Luther King, Jr.
 6. Select the *Save* icon in the top-left corner (which looks like a floppy disk, ).
 7. Ensure that the address bar shows that the file is being saved into *Documents*. If it is not, scroll in the left window to locate and select *Documents*. In the *File name* textbox, type **Lab4test** and click *Save*.
 8. Use the *Close* button in the top-right corner to close WordPad.
 9. Type **lab** in the *Search* box.
 Did your Lab4test file appear in the resulting search list? [Yes | No]
 If not, redo steps 5 through 9.
 10. Open Windows File Explorer by clicking the yellow folder on the taskbar or right-click *Start* > select *File Explorer*. (Note that the search tool in File Explorer returns folders, files, and applications on the local computer. It can also find computers on the network.)
 11. Select *This PC*. Type **msconfig** in the *Search This PC* textbox located in the upper-right corner and then press the key. Wait while the system searches for results.
 12. In the resulting list, locate and double-click the **msconfig** utility (normally located in the *C:\Windows\System32* folder).
 List the five tabs in the System Configuration window.

 13. Click *Cancel* to close the System Configuration window. Close *File Explorer*.
 14. Use the *Control Panel* > *System and Security* > *System* link to find your computer name. Notice that this opens *Settings* > *System* > *About*.
 Computer name: _____
Note: To use a Windows 10/11 computer to locate other computers on a network, you need to enable Network Discovery. Enabling Network Discovery is also required for a Windows 10/11 computer to be seen on a network.
 15. Enable Network Discovery by accessing the *Network and Internet* Control Panel > *Network and Sharing Center* > *Change advanced sharing settings* > expand the section that shows your current profile by selecting the down chevron > enable *Turn on network discovery* > *Save changes*.
 16. On your own computer, access *File Explorer* > select *Network* from the left column. If computers and devices are configured to be seen on the network, then they appear in the screen to the right.
 17. Confirm that a classmate has completed steps 14 and 15. Document your classmate's computer name.
 Second computer name: _____
 18. If the second computer from step 17 does not appear immediately, type **second computer name** in the *File Explorer Search* box and press the key. Ask your classmate if your computer appears in their File Explorer.
 Does the remote device appear? [Yes | No]
 Does your device appear in File Explorer on the remote device?
 [Yes | No]
- Instructor initials: _____

Obtaining Help

19. In the *Search* box on the taskbar, type **help**. Click the *Get Help* app. You can use the *Search* box in the center to search for specific help topics, or you can access the links for common searches.
20. Type **monitor quality** in the *Search* box and press **↵Enter**.
List two solutions suggested to improve display quality.

21. To see a list of troubleshooting topics, type **troubleshooting** in the *Search* box.
22. Close the *Get Help* app.

Working with the Taskbar

23. Right-click on an empty space within the taskbar. (Recall that the taskbar is the bar that runs across the bottom of the display.)
List the options available in the context menu.

In Windows 10, how can you tell if the taskbar is locked or unlocked without moving it? (Note that the Windows 11 taskbar cannot be unlocked.)

24. Review the items available in the notification area. Note that you may have to select an up arrow to see additional items.
List three system icons that can be customized within the notification area.

Working with Control Panels

25. Access the Control Panel by typing **control** in the *Search* box > select *Control Panel*.

TECH TIP

Different ways to access Control Panel utilities in Windows 10

- > Type **control** in *Type here to search* textbox > select *Control Panel*.
- > After searching for *Control Panel*, right-click the icon > select *Pin to Start* so you have a Control Panel tile on the Start menu or select *Pin to taskbar* so it will be available on the traditional desktop taskbar.
- > With the Control Panel window open, locate the words *Control Panel* in the address bar > select and drag the words *Control Panel* to the desktop so that a shortcut icon will be created.

Note: The *Control Panel* option gives you access to Control Panel icons or links used to configure the computer. There are two basic ways to view Control Panels: the classic view (small and large icons for each Control Panel) and category view (where eight major categories are shown with a few links under each category but more links are available after you select the link). The default view is by category.

26. To ensure that you are in the default view, locate and select the *View by* down arrow on the top right > ensure that *Category* is selected.

List two Control Panel categories shown on the screen.

27. Select *Large Icons* or *Small Icons* in the *View by* drop-down menu. This view is the older method for accessing any particular Control Panel utility. Return to the category Control Panel view.
28. Using Lab Table 14.1 as a reference, complete Lab Table 14.2. Explore the Windows Control Panel and document in Lab Table 14.2 which Control Panel category and subcategory you would use to perform particular tasks. Note that some systems have special Control Panel utilities because of the type of computer being used. Also, some of the options are found in multiple categories.

LAB TABLE 14.1 Common Windows 10/11 Control Panel categories*

Control Panel category	Subcategory	Function
System and Security	Security and Maintenance	Review computer's status and resolve issues; scan for viruses.
	Windows Defender Firewall	Prevent access to the computer through the internet or a network.
	System	View basic computer properties, such as RAM, processor type, and computer name.
	Power Options	Configure power-saving modes.
	File History	Automatically save backup copies of files.
	Backup and Restore (Windows 7)	Save or restore files and folders to or from a different location.
	BitLocker Drive Encryption	Change or use encryption options.
	Storage Spaces	Save files to two or more drives to help protect against a single drive failure.
	Work Folders	Make files available on all devices, even when offline.
	Administrative Tools	Free up hard disk space, manage hard drive partitions, schedule tasks, and view event logs.
Network and Internet	Network and Sharing Center	Check the status and modify network-related settings as well as share files, folders, and devices on the network.
	Internet Options	Customize settings for internet browsers.
Hardware and Sound	Devices and Printers	Add/remove/configure devices, scanners, cameras, printers, and mice and access Device Manager.
	AutoPlay	Change how media is automatically handled when a disc, flash drive, or type of file is added or inserted.
	Sound	Manage audio devices and change sound schemes.
	Power Options	Configure power-saving modes.
	Pen and Touch	Configure pen options for tablet devices.

Control Panel category	Subcategory	Function
	Tablet PC Settings	Configure tablet and screen settings on a tablet PC.
	Display	Adjust resolution, configure an external display, or make text larger/smaller.
Programs	Programs and Features	Uninstall or change programs as well as turn Windows features such as containers, Hyper-V, and TFTP client on or off.
	Default Programs	Remove a startup program, associate a file extension with a particular application, or select the program used with a particular type of file.
Appearance and Personalization	Taskbar and Navigation	Select items that appear on the taskbar and control the behavior of the taskbar.
	Ease of Access Center	Make the computer easier to use, especially for those with physical or visual limitations.
	File Explorer Options	Control the appearance and behavior of folders, files, shortcuts, and links. Also configure search options.
	Fonts	Preview, install, delete, and configure fonts.
User Accounts	User Accounts	Add, remove, or modify accounts on the computer.
	Credential Manager	Manage saved logon information for websites, connected applications, and networks.
	Mail	Configure email accounts and email storage directories.
Clock and Region	Date and Time	Configure time, date, time zone, and clocks for different time zones.
	Region	Configure the format for date, time, currency, and other region-specific options and customize keyboard settings.
Ease of Access	Ease of Access Center	Make the computer easier to use, especially for those with physical or visual limitations.
	Speech Recognition	Configure built-in speech recognition system.

* Note that you can find particular options by typing in the subcategory in the *Search Control Panel* textbox.

Fill in Lab Table 14.2 with the correct Control Panel category and subcategory.

LAB TABLE 14.2 Determine the correct Control Panel categories and subcategories

Task	Control Panel category	Control Panel subcategory
Configure the mouse buttons for a left-handed person.		
Mute the computer speaker sound.		
Configure the date to be in the format April 15, 202X.		

Task	Control Panel category	Control Panel subcategory
Define how quickly a character repeats when a specific key is held down.		
Define what page (home page) appears every time Edge starts.		
Configure an IP address on a wired or wireless network adapter.		
Set a printer as the default printer.		
Verify if Windows recognizes a particular piece of hardware.		

Working with the Display

29. Some items that were in Control Panel in previous versions of Windows have been moved to *Settings* in Windows 10 and Windows 11. For example, *Display* has been moved from the *Hardware and Sound* Control Panel to *Settings > System > Display*.

Access the display settings by right-clicking *Start > Settings > System > Display*. Another option is to right-click on a blank area of the Desktop > select *Display settings*. Answer the questions below. Note that you may be required to search throughout this area and select various options. Also, you may have to use another application to control your display settings, depending on the manufacturer of your computer and the manufacturer of your display adapter.

What is the current resolution?

What is the orientation?

30. Continue working within the *Display* window. Locate and select the *Advanced display settings* (*Advanced display* in Windows 11) link.

What adapter is used?

What is the bit depth?

Click *Display adapter properties for Display X* (where *X* is system dependent).

How much video memory (that is, dedicated video memory) does the adapter have?

How much total graphics memory is available?

31. Select the *Monitor* tab.

What refresh rate is used?

32. Click *Cancel* on this window and go to the desktop. Right-click on a blank area of the desktop > select *Personalization/Personalize* > *Lock screen*.

What lock screen, if any, is currently set?

33. In Windows 10, select *Pictures for Background* if it isn't already selected. In Windows 11, select *Pictures for Personalize your lock screen*. Several pictures are displayed below *Choose your picture*. Click each picture to see a preview of the lock screen. Return the lock screen to the original setting (see the answer to Question 32).

Dealing with Power Settings

34. Return to the Control Panel. Select *Hardware and Sound* > *Power Options*. The Power Options window appears. Lab Table 14.3 shows the various power options available in Windows 10/11.

What power option would a teacher use when using a laptop to teach a four-hour class?

LAB TABLE 14.3 Windows 10/11 default power schemes*

Power scheme	Purpose
Balanced	Default mode; processor adapts to activity being performed; performance provided when the computer is in use; power savings when the computer is inactive. Display powers down after 10 minutes, hard drive powers down after 20 minutes, and system goes to sleep after 30 minutes.
Power saver	Provides maximum battery life for mobile devices. Display and hard drive power down after 5 minutes, and the system goes to sleep after 15 minutes.
High performance	Maximum system performance and responsiveness. Display powers down after 5 minutes, and hard drive powers down after 20 minutes, but the system never sleeps.
Customized	A scheme created by the user that has different settings than the three default schemes.

* Note that a computer manufacturer may provide additional power schemes. Also, additional settings may be available for laptops.

35. Close all windows.

TECH TIP

Changing UAC (User Account Control) settings

Windows has a UAC dialog box that appears, asking for permission to do something. The UAC feature is intended to give you a moment to think before you make significant changes to a system. To change UAC settings, use the *User Accounts Control Panel* > select *User Accounts* > *Change User Account Control settings* > move the UAC control slider to have more notifications, fewer notifications, or no notifications > *OK*.

The UAC settings can also be accessed through the *System Configuration* (`msconfig` command) > *Tools* tab > *Change UAC Settings* > *Launch* button > select the appropriate level > *OK*.

Recycle Bin

36. Open *File Explorer* > locate the `Lab4test` document created earlier in the lab. Ensure that the file is visible in the right window.

37. Right-click on the `Lab4test` filename. Notice that there is a *Delete* option (a trashcan icon in Windows 11). Do not click this option. This is just one way you could delete the file, but here you are going to use a different way. With the `Lab4test` filename still highlighted (but no context menu showing), press the `[Del]` key. The file is sent to the Recycle Bin.

The Recycle Bin is just a folder on the hard drive that holds deleted files and folders. When a file or folder is deleted, it is not immediately discarded; instead, it goes into the Recycle Bin folder. A deleted file or folder can be removed from the Recycle Bin. This is similar to retrieving a piece of trash from an office trash can. A technician must remember that the files and folders in the Recycle Bin take up hard drive space and that users frequently forget to empty these deleted files and folders.

TECH TIP

Files deleted from the Recycle Bin cannot be retrieved

After the Recycle Bin has been emptied, the deleted files cannot be recovered without the use of special software.

38. Locate the *Recycle Bin* icon on the desktop and double-click it. If the Recycle Bin is not on the desktop, search for the *Recycle Bin* folder.
- Does the `Lab4test` WordPad document appear in the Recycle Bin window?
 [Yes | No] If no, redo the steps in this lab to create and delete the file.
39. Select *Empty Recycle Bin* from the *Recycle Bin Tools* menu ribbon option. A confirmation window appears, asking if you are sure you want to permanently delete the items in the recycle bin. Select *Yes*. The `Lab4test` document disappears from the Recycle Bin window (as do any other files that were located in the Recycle Bin). Close the *Recycle Bin* window.

Lab 14.2 Windows 10 Basic Usage: Introduction to the Start Menu

Objective: To work effectively with the Windows 10 Start menu

Parts: Desktop computer with Windows 10 and a user account with administrator privileges

Procedure: Complete the following procedure and answer the accompanying questions.

Working with the Windows 10 Start Menu

1. Power on the computer and log on to Windows 10.

On Windows 10 desktop computers, the screen that displays after a user logs in is configurable. It can be the traditional desktop or it can be tablet mode. The traditional desktop has small icons that represent files, folders, applications, or other items. Tablet mode has large tiles similar to the Start screen, which was introduced in Windows 8/8.1. Tablet computers can only use tablet mode.

Which type of screen do you see?

- a. The traditional Windows desktop with labeled shortcuts (links to applications, websites, accessories and folders), a Start button in the lower-left corner, and a taskbar across the bottom
- b. The Windows tablet mode with Pinned tiles and All apps buttons in the upper left corner, square tile shortcuts (links to applications, websites, accessories and folders), and a taskbar across the bottom



In this lab you will examine the Start menu, which is a component of the traditional desktop.

2. Right-click the *Start* button > select *Settings* > type **tablet** in the *Search* box > select *Tablet settings*.

Document your current setting for *When I sign in* so that you can reinstate it later in the lab.

When I sign in [Always use tablet mode | Never use tablet mode | Use the appropriate mode for my hardware]

If it's not already selected, choose *Never use tablet mode* for the *When I sign in* option.

3. Click the *Start* button. The Start menu opens. To see what options are available on the Start menu, begin by opening *Settings* using one of the following methods:
 - > Right-click the *Start* button in the bottom-left corner > select *Settings*.
 - > Hold down the  key and press the  key.
 - > Click the *Start* button > select the icon that has three horizontal lines (located in the top-left corner) > select *Settings* from the resulting menu.
 - > Click the *Start* button > click the icon that looks like a bulleted list (located in the top-left corner) > scroll down and select *Settings*.

Note: You might not have all these methods available, depending on the type of device or configuration settings.

4. Select *Personalization* > select *Start*.

Document your current settings so that you can reinstate them later in the lab. Be sure to document any additional settings that are not listed below.

- > Show more tiles on Start [On | Off]
- > Show app list in Start menu [On | Off]
- > Show recently added apps [On | Off]
- > Show most used apps [On | Off]
- > Show suggestions occasionally in Start [On | Off]
- > Use Start full screen [On | Off]
- > Show recently opened items in Jump Lists on Start or the taskbar and in File Explorer Quick Access [On | Off]

5. Set all options to the *Off* position. Select the *Choose which folders appear on Start* link at the bottom of the pane.

Document your current settings so that you can reinstate them later in the lab.

- > File Explorer [On | Off]
- > Settings [On | Off]
- > Documents [On | Off]
- > Downloads [On | Off]
- > Music [On | Off]
- > Pictures [On | Off]
- > Videos [On | Off]
- > Network [On | Off]
- > Personal folder [On | Off]

6. Set all the options to *Off*. Close the Settings window.

7. Click the *Start* button.

What menu options appear directly above the *Start* button?

8. Select the *All apps* option > scroll down and select *Settings* > *Personalization* > select the *Start* option.

9. Turn on the *Show more tiles on Start* option. Click the *Start* button.

How did the *Start* menu change (if at all)?

Enable the *Show suggestions occasionally in Start* option. How did the *Start* menu change, if at all?

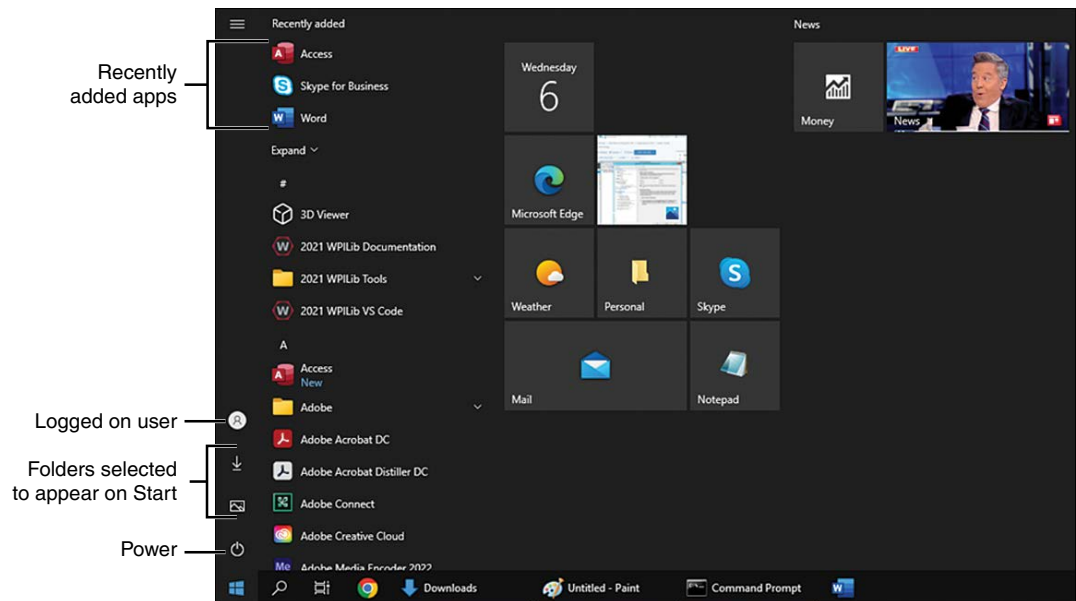
10. Lab Table 14.4 shows the purpose of each of the Windows 10 *Start* menu/screen options. Lab Figure 14.1 shows where some of these options would be located on the *Start* menu. Explore these options to see their effects.

LAB TABLE 14.4 Windows 10 *Start* menu/screen settings

Setting	Purpose
Show more tiles on Start	Shows one more column of tiles. Note that you can drag the edge of a tile to make it any size you want.
Show app list in Start menu	Shows the app list without requiring the user to click the <i>All apps</i> icon.
Show recently added apps	Lists the apps that have been installed recently.
Show most used apps	Dynamically populates with the most commonly used apps.
Show suggestions occasionally in Start	Displays ads for suggested apps.
Use Start full screen	Uses a <i>Start</i> screen that is more like the Windows 8 full screen tiles view, where you use the <i>All apps</i> icon in the left-top corner to access apps.
Show recently opened items in Jump Lists on Start or the taskbar and in File Explorer Quick Access	Shows jump lists, which include recently used documents, websites, and so on related to a particular app. Right-clicking an app icon in the <i>Start</i> menu allows you to see the associated jump list.
Choose which folders appear on Start	Determines which folders appear at the bottom of the <i>Start</i> menu for easy access.

11. Within the *Start* settings, ensure that the *Use Start full screen* option is *Off*. Access the *Choose which folders appear on Start* link at the bottom of the right pane. Review the list of available folders. Select up to three folders. Click the arrow in the upper-left corner to return to the *Start* settings main page.
12. Change several of the settings and re-access the *Start* screen. Confirm your configurations from this step and the previous step.

List which options you think would be most beneficial for people in a work environment.



LAB FIGURE 14.1 Windows 10 Start menu areas

Manipulating the Start Screen

13. Within the *Personalization* > *Start* settings, ensure that the *Use Start full screen* option is *On*. When this option is on, the Start menu is called the Start screen.
14. Re-access the Start screen by selecting the *Start* icon from the desktop.
15. Examine the tiles shown on the Start screen.

Which tile is currently located in the far-left position?

16. Select and drag the tile located in the far-left position to the last position in the first block of tiles. Then return the tile to the original position.
17. To add a tile that represents an app to the Start screen, access the *All apps* icon that looks like a bulleted list. Select the *Windows Accessories* menu item and locate but do not select the *Notepad* application. Right-click the *Notepad* option. A context menu appears. Move the pointer to the *More* option to see the other options that are available.

Which additional options are available?

18. Press the escape key to return to the main context menu. Select the *Pin to Start* option. While still on the Start screen, select the *Pinned tiles* icon (which looks like two squares and two rectangles) in the upper-left corner. A Notepad tile is now in the Start screen. Right-click the *Notepad* tile.

List the options available in the context menu.

19. Tap or select the *Notepad* tile. The Notepad application window opens. Close the window using the *Close* button in the upper-right corner.
20. Re-access the *Start* screen using whatever method you prefer. Locate the *Notepad* tile and right-click it to access the context menu.
21. Hover the pointer over the *Resize* option.

What choices do you have?

22. Select a different tile size than the one currently used. Re-access the *Notepad* tile context menu > select *More* option > select *Open file location*. Windows *File Explorer* opens, showing the folder that contains this file (and other files in the same folder). Notice that the Notepad option is a shortcut. You can tell because the icon on the left has a bent arrow on it. Also, in the *Type* column, you can see the word *Shortcut*.
23. To see where the original file is located, right-click the *Notepad* icon from within *File Explorer* > select *Properties*. Ensure that the *Shortcut* tab is selected. The *Target* textbox shows where the actual file is located. *%windir%* is a variable used to describe the folder where Windows was installed. Commonly it is *C:\Windows*, but because this might be on another drive letter or installed to a different folder, Microsoft simply describes it as *%windir%*. The full path for the Notepad application is commonly *C:\Windows\System32\notepad.exe*.
24. Click *Cancel* to return to File Explorer. Close *File Explorer* and return to the *Start* screen (the one with the tiles).
25. Re-access the *Notepad* context menu > select *Unpin from Start*.

Conducting Searches

Note: Searches in Windows 10 can be conducted through the taskbar, using the *Search here to search* textbox. Note that if you have the Cortana feature turned on, you can speak or type questions or conduct searches through that interface. To ensure that everyone is on the same page, you need to document some original configuration settings and, if necessary, change them.

26. On the *Start* screen, start typing **search** (note that you do not have to click anywhere in the Start screen) and select *Windows Search settings* from the resulting list.
Document the device's current settings related to searching. Note that you may have to explore the links to find answers. Document any additional settings.
 - > [Find My Files \[Classic | Enhance \]](#)
 - Under [Permissions & History](#):
 - > [SafeSearch \[Strict | Moderate | Off \]](#)
 - > [Microsoft Account \[On | Off \]](#)
 - > [Work or School account \[On | Off \]](#)
 - > [History \[On | Off \]](#)
27. Ensure that *History* is turned *On*.
28. Select the *Search* icon from the taskbar. Type **comm** in the textbox. A list including *Best match*, *Apps*, *Store*, *Search school and web*, *People*, *Settings*, and/or other possible categories appears. Select the *Command Prompt* option. The Command Prompt window appears. Close the Command Prompt window by using the *Close* button in the top-right corner.
29. Re-access the Search function and type **word**. In the resulting list, right-click on the *WordPad* app. Notice from the search results that you still have access to the context menu that allows you to pin a particular app to the Start menu or taskbar. You also have the option to run an app as an administrator. This is sometimes required with Windows utilities used by technicians, although it is not needed with WordPad. Click away from the search list.
30. In the textbox at the bottom of the list, remove **word** and type **trinkets** instead. Notice that because there is nothing in the Windows 10 environment related to trinkets, web links are provided if this computer is connected to the internet. Select somewhere away from the search list.

Power Button Options

31. Click the *Power button* icon in the Start menu. It is a circle with a vertical line that extends through the top part of the circle (⏻). Lab Table 14.5 explains the various power button options that you might see.

LAB TABLE 14.5 Windows 10 power button shutdown options

Option	Purpose
Restart	Used when new software or hardware has been installed or when the computer locks.
Sleep	Reduces power consumption. Stores the current state of open files and settings in RAM.
Hibernate	Reduces power consumption even more than does the sleep mode. Saves the current state of open files and settings to the hard disk. Takes longer to resume operations than sleep mode but not as long as with a cold boot.
Shut down	Powers off the computer.
Update and restart	Applies pending updates and then restarts the system.
Update and shut down	Applies pending updates and then shuts down the system.

What options are available?

User Account Options

32. Click the *User account options* icon in the Start menu. It is a circle with a figure of a person inside the circle and the current user's name beside it. Lab Table 14.6 explains the various user account options that might be seen.

LAB TABLE 14.6 Windows 10 user account options

Option	Purpose
Change account settings	Opens <i>Settings > Accounts > Your info</i> to allow configuration of a Microsoft account, a picture, and other settings.
Lock	Returns the system to the login screen. The current user can log in again to resume the current session, or another user can log in to their account. If the system shuts down or restarts while an account is locked, the current state of the user's open documents or files might be lost.
Sign out	Reduces power consumption even more than does the sleep mode. Saves the current state of applications and settings to the hard disk. Takes longer to resume operations than sleep mode but not as long as with a cold boot.

What options are available?

Controlling the Desktop

Note: The desktop is the main screen area that you see when you log in to Windows 10. You can customize what is shown on the desktop and the default options, just as you can with the Start menu.

33. Right-click on an empty space on the desktop > point to the *View* option.

What options are available in the context menu?

What options are currently enabled?

34. If necessary, select the *Show desktop icons* option to disable it (that is, remove the check mark beside the option).

What changed?

35. Re-access the *View* context menu and ensure that the *Show desktop icons* option is set to the original configuration.

Task View

Note: On the taskbar is the *Task View* option, which allows you to view thumbnails of open apps and easily switch between them. In this section, you will see how the *Task View* option works.

36. Open the *Notepad*, *Snipping Tool*, and *Command Prompt* apps.
37. Find and select the *Task View* option, which is located to the right of the *Search* box on the taskbar. It has a rectangle in the center and a vertical line on the side. If you hold your cursor over the icon, it changes to two rectangles.

What happened when you selected the *Task View* option?

38. Locate and select the *Notepad* app. Note that you may have to select a down arrow below the thumbnails to see more thumbnails if you have more apps open than can fit on the screen. Leave these apps open.

Note: Task View can also be used to create more than one desktop. It enables you to have one or more apps open within one desktop and different apps open within another desktop. Then you can use Task View to easily swap between them.

39. Re-access *Task View* from the taskbar.
40. Select the *New desktop* option from the top of the *Task View* desktop.
41. Access the new desktop by clicking that numbered desktop (usually *Desktop 2*).
42. On the new desktop, open the *WordPad* app.
43. Select the *Task View* taskbar option again. The multiple desktops appear. Hover the mouse pointer over the first desktop (*Desktop 1*), and all open apps appear in the window above. Move the pointer to the desktop you just created, and the WordPad app thumbnail appears.

Note: Virtual desktops are not totally separated from one another. For example, if you enable the *Use Start full screen* option, it will be enabled across all desktops.

44. Ensure that the pointer is pointing toward the last desktop that was just created (usually *Desktop 2*). Click the *X* in the upper-right corner to delete that virtual desktop. If you have clicked within that virtual desktop and see the opened WordPad app, you are in the wrong place. Click the *Task View* icon on the taskbar and then hover the pointer over the miniature icon representing the last desktop created. Then click the *X* in the upper-right corner to delete that particular virtual desktop.
45. In the original desktop, close any apps you have open (for example, *Notepad*, *Snipping Tool*, and *Command Prompt*).

Getting the Machine Back in Order

46. Referring to steps 2, 4, 5, 26, and 33, return all settings to their original configuration.
47. Have a classmate verify that the settings are configured properly.

Are the computer settings back to the original configuration, as listed in steps 2, 4, 5, 26, and 33?
[Yes | No]

Classmate's printed name: _____

Classmate's signature: _____

Lab 14.3 Windows 11 Basic Usage: Introduction to the Start Menu

Objective: To work effectively with the Windows 11 Start menu

Parts: Desktop computer with Windows 11 and a user account with administrator privileges



Procedure: Complete the following procedure and answer the accompanying questions.

Working with the Windows 11 Start Menu

1. Power on the computer and log on to Windows 11.

Note: In this lab you will examine the Start menu, which is a component of the Windows 11 desktop. By default, the Windows 11 Start button is at the left of a group of icons in the center of the taskbar.

2. To move these icons to the left of the taskbar (as in the traditional Windows desktop), right-click the taskbar > click *Taskbar settings* > *Taskbar behaviors* > select *Center* for *Taskbar alignment*.
3. Click the *Start* button. The Start menu opens. To see what options are available on the Start menu, open *Settings* using one of the following methods:

- > Right-click the *Start* button in the bottom-left corner > select *Settings*.
- > Click the *Start* button > *Settings*.
- > Hold down the  key and press the  key.

Note: You might not have all these methods available, depending on the type of device or configuration settings.

4. Select *Personalization* > select *Start*.

Document your current settings so that you can reinstate them later in the lab. These settings control the options available when you click the Start button. Be sure to document any additional settings that are not listed below.

- > Show recently added apps [On | Off]
- > Show most used apps [On | Off]
- > Show recently opened items in Start, Jump Lists, and File Explorer [On | Off]

5. Set all options to the *Off* position. Click the *These folders appear on Start next to the Power button* arrow.

Document your current settings so that you can reinstate them later in the lab.

- > Settings [On | Off]
- > File Explorer [On | Off]
- > Documents [On | Off]
- > Downloads [On | Off]
- > Music [On | Off]
- > Pictures [On | Off]
- > Videos [On | Off]
- > Network [On | Off]
- > Personal folder [On | Off]

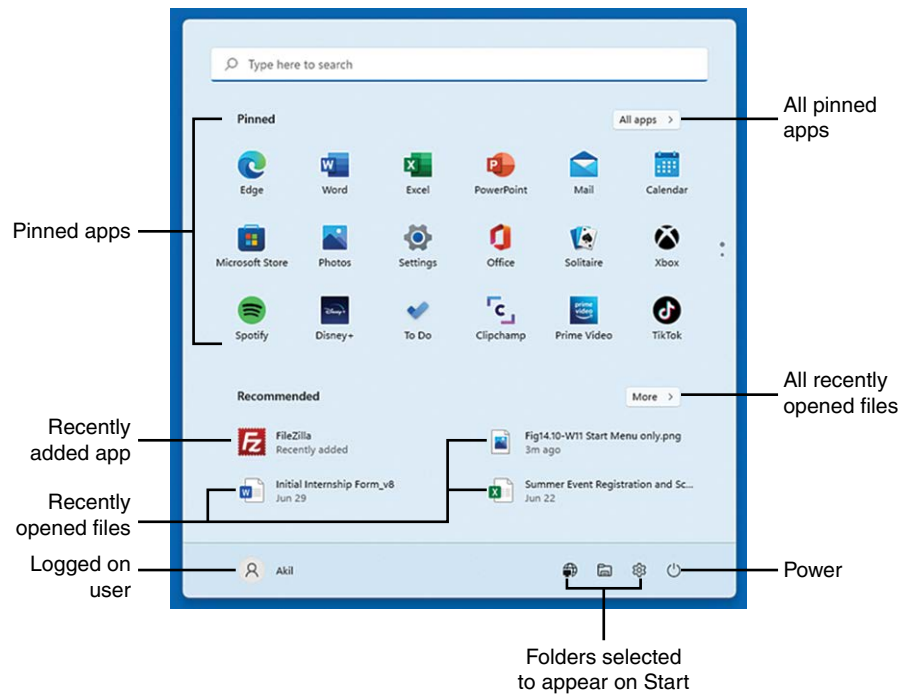
6. Set all the options to *Off*. Close the *Settings* window. Click the *Start* button to open the Start menu. What options appear at the bottom of the Start menu?

7. Select the *All apps* option > scroll down and select *Settings* > *Personalization* > select the *Start* option.

Lab Table 14.7 shows the purpose of each of these options. Lab Figure 14.2 shows where these options would be located on the Start menu. Explore these options to see their effects.

LAB TABLE 14.7 Windows 11 Start button settings

Setting	Purpose
Show recently added apps	Lists the apps that have recently been installed.
Show most used apps	Dynamically populates with the most commonly used apps.
Show recently opened items in Start, Jump Lists, and File Explorer	Shows jump lists, which include recently used documents, websites, and so on related to a particular app. Right-clicking an app icon in the Start menu allows you to see the associated jump list.
These folders appear on Start next to the Power button	Determines which folders appear at the bottom of the Start menu for easy access.



LAB FIGURE 14.2 Windows 11 Start menu areas

8. Within the *Start* settings, ensure that the *Use Start full screen* option is *Off*. Access the *These folders appear on Start next to the Power button* link at the bottom of the right pane. Review the list of available folders. Select up to three folders. Click the arrow in the upper-left corner to return to the *Start* settings main page.
9. Change several of the settings and re-access the *Start* screen. Confirm your configurations from this step and step 8.

List which options you think would be most beneficial for people in a work environment.

Conducting Searches

Note: Searches in Windows 11 can be conducted through the taskbar, using the *Search* function. Note that if you have the Cortana feature turned on, you can speak or type questions or conduct searches through that interface. To ensure that everyone is on the same page, let's document some original configuration settings and, if necessary, change them.

10. Open the *Start* menu and type **search** (note that you do not have to click anywhere in the *Start* menu) and select *Windows Search settings* from the resulting list.

Document the device's current settings related to searching. Note that you may have to explore the links to find answers. Document any additional settings.

 - > Respect power settings when indexing [On | Off]
 - > Find my files [Classic | Enhance]
 - > Exclude folders from enhanced search (List the excluded folders: _____)
 - > Advanced indexing options > Index these locations (List the locations: _____)
11. Select the *Search* icon from the taskbar. Type **comm** in the textbox. A list including *Best match, Apps, Store, Search school and web, People, Settings*, and/or other possible categories appears. Select the *Command Prompt* option. The *Command Prompt* window appears. Close the *Command Prompt* window by using the *Close* button in the top-right corner.
12. Re-access the *Search* function and type **word**. In the resulting list, right-click on the *WordPad* app. Notice from the search results that you have access to a context menu that allows you to pin a particular app to the *Start* menu or taskbar. You also have the option to run an app as an administrator. This is sometimes required with Windows utilities used by technicians, although it is not needed with *WordPad*. Click away from the search list.
13. In the textbox at the top of the list, remove **word** and type **trinkets** instead. Notice that because there is nothing in the Windows 11 environment related to trinkets, web links are provided if this computer is connected to the internet. Select somewhere away from the search list.

Power Button Options

14. Click the *Power button* icon in the *Start* menu. It is a circle with a vertical line that extends through the top part of the circle (⏻). Lab Table 14.8 explains the various power button options that might be seen.

LAB TABLE 14.8 Windows 11 power button options

Option	Purpose
Restart	Used when new software or hardware has been installed or when the computer locks.
Sleep	Reduces power consumption. Stores the current state of open files and settings in RAM.
Hibernate	Reduces power consumption even more than does the sleep mode. Saves the current state of open files and settings to the hard disk. Takes longer to resume operations than sleep mode but not as long as with a cold boot.
Shut down	Powers off the computer.
Update and restart	Applies pending updates and then restarts the system.
Update and shut down	Applies pending updates and then shuts down the system.

What options are available?

User Account Options

15. Click the *User account options* icon in the Start menu. It is a circle with a figure of a person inside the circle and the current user's name beside it. Lab Table 14.9 explains the various user account options that might be seen.

LAB TABLE 14.9 Windows 11 user account options

Option	Purpose
Change account settings	Opens <i>Settings > Accounts > Your info</i> to allow configuration of a Microsoft account, a picture, and other settings.
Lock	Returns the system to the login screen. The current user can log in again to resume the current session, or another user can log in to their account. If the system shuts down or restarts while an account is locked, the current state of the user's open documents or files might be lost.
Sign out	Reduces power consumption even more than does the sleep mode. Saves the current state of applications and settings to hard disk. Takes longer to resume operations than sleep mode but not as long as with a cold boot.

What options are available?

Controlling the Desktop

Note: The desktop is the main screen area that you see when you log in to Windows 11. You can customize what is shown on the desktop and the default options, just as you can with the Start menu.

16. Right-click on an empty space on the desktop > point to the *View* option.

What options are available in the context menu?

What options are currently enabled?

17. If necessary, select the *Show desktop icons* option to disable it (that is, remove the check mark beside the option).

What changed?

18. Re-access the *View* context menu and ensure that the *Show desktop icons* option is set to the original configuration.

Task View

Note: On the taskbar to the right of the Search box is the Task View option, which allows you to view thumbnails of open apps and easily switch between them. In this section, you will see how the Task View option works.

19. Open the *Notepad*, *Snipping Tool*, and *Command Prompt* apps.

20. Locate and select the *Task View* option on the taskbar. It has a black rectangle overlapping a white rectangle.

What happened when you selected the *Task View* option?

21. Locate and select the *Notepad* app. Note that you may have to scroll within a screen to see more thumbnails if you have more apps open than can fit on the screen. Leave these apps open.
Note: Task View can also be used to create more than one desktop. That way you can have one or more apps open within one desktop and different apps open within another desktop. Then you can use Task View to easily swap between the desktops.
22. Re-access *Task View* from the taskbar.
23. Select the *New desktop* option from the bottom of the *Task View* desktop.
24. Access the new desktop by clicking that numbered desktop (usually *Desktop 2*).
25. On this desktop, open the *WordPad* app.
26. Select the *Task View* taskbar option again. The multiple desktops show. Hover the mouse pointer over the first desktop (*Desktop 1*), and all open apps appear in the window above. Move the pointer to the desktop you just created, and the WordPad app thumbnail appears.
Note: Virtual desktops are not totally separated from one another. For example, if you disable the *Show desktop icons* option, it will be disabled across all desktops.
27. Ensure that the pointer is pointing toward the last desktop that was just created (usually *Desktop 2*). Click the *X* in the upper-right corner to delete that virtual desktop. If you have clicked within that virtual desktop and see the opened WordPad app, you are in the wrong place. Click the *Task View* icon on the taskbar and then hover the pointer over the miniature icon representing the last desktop created. Then click the *X* in the upper-right corner to delete that particular virtual desktop.
28. In the original desktop, close any apps you have open (for example, *Notepad*, *Snipping Tool*, and *Command Prompt*).

Getting the Machine Back in Order

29. Referring to steps 4, 5, 10, and 16, return all settings to their original configuration.
30. Have a classmate verify that the settings are configured properly.
Are the computer settings back to the original configuration, as listed in steps 4, 5, 10, and 16?
[Yes | No]

Classmate's printed name: _____

Classmate's signature: _____

Lab 14.4 Windows 10/11 Basic Usage: Introduction to Settings

Objective: To be familiar with the Windows 10/11 Settings

Parts: Computer with Windows 10/11 installed

Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

Working with Windows 10/11 System Settings

1. Power on the computer and log on to Windows.
2. Right-click the *Start* button to access *Settings*.

Note: Settings provides more configurable options in Windows 10/11 than does Control Panel. Some configuration items have been moved from Control Panel to Settings. Some options in Settings open Control Panels.

3. Select the *System* option from the *Settings* screen and look over the list.
Which option(s) are you curious about?

4. Select the *Display* setting. This setting is commonly used to set the size of text and the orientation of the display, and it shows the number of displays detected.
What is the current orientation? [Landscape | Portrait | Landscape (flipped) | Portrait (flipped)]
5. Change the orientation to something else, such as *Landscape (flipped)*. Select *Keep changes*. If you cannot select an option, the display automatically changes back to the original setting, allowing you to try again.
What happened?

- If necessary, change the orientation back to the original orientation.
What is the current resolution?

6. Select the *Display resolution* drop-down menu. Normally, you will see (*Recommended*) beside the resolution that is best for the screen being used.
What is the recommend resolution?

7. Select the *Multitasking* option in the left pane in Windows 10 or in the right pane in Windows 11. The *Multitasking* option has items related to snapping and resizing windows, as well as virtual desktop settings that relate to Task View (covered in Labs 14.2 and 14.3).
What is the current setting for *On the taskbar, show windows that are open* (Windows 10) or *On the taskbar, show all the open windows* (Windows 11)?
[Only the desktop I'm using | All desktops]
8. Select the *System > Power & sleep* (Windows 10) or *Power* (Windows 11) option. This is where you can configure power settings for the system. The options available depend on the hardware specifications for your computer.
After what period of inactivity will the screen turn off?

- After what period of inactivity will the PC go to sleep?

- Could you configure a Windows 10 or Windows 11 computer so that it never goes to sleep?
[Yes | No]
9. Select the *Additional power settings* link. Notice that you are taken to the *Power Options* Control Panel utility, discussed in Lab 14.1. You can navigate here via *Control Panel > Hardware and Sound > Power Options*.
10. Attach a flash drive to the PC.
11. Open the *System > Storage* settings. Click *View storage usage on other drives* (*Advanced storage settings > Storage used on other drives* in Windows 11). Select the flash drive that has just been attached. Windows categorizes the type of documents found on the drive (system files, apps and features, documents, pictures, music, videos, maps, temporary files, and others) and shows you how much of each type are on the chosen file media.

Return to the *Storage* settings screen and click the *Change where new content is saved* link (*Advanced storage settings > Where new content is saved* in Windows 11).

Use Lab Table 14.10 to document current save locations.

LAB TABLE 14.10 Windows 10/11 save locations

Option	Current setting
New apps will save to	
New documents will save to	
New music will save to	
New photos and videos will save to	
New movies and TV shows will save to	
Change where you store your offline maps	

Describe a situation in which you think someone might want to change one or more of these settings.

12. Return to the *System* settings. On the left menu in Windows 10 or the right pane in Windows 11, select and access the *About* setting. This screen is full of information that is important to an IT person.

List five items that you think might be useful to a technical person that are not usually useful to end users.

Can you rename the computer from this window? [Yes | No]

From the *Related* settings area, select the *Device Manager* link. Does the Device Manager tool open in another window or display within the settings window?

[Another window | Same window]

13. Close any Control Panel or Device Manager window that is open. Return to the main *Settings* window.

Devices

14. Select the *Devices* setting in Windows 10 or *Bluetooth and devices* in Windows 11. This setting is used to quickly see and configure attached devices. Rather than go through each option, answer some questions in each section to make sure you are looking at important options. Explore the different options to answer the questions.

Does the *Printers & scanners* option have any settings related to devices other than printers and scanners? [Yes | No] If yes, explain what is there.

Can you configure Bluetooth devices through the *Bluetooth & other devices* link in *Windows 10* or *Devices in Windows 11*?

[Yes | No]

Does the attached flash drive appear as a connected device? [Yes | No]

List two connected devices under Bluetooth & other devices in Windows 10 or Devices in Windows 11.

Describe which steps can be taken so the PC can be found by other Bluetooth devices. Note that not all devices have Bluetooth installed. Write “not applicable” as an answer if this is the case.

Which button is the primary mouse button? [Left | Center | Right]

If the mouse has a scroll wheel, how many lines scroll each time the mouse wheel is rolled?

Can the computer scroll inactive windows when the user hovers the mouse pointer over them?

[Yes | No]

Can the Windows operating system be configured to automatically correct misspelled words? (Note that in Windows 11, you need to look in another *Settings* option.)

[Yes | No]

Can the Windows operating system be configured to suggest alternative words? (Note that in Windows 11, you need to look in another *Settings* option.)

[Yes | No]

Can you disable AutoPlay through the *AutoPlay* settings? [Yes | No]

What is the default web browser for the machine? How did you find this through Settings?

Network & Internet

15. Return to the main *Settings* window.
16. Select *Network & Internet*. Explore the different options to answer the questions.

What types of networks are supported?

Does your computer allow you to turn on airplane mode? [Yes | No]

If you work in a corporate environment in which a proxy server is used and you are required to configure an executive’s laptop, what configuration settings do you need to obtain from the network support staff to manually configure the settings?

Which option would you use to see the MAC address of the Ethernet network card?

Which option would you use to attach the device to the wireless network?

[Wi-Fi | Airplane Mode | Proxy | Ethernet | Dial-up]

Personalization

17. Return to the *Settings* screen.
18. Select *Personalization* from the *Settings* window.
19. The lock screen function is a screen that appears when you have not interacted with the device after a specified amount of time. Select the *Lock screen* option. This particular setting allows you to control how the display reacts, and possibly the camera as well (if one is installed), after a period of inactivity. The lock screen commonly shows information such as time, date, battery status, and network status.

What is the current setting for the *Show lock screen background picture on the sign-in screen* option?
[On | Off]

20. Choose the opposite selection for the *Show lock screen background picture on the sign-in screen* by clicking the colored oval so that the dot goes to the opposite side. If the answer to Question 19 was *On*, you should turn the option *Off*. If the answer to Question 19 was *Off*, you should turn the option to *On*.

What visual clue did you have that the option changed?

21. Return the setting to the original *On* or *Off* position.
22. Access the *Screen saver settings* link (*Screen saver* in Windows 11) at the bottom of the window. Screen timeout and screen saver settings are important options in the business environment for security reasons.

Accounts

23. Return to *Settings*. Click the *Accounts* option. Rather than go through each option, answer some questions in each section to make sure you are looking at important options. Explore the different *Accounts* options to answer the questions.

What are three sign-in options that can be used with Windows 10/11?

What is the minimum length of a PIN in Windows 10/11?

How would you add an additional account to this machine? Give exact steps.

What does *Sync your settings* (*Remember my preferences* in Windows 11) mean?

Time & Language

24. Return to the *Settings* screen.
25. Select *Time & Language* from the *Settings* screen. Explore the different options to answer the questions.

Can the time be manually configured?

[Yes | No]

Write the date Wednesday, June 8, 2022, in the same format as each of the Long date options.

Does Windows 10/11 support multiple languages being installed at the same time? [Yes | No]

Is any option available that might help with speech recognition for a person from the deep South? If so, what?

What is the default voice for text-to-speech apps?

Ease of Access

26. Return to the *Settings* screen.
27. Select *Ease of Access* (*Accessibility* in Windows 11). Explore the different options to answer the questions.

Can the Narrator be turned on and the *Start Narrator after sign-in for me* option (*Start Narrator after sign-in* for Windows 11) be turned off at the same time? [Yes | No]

What is the purpose of the magnifier?

Does *Use color filters* have to be on to invert colors? [Yes | No]

In what other way could you adjust color settings for a person who is color blind?

Why do you think someone would want to have the onscreen keyboard enabled?

What is the purpose of the third *Change pointer color* (*Mouse pointer style* in Windows 11) option?

What option would be used to increase the thickness of the cursor?

Does Windows 10/11 support closed captioning? [Yes | Not that I can tell]

Privacy

28. Return to the *Settings* screen.
29. Select *Privacy* (*Privacy and security* in Windows 11). Explore the different options to answer the questions.

Does Windows 10/11 allow you to disable and enable the capability to let apps access the account information (name, picture, and so on) on the computer?

[Yes | No]

What apps, if any, can use the computer's location?

Does the computer have a webcam? [Yes | No]

If so, are any devices allowed to use it? Where did you find this information?

Which apps are allowed to use the computer's microphone?

Which apps are allowed to access your phone call history?

Update & Security

Note: Be very careful to follow the directions in this section exactly. You can lose all data if you're not careful.

30. Return to the *Settings* screen.
31. Select *Update & Security* (*Windows Update* in Windows 11). Explore the different options to answer the questions.

When was the last update installed on this computer? How did you find this information? Document your process.

Does Windows 10/11 allow you to choose how updates get installed? [Yes | No]

What steps would you take to uninstall an update?

What is the purpose of the *File History* option? Note that in Windows 11, you need to look in Control Panel.

What recovery options are available? Note that in Windows 11, you need to look in *Settings > System*.

Which recovery option would allow you to access Windows Recovery Environment?

[Reset this PC | Advanced startup]

32. From the *Update & Security > Recovery* option (*System > Recovery* in Windows 11), click the *Restart now* button. The Windows Recovery Environment opens.

What options are available?

33. From the screen shown, select *Troubleshoot*.

What options are available to you?

34. Select *Advanced options*.

What options are available to you?

35. Select *Startup Repair*.
36. If necessary, select an account and enter the appropriate password > select *Continue*.
37. The system attempts to repair the PC and presents a results page. Select *Advanced options*. You are returned to the Windows Recovery Environment. Select the *Continue* option.

Lab 14.5 Windows 10/11 Taskbar Options

Objective: To interact with and customize the Windows taskbar

Parts: Computer with Windows 10/11 installed

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log on, if necessary.

Taskbar Options

2. Locate the taskbar on the bottom of the screen. If it is not showing, move the mouse to the bottom of the screen, and the taskbar pops up.
3. To modify or view the taskbar settings, right-click a blank area of the taskbar. A menu appears. Select the *Taskbar settings* option. The *Settings > Personalization > Taskbar* window appears. (Note that the *Taskbar and Navigation* link in *Control Panel > Appearance and Personalization* opens this window also.)
4. The options available on this screen relate to how things are shown on the taskbar. The *On* items are active. Simply click an item's switch to toggle between *On* (enabled) and *Off* (disabled). Lab Table 14.11 shows the functions of the options in Windows 10. Lab Table 14.12 shows the functions for Windows 11.

Document the current settings for Windows 10:

- > Lock the taskbar [On | Off]
- > Automatically hide the taskbar in desktop mode [On | Off]
- > Automatically hide the taskbar in tablet mode [On | Off]
- > Use small taskbar buttons [On | Off]
- > Use Peek to preview the desktop when you move your mouse to the Show desktop button at the end of the taskbar [On | Off]
- > Replace Command Prompt with Windows PowerShell in the menu when I right-click the start button or press Windows key+X [On | Off]
- > Show badges on taskbar buttons [On | Off]
- > Taskbar location on screen [Left | Top | Bottom | Right]
- > Combine taskbar buttons [Always, hide labels | When taskbar is full | Never]
- > Show taskbar on all displays [On | Off]
- > Show taskbar buttons on [All taskbars | Main taskbar and taskbar where window is open | Taskbar where window is open]
- > Combine buttons on other taskbars [Always, hide labels | When taskbar is full | Never]
- > Show contacts on the taskbar [On | Off]
- > Choose how many people to show [1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10]

- > Show My People notifications [On | Off]
 - > Play a sound when a My People notification arrives [On | Off]
 - > Show My People suggestions [On | Off]
5. The notification area is on the far right side of the taskbar. It displays important information about specific system tools and applications. Some icons remain on the taskbar permanently. You have to click the *Show hidden icons* symbol (^) to see the other icons. In the Windows 10 only, open *Settings* > *Personalization* > *Taskbar* window > click the *Select which icons appear on the taskbar* link.

Document the current settings:

- > Always show all icons in the notification area [On | Off]
- > Network [On | Off]
- > Volume [On | Off]
- > Windows Explorer [On | Off]
- > Microsoft OneDrive [On | Off]
- > Document any other settings:

6. In Windows 10 only, select the *Turn system icons on or off* link.

Document the current settings:

- > Clock [On | Off]
- > Volume [On | Off]
- > Network [On | Off]
- > Power [On | Off]
- > Input Indicator [On | Off]
- > Location [On | Off]
- > Action Center [On | Off]
- > Document any other settings:

LAB TABLE 14.11 Windows 10 taskbar options and functions

Option	Function
Lock the taskbar	Prevents the taskbar from being moved.
Automatically hide the taskbar in desktop mode	Hides the taskbar until the pointer is moved to the taskbar area when the computer uses the traditional desktop.
Automatically hide the taskbar in tablet mode	Hides the taskbar until the pointer is moved to the taskbar area when the computer uses tablet mode.
Use small taskbar buttons	Makes icons on the taskbar smaller.
Use Peek to preview the desktop when you move your mouse to the Show desktop button at the end of the taskbar	Hides all open windows when the pointer is moved to the last spot past the date and time at the end of the taskbar.
Replace Command Prompt with Windows PowerShell in the menu when I right-click the start button or press Windows key+X	Allows you to easily access Windows PowerShell as a command-line interface.

Option	Function
Show badges on taskbar buttons	Displays status information related to an app, such as the number of unread emails.
Taskbar location on screen	Sets whether the taskbar appears at the bottom (default) or to the left, right, or top.
Combine taskbar buttons	Optionally combines similar labels.
Show taskbar on all displays	Puts a taskbar on each display when multiple displays are connected to the computer.
Show taskbar buttons on	Determines what buttons are shown on each of multiple displays.
Combine buttons on other taskbars	When multiple displays are connected to the computer, controls combining of buttons on the other displays.
Show contacts on the taskbar	Places an icon for the My People app (address book and communication tool) in the notification area.
Choose how many people to show	Determines the number of pinned contacts that display on the taskbar (with the remaining pinned contacts appearing in My People app).
Show My People notifications	Displays notifications from pinned contacts.
Play a sound when a My People notification arrives	Plays a sound when notifications are received from pinned contacts.
Show My People suggestions	Allows the My People app to suggest communication apps.

Similar taskbar settings are available in Windows 11.

Document the current settings for *Settings > Personalization > Taskbar* in Windows 11:

- > Search [On | Off]
- > Task view [On | Off]
- > Widgets [On | Off]
- > Chat [On | Off]
- > Pen Menu [On | Off]
- > Touch Menu [On | Off]
- > Virtual Keyboard [On | Off]
- > Taskbar corner overflow items:
 - _____ [On | Off]
 - _____ [On | Off]
 - _____ [On | Off]
 - _____ [On | Off]
 - _____ [On | Off]
 - _____ [On | Off]
- > Taskbar alignment [Left | Center]
- > Show badges (unread messages counter) on taskbar apps [Enabled | Disabled]

- > Show my taskbar on all displays [Left | Center]
- > Share any window from my taskbar [Left | Center]
- > Select the far corner of the taskbar to show the desktop [Left | Center]

LAB TABLE 14.12 Windows 11 taskbar options and functions

Option	Function
Search	Displays the <i>Search</i> icon on the taskbar.
Task view	Displays the <i>Task view</i> icon on the taskbar.
Widgets	Displays the <i>Widgets</i> icon on the taskbar.
Chat	Displays the <i>Chat</i> icon on the taskbar.
Pen menu	Permanently displays the <i>Pen menu</i> icon in the notification area.
Touch menu	Permanently displays the <i>Touch menu</i> icon in the notification area.
Virtual keyboard	Permanently displays the <i>Virtual keyboard</i> icon in the notification area.
Taskbar corner overflow items	Prevents the respective icon from moving to the overflow menu on the taskbar.
Taskbar alignment	Determines the position of the <i>Start</i> button and general application icons.
Show badges (unread messages counter) on taskbar apps	Allows messaging applications to display the number of unread messages.
Show my taskbar on all displays	Determines whether the taskbar is duplicated on all screens when multiple displays are connected to the computer.
Share any window from my taskbar	Allows application windows to be shared directly from the taskbar to Microsoft Teams.
Select the far corner of the taskbar to show the desktop	Enables the Show Desktop area.

7. In Windows 10, open the *Settings > System > Notifications & actions* window.

Document the current settings:

- > Get notifications from apps and other senders [On | Off]
- > Show notifications on the lock screen [Enabled | Disabled]
- > Show reminders and incoming VoIP calls on the lock screen [Enabled | Disabled]
- > Allow notifications to play sounds [Enabled | Disabled]
- > Show me the Windows welcome experience after updates and occasionally when I sign in to highlight what's new and suggested [Enabled | Disabled]
- > Suggest ways I can finish setting up my device to get the most out of Windows [Enabled | Disabled]
- > Get tips, tricks, and suggestions as you use Windows [Enabled | Disabled]

In Windows 11, open *System > Notifications* and then expand Notifications.

Document the current settings:

- > Show notifications on the lock screen [Enabled | Disabled]
- > Show reminders and incoming VoIP calls on the lock screen [Enabled | Disabled]
- > Allow notifications to play sounds [Enabled | Disabled]

8. Return to the *Taskbar* window. It might be easier to close all windows and right-click on an empty taskbar space > select *Taskbar settings*.
9. In the *Taskbar settings* window, ensure that the *Automatically hide the taskbar in desktop mode* option (*Taskbar behaviors > Automatically hide the taskbar* in Windows 11) is enabled and all other taskbar options are disabled. The taskbar disappears from view. If it does not, redo this step.
10. Point to the area of the screen (the main display, if you have more than one display) where the taskbar is normally located. The taskbar appears. Open the *Notepad* app using any method previously described or one of your own methods. Maximize the screen by clicking the *Maximize* button, which is the center button at the top-right side of the window.

What happened to the taskbar?

11. Move the pointer to the screen area where the taskbar is normally located.
Did the taskbar appear? [Yes | No]
12. Close the *Notepad* window.
13. Move the pointer to the taskbar area so that the taskbar appears. Three common options are Clock, Volume, and Network. The Clock option displays the time in the notification area. The Volume option is used to change the sound output level. The Network option is used to show local network and internet access status.
14. Make the taskbar reappear. On the taskbar, select the *Show hidden icons* symbol (^) to show and view hidden icons.
Did the computer display any hidden icons? [Yes | No]
15. In Windows 10 only, right-click an empty taskbar space and select *Taskbar settings > select Turn system icons on or off*. Windows 11 users can skip to step 20.
16. Locate an icon that is currently enabled (turned on). Turn off that option.
17. Verify the setting modification by making the taskbar reappear and looking in the notification area.
18. Return to the *Taskbar settings* window.
19. Windows gives you the option to use Windows PowerShell in addition to the command prompt. Windows PowerShell allows more powerful commands and scripts to be executed, so it may be more useful than the command prompt environment. To have easy access to PowerShell, you can enable the *Replace Command Prompt with Windows PowerShell in the menu when I right-click the start button or press Windows key+X* option.
20. In Windows 11, PowerShell opens by default when you right-click the *Start* button and select *Windows Terminal*. You can set the command prompt as the default command line interface via this procedure: open *Windows Terminal > click the down arrow at the top of the terminal window > select Settings > select Command Prompt in the Default profile* section.
21. Bring the taskbar settings back up and reset them to their original configuration. Refer to the answer to questions in steps 4, 5, 6, and 7 for option settings.

Lab 14.6 Windows 10/11 File and Folder Management

Objective: To create folders, move files, and copy files to new locations

Parts: Computer with Windows 10/11 installed

Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

Note: There are multiple ways to complete some of the steps in this exercise. For some steps, an alternative method for doing the same procedure is listed. For such a step, you may use either method.

1. Power on the computer, log in, and attach a flash drive. Ensure that it is recognizable through File Explorer and is assigned a drive letter.

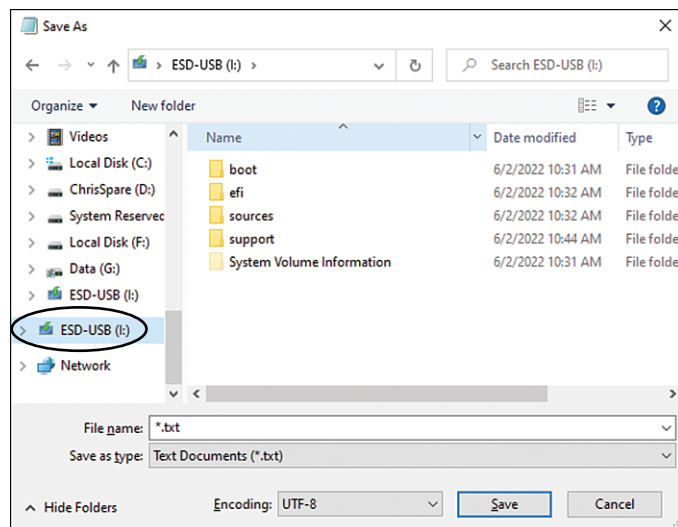
What drive letter is assigned to the flash drive?

2. Access the *Notepad* Windows accessory or app using whatever method you like, including using the *Search* function. Then type the following in Notepad:

Develop a passion for learning. If you do, you will never cease to grow.-Anthony J. D'Angelo

3. Select the *File* menu > *Save*.
4. Select the flash drive letter in the left pane. Note that you may have to scroll down to view it in the left pane (see Lab Figure 14.3). Notice that the flash drive letter appears in the address bar. Whenever you are at the start of a drive, this is known as the root directory of that drive.
5. In the *File Name* textbox, click once, and the entire filename, including *.txt, is highlighted. Notice that the default *Save as type* option is *Text Documents (*.txt)*. You do not have to add a file extension when you type a filename for a document of that file type.

Type **Quote1** for the name of the file. Click or tap the *Save* button. If you accidentally selected somewhere else and *Text Documents (*.txt)* is not highlighted, simply erase all that and type **Quote1**. (Note that the file will have the extension .txt because of the default setting, so the full filename will be Quote1.txt.)



LAB FIGURE 14.3 Windows 10 Notepad flash drive selection

6. In Notepad, select *File* > *New*. Then type the following:

The man who graduates today and stops learning tomorrow is uneducated the day after.-Newton D. Baker

7. Using the skills you just learned or know already, save the file as Quote2.
8. Select *File > New*. Then type the following:
Don't just learn the tricks of the trade. Learn the trade.-James Bennis
9. Save the file as Quote3.
10. Select *File > New*. Then type the following:
Nine-tenths of education is encouragement.-Anatole France
11. Save the file as Quote4.
12. Select *File > New*. Then type the following:
Technology is dominated by two types of people: those who understand what they do not manage and those who manage what they do not understand.-Source Unknown
13. Save the file as Quote5.
14. Close the *Notepad* application by selecting the *Close* button (the *X*) in the upper-right corner.
15. Open *File Explorer*. In the left window, use the vertical scrollbar to locate and select the drive media you are using. Remember that you might have to expand the *This PC* area in order to be able to see the drive.
16. In the right window, locate the five files you just created (Quote1, Quote2, Quote3, Quote4, and Quote5). If the files are not there, redo the lab from the beginning.

Instructor initials: _____

Create a Folder

Note: The label *Alternative* denotes an alternative way to perform the same step. For such a step, you may use either method, and you might consider using one method in one step and then trying it a different way on another step.

17. Ensure that the flash drive is selected in the left *File Explorer* pane. Right-click an empty space in the right pane. Point to the *New* option > select the *Folder* option. A folder appears in the right window with the words *New folder* highlighted. Type **LearningQuotes** and press **[Enter]**. The *LearningQuotes* folder now appears in the right pane.

Alternative: Select the *Home* tab at the top of the screen. Select the *New item > New folder* option from the ribbon. A folder appears in the right window with the words *New folder* highlighted. Type **LearningQuotes** and press **[Enter]**.

On Your Own

18. Create another new folder in the root directory of the flash drive called *GeneralQuotes*, using either procedure outlined in step 17.

Instructor initials: _____

Copy a File

19. In the right *File Explorer* pane, right-click the file named Quote1. A context menu appears. In Windows 10, one of the text options is *Copy*. There is not a text *Copy* option in the context menu in Windows 11, but there is a *Copy* icon. The icon consists of two rectangles overlapping each other. The word *Copy* appears when you hover the mouse over the icon. Press the **[Esc]** key.

Similarly, the Home menu ribbon in the Windows 10 File Explorer contains a *Copy* button that consists of two overlapping sheets of paper and the word *Copy*. The *Copy* button at the top of the Windows 11 File Explorer simply consists of two overlapping rectangles.

20. In the right *File Explorer* pane, right-click the file named `Quote1`. A context menu appears. Select the *Copy* option. The file is placed in a Windows utility called the Clipboard, which works in the background.

Alternative: In the right *File Explorer* pane, select the file named `Quote1` > select the *Home* menu option (Windows 10 only) > *Copy*. The file is copied to the Windows utility called the Clipboard, which works in the background.

Note: Complete steps 21 and 22 (opening the destination folder) OR complete step 23 (right-clicking on the destination folder).

21. In Windows 11, the *Paste* icon looks like a clipboard with a small piece of paper. The word *Paste* appears when you hover the mouse over the icon.

In the right pane, double-click the *LearningQuotes* folder to open it. Notice that the address bar changes to *This PC > X > LearningQuotes* (where *X* is the name and drive letter of the flash drive).

The right pane is empty because the folder does not have any files or subfolders in it yet.

22. Right-click in the right window and a context menu appears. Select *Paste*, and the `Quote1` file appears in the right pane.

Alternative: In the Windows 10 *File Explorer* window, select the *Home* menu option > *Paste*. In Windows 11, simply click the *Paste* icon at the top of *File Explorer*. The `Quote1` file appears in the right pane.

Note: If you completed steps 21 and 22, DO NOT complete the next step because it is an alternative method that accomplishes the same paste task.

23. Right-click on the *LearningQuotes* folder > select *Paste*. To confirm the paste, double-click the *LearningQuotes* folder. The `Quote1` file is in the folder.

On Your Own

24. Copy the files named `Quote2` and `Quote3` from the root directory of the flash drive into the *LearningQuotes* folder, using the methods outlined in previous steps.

Copy Multiple Files

25. In the left *File Explorer* pane, select the drive option for the media you are using.

Alternative: In the address bar, select the left arrow to return to the root directory of the flash drive.

26. Locate the files called `Quote4` and `Quote5` in the right *File Explorer* pane. In the right *File Explorer* pane, click once on the `Quote4` filename. The name is highlighted.

27. Hold down **⇧** and select the `Quote5` filename. Both the `Quote4` and `Quote5` filenames are highlighted.

Note: The **⇧** key is used to select files that are consecutive in a list (one right after the other). If you wanted to select files that are not consecutive, hold down the **⌘** key while selecting the files.

28. Right-click the `Quote4` file or the `Quote5` file > select the *Copy* option.

Alternative: Select the *Home* menu option > *Copy* in Windows 10 or the *Copy* menu item in Windows 11.

29. Double-click the *GeneralQuotes* folder.

The path across the top changes to *This PC > X > GeneralQuotes* (where *X* is the name and drive letter of the flash drive). The right pane is empty because the folder does not have any files or subfolders in it yet.

30. In the right *File Explorer* pane, right-click an empty space > select *Paste*. The Quote4 and Quote5 files appear in the right pane.

Alternative: Select the *Home* menu option > *Paste* in Windows 10 or the *Paste* menu item in Windows 11. The Quote4 and Quote5 files appear in the right pane.

How many folders are located in the flash drive root directory?

How many files are in the root directory?

How many files are in the *LearningQuotes* folder?

How many files are in the *GeneralQuotes* folder?

Instructor initials: _____

Copying a File from One Folder to Another

31. In the left *File Explorer* pane, select the flash drive you are using. The files and folders in the flash drive root directory appear in the right *File Explorer* pane.
- Alternative:* Select the name of the flash drive in the address bar. The flash drive root directory files and folders appear in the right *File Explorer* pane.
32. Open the *LearningQuotes* folder. The files Quote1, Quote2, and Quote3 appear in the right *File Explorer* pane.
33. In the right *File Explorer* pane, right-click the Quote3 file > select *Copy*.
34. Open the *GeneralQuotes* folder located under the flash drive option you are using. The Quote4 and Quote5 files appear in the right *File Explorer* pane, and the address bar shows *GeneralQuotes*.
35. In the right *File Explorer* pane, right-click an empty space > select *Paste*. The Quote3 file appears.

On Your Own

36. Using the same procedures previously described, copy the Quote1 and Quote2 files from the *LearningQuotes* folder into the *GeneralQuotes* folder. At the end of this step, you should have three files (Quote1, Quote2, and Quote3) in the *LearningQuotes* folder and five files (Quote1, Quote2, Quote3, Quote4, and Quote5) in the *GeneralQuotes* folder.

Moving a File

37. Create a folder in the root of the flash drive and name it *MyStuff*. Refer to the steps earlier in the lab if you need assistance.

TECH TIP

The purpose of Cut and Paste

The Cut and Paste options move a file from one folder to another. When a file is cut, it no longer exists in the original folder.

38. Open the folder called *GeneralQuotes*. In the right pane, all five files appear.
39. In the right *File Explorer* window, select the `Quote1` file to highlight it. Hold down the `Ctrl` key and select the `Quote3` file. Both the `Quote1` and `Quote3` filenames are highlighted.
Note: The `Ctrl` key is used to select nonconsecutive files, whereas the `Shift` key is used to select files that are listed consecutively.
40. In Windows 11, the *Cut* icon is a pair of scissors. The word *Cut* appears when you hover the mouse over it.
 Right-click either the `Quote1` or `Quote3` filename (both filenames are still highlighted). A context menu appears. Select the *Cut* option. The *Cut* option is used to move a file from one folder to another.
Alternative: Select the *Home* menu option > *Cut* in Windows 10. Select the *Cut* menu option in Windows 11.
41. Open the *MyStuff* folder. The right *File Explorer* pane is empty because no files have been copied or moved into the *MyStuff* folder yet. Right-click in the right *File Explorer* pane > select *Paste*. The `Quote1` and `Quote3` files appear in the right *File Explorer* pane.
Alternative: In Windows 10, select the *Home* menu option > *Paste*. In Windows 11, select the *Paste* menu option. The `Quote1` and `Quote3` files appear in the right *File Explorer* pane.

On Your Own

42. Using the procedures just learned, move the `Quote1` file from the *LearningQuotes* folder into the *GeneralQuotes* folder.

How many files are in the *GeneralQuotes* folder?

How many files are in the *LearningQuotes* folder?

How many files are in the *MyStuff* folder?

Instructor initials: _____

TECH TIP

Deleted files on external media are not put in the Recycle Bin

When deleting files from an optical disc, a flash drive, or other external media, the files are not placed in the Recycle Bin; they are deleted. When deleting files from a hard drive, the files are placed in the Recycle Bin.

Deleting Files and Folders

43. Open the *MyStuff* folder. The `Quote1` and `Quote3` files appear in the right pane.
44. In the right *File Explorer* pane, select the `Quote1` and the `Quote3` files. Both the `Quote1` and `Quote3` filenames are highlighted.
45. In Windows 11, the *Delete* icon is a trash can. The word *Delete* appears when you hover the mouse over the icon.
 Press the `Del` key on the keyboard. A message appears on the screen, asking *Are you sure you want to delete these 2 items?* if you are on a flash drive. Select *Yes*.

Alternative: In Windows 10, select the *Home* menu option > *Delete*. In Windows 11, select the *Delete* icon in the menu. A message appears on the screen, asking *Are you sure you want to delete these 2 items?* if you are on a flash drive. Select *Yes*.

46. From the flash drive root directory, select the *MyStuff* folder. The *MyStuff* folder is highlighted. Press the **[Del]** key on the keyboard. If working from a flash drive, a message appears on the screen, asking *Are you sure you want to permanently delete this folder?* Click the *Yes* button.

Instructor initials: _____

TECH TIP

Skipping the Recycle Bin for deleted hard drive files

If you want to permanently delete a file from a hard drive so that the file will not first be placed in the Recycle Bin, hold down the **[Shift]** key while pressing the **[Del]** key.

On Your Own

47. Using the previously demonstrated procedures, delete the *LearningQuotes* folder, the *GeneralQuotes* folder, all files contained within each folder, and the original *Quote1*, *Quote2*, *Quote3*, *Quote4*, and *Quote5* files.
48. Close the *File Explorer* window.

TECH TIP

Retrieving a deleted file

To restore a file that has been accidentally placed in the Recycle Bin, open the Recycle Bin > right-click the file > click the *Restore* option.

Challenge

49. Using Notepad, create three text files and save them to the external media in a folder called *MyFiles*.
50. On the flash drive, create a folder called *ComputerText*.
51. Copy two of the three text files from the *MyFiles* folder into the folder called *ComputerText*.
52. Move the third text file from the *MyFiles* folder into the folder called *ComputerText*.

Instructor initials: _____

How many files are in the *MyFiles* folder?

How many files are in the *ComputerText* folder?

53. Permanently delete the folder called *ComputerText* and all files within it.
54. Delete the folder called *MyFiles* and all files within it.

Lab 14.7 Windows 10/11 File Extensions

Objective: To associate a file extension with a file type

Parts: Computer with Windows 10/11 installed
Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer, log in, and attach a flash drive to the computer.
2. Access and launch the *Notepad* application. Type the following:
I hear and I forget. I see and I remember. I do and I understand. -Confucius
3. Select the *File* menu > *Save*. Select the appropriate drive option for the media you are using. In the *File name* textbox, type **Junk**. Click the *Save* button.
4. Close the *Notepad* application.
5. Right-click the *Start* button > select *File Explorer*.
6. In Windows 10, select the *View* ribbon menu option > enable the *File name extensions* option. In Windows 11, select the *View* dropdown menu > *Show* > enable *File name extensions*.
7. In the left *File Explorer* pane, use the vertical scrollbar to locate and select the disk media you used to save the file. Locate the `Junk.txt` file in the right pane and double-click the icon.

What happened?

8. Close the *Notepad* application.
 9. In Windows 11, the *Rename* icon is a rectangle with a cursor shape on top of it. The word *Rename* appears when you hover the mouse over the icon. In the right *File Explorer* pane, right-click the file called `Junk.txt`. Click the *Rename* option. Ensure that the entire filename, `Junk.txt`, is highlighted. Type **junk.abc** and press **Enter**. A rename warning box appears, stating *If you change a file name extension, the file may become unusable*. It also asks *Are you sure you want to change it?* Click *Yes*. `Junk.txt` is renamed `junk.abc`.
What does the `junk.abc` file icon look like now?
-

10. Double-click the `junk.abc` file icon.
What happened when you double-clicked on the `junk.abc` file icon?
 11. Click the *More apps* link. Locate and click the *Notepad* icon. Click *OK*.
What happened when you selected Notepad?
-

12. In the *Notepad* application, select the *File* menu > *New*.
13. Type the following:
The only real mistake is the one from which we learn nothing. -John Powell
14. Select the *File* menu option > click *Save As*. Ensure that the disk media option that you are using is the destination. In the *File name* textbox, type `Junk2` and click *Save*.
15. Close the *Notepad* application.

16. Using File Explorer, rename the `Junk2.txt` file to `Junk2.abc`. A rename warning box appears, stating *If you change a file name extension, the file may become unusable*. It also asks *Are you sure you want to change it?* Click *Yes*. Notice the file icon after the change.

How is the icon different from before?

17. Double-click the `Junk2.abc` icon.

What happened when you double-clicked the `Junk2.abc` icon?

Instructor initials: _____

18. Close *Notepad*. Delete both files.

Lab 14.8 Windows 10/11 Attributes, Compression, and Encryption

Objective: To identify and set file and folder attributes, including compression and encryption

Parts: Computer with Windows 10/11 installed on an NTFS partition

Note: The compression and encryption portions of this exercise require an NTFS partition.

Procedure: Complete the following procedure and answer the accompanying questions.

Managing File Attributes

1. Access and open the *Notepad* application. Type the following:
Aim for success, not perfection.-Dr. David M. Burns
2. Select the *File* menu > *Save*. In the *File Explorer* left pane, select a location such as *Documents* or *Desktop*. In the *File name* textbox, type **Attribute File** and click *Save*.

Document which folder holds the file.

3. Close the *Notepad* application.
4. Open *File Explorer*.
5. In the left pane, select the option where you stored the file. The `Attribute File` file should be listed in the right pane. If it is not, redo the previous steps to create the file.
6. Select (but do not open) the `Attribute File` file in the right pane.
7. In Windows 10, select the *Home* menu option > *Properties*. In Windows 11, select the three dots to the right of the *View* menu > *Properties*. The same results can be obtained by right-clicking the filename and selecting *Properties*.

The file attributes are listed at the bottom. Additional attributes can be viewed for a file stored on an NTFS partition by clicking the *Advanced* button. Note that the *Advanced* button is not available on a flash drive that uses a file system other than NTFS.

What file attributes are listed for the `Attribute File` file?

What file attributes are enabled by default?

8. Backup applications use the *File is ready for archiving* attribute when backing up data. When this attribute is enabled, the file is selected for backup by default.

On the *General* tab of the *Attribute File.txt Properties* window, select (enable) the *Read-only* attribute checkbox and click *OK*.

9. Open the *Attribute File* file. The application opens with the typed text shown. Add the following to the quote:

**Never give up your right to be wrong, because then you will lose the ability to learn new things and move forward with your life.-
David M. Burns**

10. Select the *File* menu option > select *Save*. A *Save As* window will open. With the same name listed (do not change it), click the *Save* button.

What happens when the *Save* option is chosen?

11. Click *Yes* to save the file. Another message box appears, stating that the file is read-only. Select *OK* > *Cancel* to return to the changed Notepad document.

12. Click the *Close* button in the Notepad window. When asked if you want to save the changes, select *Don't Save*. The read-only attribute prevented the file from being changed.

13. In the *File Explorer* window, right-click the *Attribute File* filename > select *Properties*. Select the *Hidden* file attribute checkbox > select *OK*.

What happens to the *Attribute File* filename in *File Explorer* ?

14. In a Windows 10 *File Explorer* window, select the *View* menu option > *Options* down arrow > *Change folder and search options* > *View* tab. In Windows 11, select the three dots to the right of the *View* menu > *Options* > *View* tab.

Which one of the following options is enabled? [*Don't show hidden files, folders, or drives* | *Show hidden files, folders, and drives*]

15. Select (enable) the *Show hidden files, folders, and drives* radio button or ensure that it is enabled. Click *OK*. This option is used to see files or folders that have the hidden attribute set or enabled.

Note: If you want to make this change applicable to all folders, you can select the *Apply to folders* button, but you do not do this in this lab.

Does the *Attribute File* file appear in the right pane of the *File Explorer*?

[*Yes* | *No*]

If the file does not reappear, press the **F5** key to refresh the window or click the *Refresh* icon (which is a curved arrow at the end of the address bar).

How does the file icon differ from before? Note that you may need to create an unhidden text file to see the difference.

16. In *File Explorer*, select the *View* menu option > select *Small icons*.

How do the icons now appear in the *File Explorer* right pane?

17. Select the *View* menu option > select *List*.

How does the `Attribute File` now appear in the right pane?

18. Select the *View* menu option > *Details*.

Why do you think that a technician would prefer the *Details* option over any other view?

Instructor initials: _____

19. Delete the `Attribute File` file.

Did either the hidden or read-only attribute stop the `Attribute File` file from being deleted?

[Yes | No]

20. Put the folder option back to the original setting (see step 14).

Using Compression

Note: The disk volume must have an NTFS file system on it in order for you to complete this section. To check the file system, in File Explorer, open *This PC* > right-click the hard drive volume that contains Windows > select *Properties*. The file system is listed in the Properties window near the top.

21. Create a WordPad file called `CompressionFile` and save it in the *Documents* folder on the hard drive. If necessary, refer to a previous exercise for steps. Enter the following text in the file:
- The most successful career must show a waste of strength that might have removed mountains, and the most unsuccessful is not that of the man who is taken unprepared, but of him who has prepared and is never taken. On a tragedy of that kind, our national morality is duly silent.-Edward M. Forster**
22. Copy the text from step 21 repeatedly in the document until you have four pages of text. You could also copy a picture from the internet, use the Windows *Snipping Tool* accessory to make screen captures and windows captures and then paste them into the document, or use different kinds of fonts and text formatting to make the document of decent size so this step will work. (Note that if you do not make the file size large enough, compression will not occur.)
23. Save and close the *WordPad* application. Using File Explorer, locate the `CompressionFile` file. (Note that you might need to change the view or get the properties of the file to answer the question that follows.)

What is the file size of the `CompressionFile` file?

The file needs to be at least 20 KB in size. If it is not, add more content to the file.

24. Right-click on the `CompressionFile` file > select *Properties*. Click the *Advanced* button. In the *Advanced Attributes* dialog box, locate the *Compress or Encrypt attributes* section.
25. Select (enable) the *Compress contents to save disk space* checkbox. This option is used to compress a file or folder. Click the *OK* button > click *OK* again.
26. Using *File Explorer*, locate the file called `CompressionFile` and open the file's *Properties* window again.

27. On the *General* tab, notice the *Size* and *Size on disk* numbers. If these numbers are the same, you don't have enough information in the file to compress it. Type more information into it, use graphics to increase the size, or recopy and paste the content you have to increase the size of the file and then attempt the compression again. Leave this window open to show the instructor the reduction.

Document the *Size* and the *Size on disk*.

What visual clue do you have in File Explorer that a file is compressed?

Instructor initials: _____

28. Click *OK* to close the *CompressionFile Properties* window.

Enabling Encryption

Note: The disk volume must have an NTFS file system on it for you to complete this section.

29. Use Notepad or WordPad to create a file called `EncryptionFile` and save it to *Documents*. If necessary, refer to a previous exercise for steps. Enter the following text in the file:

I do not fear computers. I fear the lack of them.-Isaac Asimov

30. Close the *Notepad/WordPad* application window. Using *File Explorer*, locate the file named `EncryptionFile`.

What is the current size of `EncryptionFile`?

31. Right-click on the filename `EncryptionFile` > select *Properties* > *Advanced* button. In the *Advanced Attributes* dialog box, locate the *Compress or Encrypt attributes* section. Select (enable) the *Encrypt contents to secure data* checkbox, the option used to encrypt a file or folder. (Note that the checkbox may not be available on some Windows Home versions. See the following Tech Tip.) Click *OK* twice. A dialog box appears, asking if you want to encrypt the file and the parent folder or encrypt only the file. Select the *Encrypt the file only* radio button > *OK*.

TECH TIP

Limited encryption support on Home versions

Windows Home versions do not fully support encrypting files. In these versions, the `cipher` command can be used at the command prompt to decrypt files, to modify an encrypted file, and to copy an encrypted file to the computer.

32. The first time you select to encrypt a file, a prompt appears, telling you that you should back up the recovery key. This is *extremely* important. If the encryption key used to encrypt your file ever has an issue, you will not be able to get into your file again. For now, ignore the message, and later you will see how to access it and back it up.

What is the size of `EncryptionFile` after encryption?

Instructor initials: _____

Backing Up the File Encryption Certificate and Key

- 33.** Open *Control Panel*. In the *Search Control Panel* textbox, type **encrypt** and select the *Manage file encryption certificates* link > *Next* > ensure that the *Use this certificate* radio button is selected > *Next* > in the *Back up the certificate and key* window, ensure that the *Back up the certificate and key* radio button is selected (enabled) > use the *Browse* button to specify a backup location that is on some type of removable media and type in a filename so you will know it is your encryption certificate > select *Save*. In the *Password* and *Confirm password* textboxes, type a password that you won't forget > *Next* > do not select anything within the *Update your previously encrypted files* window > *Next* > *Close*.

In File Explorer, open the external media and verify that you saved the key.

Instructor initials: _____

TECH TIP

Recovering EFS-protected files

If your encryption key ever becomes corrupted or you move a drive that contains encrypted files to another computer, it is possible to recover it if you have that encryption certificate and key backed up. Use the following steps:

- Step 1.** Enter the **certmgr.msc** command in the *Search* textbox or at a command prompt.
- Step 2.** In the left window, select *Personal*.
- Step 3.** From the *Action* menu, select *All Tasks* > *Import* > *Next* > *Browse* > in the drop-down menu to the right of the *File name* textbox, select *Personal Information Exchange (*.pfx; *.p12)*, and browse to where the encryption certificate and key are located in the external media. Select the *key file* > *Open* button > *Next* > in the *Password* textbox, type the password (that you were never supposed to forget!) > select the checkbox *Mark this key as exportable. This will allow you to back up or transport your keys at a later time* > leave the *Include all extended properties* checkbox enabled > *Next* > on the certificate store window click *Next* > *Finish*. A message appears, indicating success.

- 34.** Permanently delete the `CompressionFile` file.
- 35.** Permanently delete the `EncryptionFile` file.

Lab 14.9 Using `regedit.exe` in Windows 10/11

Objective: To become familiar with the `regedit.exe` registry-editing utility

Parts: Computer with Windows 10/11 installed and a user account with administrator rights
Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: `regedit.exe` is a utility used for editing the Windows registry. With `regedit.exe`, you can view existing registry settings, modify registry settings values, or create new registry entries to change or enhance the way Windows operates. In this lab, you will use `regedit.exe` to view the system BIOS and component information on your computer.

Caution: Editing the registry can cause your computer to run erratically or not run at all! When performing any registry editing, follow all directions carefully, including spelling, syntax use, and so on. Failure to do so may cause your computer to fail!

Viewing Registry Information

1. In Windows 10/11, search for `regedit` using the *Search* function or any other search method > open *Registry Editor*.
2. In the left Registry Editor window, expand `Hkey_Local_Machine`, `Hardware`, and `Description` by selecting the arrow located to the left of each name. Select the *System* option located under *Description*. In the right window, the system BIOS and component information displays.

What is the system BIOS version?

Who is the manufacturer of the system BIOS?

What values are listed in the *Component Information* option?

Exporting and Importing a Registry Section

3. `regedit.exe` can be used to back up and restore part or all of the registry. To illustrate this point, a portion of the registry will be exported to disk and then imported into the registry. Ensure that `Hkey_Local_Machine\Hardware\Description\System` is still selected in the left Registry Editor window. (Ensure that the word *System* is selected under *Description*.)
4. Select the *File* menu option > choose *Export*. The *Export Registry File* window opens.
5. Attach a flash drive. Select the down arrow in the *Save in* textbox and select the appropriate drive option for the flash drive you are using. In the *File name* textbox, type **Registry System Section** and click *Save*. The specific registry key is saved to disk.
6. To restore the registry (or a portion of it, as in this exercise), select the *File* menu option > select *Import*. The screen should list the file located on the external disk media, but if it does not, select the appropriate drive letter option for the disk media you are using.
7. Select the *Registry System Section* filename and click the *Open* button. A message appears when the section is successfully inserted into the registry. Show this message to the instructor or lab assistant.

Instructor initials: _____

8. Close the `regedit.exe` utility.

Lab 14.10 Windows 10 File History Utility

Objective: To explore backing up data using Windows File History via Settings

Parts: Computer with Windows 10 installed
Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log in to Windows.
2. Attach the flash drive to the computer.

Which drive letter is assigned to the flash drive?

3. Search by typing in the words **file history** in the *Search* textbox. Select *Backup settings* from the resulting search list.
4. If more than one external drive is connected to the computer, select the *+ Add a drive* option and choose the drive to use for File History backups. If there is only one external drive, the *+ Add a drive* option does not appear.

Click *Automatically back up my files* and select the *More options* link to select what files/folders are backed up, how often to back up the files, and how long to keep the backups.

5. After all settings have been configured, click the *Back up now* button.

How much space is the backup going to take?

6. Open *File Explorer* and access the flash drive.

What is the name of the folder that contains the backed-up data?

7. Return to the *Backup* window and set the *Automatically back up my files* option to *Off*.

8. Return to *File Explorer* and access the flash drive. Right-click on the *FileHistory* folder > select *Delete* > *Yes*.

Do you think most people will use this option? Why or why not?

Lab 14.11 Windows 11 File History Utility

Objective: To explore backing up data using Windows File History via Control Panel

Parts: Computer with Windows 11 installed. (*Note:* This procedure also works in Windows 10.)
Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

1. Boot the computer and log on.
2. Insert the flash drive.
3. Access *Control Panel* > *System and Security* > *File History*.
4. Click the *Select drive* option on the left > select the flash drive where the recovery files will be stored > click *OK*.
5. Select the *Exclude folders* option. For each library that you want to exclude, click *Add* > click the library > click *Select Folder*. Click *Save changes* when you're done.
6. Click the *Advanced settings* option to select how often to back up the files and how long to keep the backups. Click *Save changes* when you're done.
7. Click *Turn on*. The system does an initial backup to the flash drive.
8. Open *File Explorer* and access the flash drive.

What is the name of the folder that contains the backup data?

9. Return to the *Control Panel* > *System and Security* > *File History* window and click *Turn off*.

10. Return to *File Explorer* and access the flash drive. Right-click on the *FileHistory* folder > select *Delete* > *Yes*.

Do you think most people will use this option? Why or why not?

Lab 14.12 Creating a Windows 10/11 Recovery Drive

Objective: To create a system recovery in the Windows 10/11 environment

Parts: Computer with Windows 10/11 installed
16 GB+ flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

1. Boot the computer and log on.
2. Access the Search function and type **Create a recovery**. Select the *Create a recovery drive* option.
3. Leave the *Back up system files to the recovery drive* option enabled > click *Next*. The message *Please wait* appears for a long time.
4. Select the flash drive where the recovery files will be stored > click *Next*. The system gives a final warning that everything on the flash drive will be erased. Click *Create*. The message *Creating the recovery drive* appears for a long time. The message *The recovery drive is ready* appears after the process completes. Click *Finish*.

How often do you think a home user should create a system recovery drive?

What is the difference between a system recovery drive and a system image disc?

5. After the drive has been created, open *File Explorer*. The flash drive should have the label RECOVERY.

(Optional) Using the System Recovery Drive in Windows 10

6. Confirm that the flash drive is attached to the computer.
7. Boot the computer and access the BIOS/UEFI BIOS. Ensure that the computer is configured to boot from the USB drive.
8. Restart the computer. Choose your keyboard layout.
9. Click *Troubleshoot*.
10. From this screen, you can use any of the Windows recovery tools, such as restoring the system from a previously created system image.

List three options from the menu shown in this step.

Instructor initials: _____

11. Select *Startup Repair*. The system should report that it could not repair your computer; that's because the computer is not broken. Click *Shutdown*.
12. Boot the computer and return the BIOS/UEFI BIOS to the original configuration.

Lab 14.13 Creating a Windows 10/11 System Image

Objective: To create a system image disc in the Windows 10/11 environment

Parts: Computer with Windows 10/11 and a user account with administrator rights

At least two hard drives (operating system disk and a backup disk). The backup disk can be external. The free space on the hard disk must be at least as large as the utilized space on the operating system disk.

(Optional) Windows 10/11 installation media or system recovery drive

Procedure: Complete the following procedure and answer the accompanying questions.

1. Boot the computer and log on.
2. Click the *Start* button > *Control Panel* > *System and Security* link > *Backup and Restore (Windows 7)* link > *Create a system image* link.

What three options are available for where to save the backup?

3. Determine from the instructor or lab assistant the appropriate storage medium and select the appropriate radio button. Click *Next*.
4. Select at least the operating system volumes to back up. An operating system volume has (*System*) after its name.

What is the amount of space required to do the system image?

5. Click *Next*. Click *Start Backup*.

While the image is being created, what option(s) do you have on the screen?

The message *The backup completed successfully* appears when the backup is done. You might get the message *Do you want to create a system repair disc?*. If so, click *No*.

Instructor initials: _____

Click *Close*.

6. Open *File Explorer* and navigate to the disk where the image was saved. It should include a file named `WindowsImageBackup`.
7. Create a new folder on the desktop and name it **Disappear**.

(Optional) Using the System Image Disk

8. Confirm that the disk with the system image is installed in or attached to the computer.
9. Insert the Windows 10/11 installation media or system recovery drive.
10. Start the computer and enter BIOS/EUFI BIOS. Confirm that the computer is configured to boot from the inserted device.
11. Boot the computer. Choose your keyboard layout.
12. Click *Troubleshoot*.
13. Select *System Image Recovery*.
14. If necessary, log in as a user with administrator rights. Change the keyboard layout if necessary. Click *Continue*.
15. Select to the appropriate system image. Click *Next*. Click *Next* again. Confirm the settings and click *Finish*. Click *Yes*. The message *Restoring disk (X:)*... appears for a long time while the image is applied.

Instructor initials: _____

16. When the process is done, restart the computer when prompted to do so. If you don't respond, the computer restarts automatically.
17. After the computer restarts, log on, if necessary. The *Disappear* folder should not be present on the desktop because it was created after the system image was created.

Lab 14.14 Using the Backup and Restore (Windows 7) Tool

Objective: To be able to use the Backup tool provided with Windows 10/11

Parts: Windows 10/11 computer and a user account with administrator rights
Flash drive with 1 GB of free space. The flash drive must be empty. That is, it must not contain any files or folders.

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: This lab does not back up the hard drive but simply illustrates the concept of using the Backup tool.

1. Power on the computer and log on using the user ID and password for an account that has administrator rights.
2. Microsoft introduced the Backup and Restore tool in Windows 7. Although using the File History tool is the recommend backup method, the Backup and Restore tool is still available in Windows 10/11 as *Backup and Restore (Windows 7)*. You might need to use this tool to restore backups that were made in previous versions of Windows.

Use the internet to answer the following questions to learn more about backups in Windows.

Is Shadow Copies of Shared Folders a feature available in Windows 10/11? [Yes | No]

What is the purpose of the Shadow Copies of Shared Folders feature?

What command is used from the command prompt to create and manage system image backups for Windows 10/11 computers?

What are five Windows-based backup tools?

List one recommended location for storing a backup.

If a flash drive is to be used for this lab, what is the minimum amount of free space that must be available on that drive?

3. Insert a flash drive. Ensure that the drive is visible in File Explorer.
4. Using File Explorer, create a folder called **Backup** in the *Documents* folder. Inside *Backup*, create a Notepad file called **Data**.
5. Locate the *System and Security* Control Panel and then select the *Backup and Restore (Windows 7)* link.
6. If a backup has not been performed before, select the *Set up backup* link. If a backup has been performed before, select the *Change settings* link.

Note: You may need to use the *Refresh* button to be able to see the flash drive. If the flash drive does not appear, ensure that it is viewable through File Explore and that it has more than 1 GB of free space available. Select the appropriate drive letter. Click *Next*.

Select the *Let me choose* radio button. Click *Next*. If the system is not set up to do backups on demand, you may have to click the *Change schedule* link to modify the schedule so the backup can be done.

7. Locate the *Backup* folder in *Documents* by expanding *Computer > X: > Users > Username*, where *X:* is the drive where the operating system is installed (usually *C:*) and *Username* is the account that you're using. Check the box beside *Backup*. Uncheck the *Include a system image of drives* box. Click *Next*.
8. If this is the initial setup, select the *Save settings and run backup* button. If you are updating settings, select *Save settings and exit > Back up now*.
9. While the backup is occurring, click the *View Details* button.

Why do you think a technician would use this option?

Were you surprised at the time it took to perform the backup?

Instructor initials: _____

10. When the backup is complete, click *Close*. Use File Explorer to open the flash drive. You should see a folder with the same name as the computer. The folder's icon shows a curved green arrow and an optical disc.

(Optional) Restoring the Backup

11. In File Explorer, delete the *Backup* folder in the *Documents* folder.
12. Return to *Control Panel > System and Security > Backup and Restore (Windows 7)*.
13. Click *Restore my files > Browse for files*. Locate the backup file (the file with the same name as your computer) that you just created. The title will be *Backup of X:* where *X:* is usually the drive letter of your operating system disk (usually *C:*). Follow the path to your Data file, which is usually *Backup of X: > Users > Username > Documents > Disappear*. Double-click the *Data* file.
14. Click *Next > Restore > Finish*.
15. Open *Documents* in File Explorer. The *Backup* folder has been restored. Open the *Backup* folder. The *Data* file has been restored as well.
16. Delete the *Data* file and the *Backup* folder.

15 Introduction to Scripting Labs



Lab 15.1 Using Basic Commands from a Windows Command Prompt

Objective: To execute basic commands at a command prompt

Parts: A Windows-based computer with command prompt access
The ability to save a file to the hard drive
Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

Note: For each step requiring a typed command, the **Enter** key must be pressed to execute the command. This instruction is not given with each step.

1. Power on the computer and log on, if necessary.
2. Create a file in Notepad called `LadyVOLS.txt` and save the file to the flash drive. Add this text to your file:

```
This is a fine mess you've gotten me into, Ollie.  
Go get that Earth creature and bring back the Uranium Pew36 Space Modulator.  
Can you sing "Rocky Top"?  
What drive letter does the flash drive use?
```

3. Close Notepad. The `LadyVOLS.txt` file will be used later in the lab.
4. Use the *Search* function on the taskbar to search for **command**, and select the *Command Prompt* option from the resulting list.
Does a prompt display? [Yes | No]
If you do not see a prompt but you followed every step correctly, contact your instructor.
What prompt displays on the screen? This is the folder (directory) from which you are starting.

5. At the prompt, type the following command:

```
cd\
```

The prompt changes to `C:\>`. If a message appears, stating that this is an invalid command or an invalid directory, you made a typing error. If you suspect an error, verify that the backslash is after `cd` and that there are no extra spaces. The backslash starts from the left side and goes down to the right (`\`). Other commands use a forward slash (`/`).

`cd` is the command to change the directory, and it can tell the operating system to go to a different directory in the tree structure. The `\` after the `cd` command tells the operating system to go to the root directory. An alternative way of typing this command is `cd \`, with a space between the `cd` command and the backslash. There are usually different ways to use every command from a prompt. The `cd\` or `cd \` command allows you to return to the root directory at any time.

6. At the command prompt, type the following:

```
dir
```

A list of files and directories appears. In this list, next to each filename, you see a period and an extension to the right of the filename, the file size, and the date and time when the file was last modified. The file extension gives a clue about which application created the file. Each directory has a `<DIR>` entry to the right of the timestamp.

List two filenames, including their extensions, and one directory shown on the screen. Using your own knowledge or the internet, try to determine what application was used to create each file and write the name of that application (if found) beside the filename. Document your findings in Lab Table 15.1.

LAB TABLE 15.1 File and directory information

Information displayed	Name	Application
File		
File		
Directory		N/A

7. When the number of files shown exceeds what can display on the screen, the files quickly scroll off the screen until all files finish displaying. The `DIR` command has a switch that controls this scrolling. A command switch, which begins with a forward slash, enhances or changes the way a command functions.

At the command prompt, type `dir /p`. The `/p` switch, when used with the `dir` command, tells the operating system to display the files one page at a time.

After looking at the data on the screen, you can press `↵Enter` again to see the next page and then continue pressing `↵Enter` until the prompt reappears.

8. At the prompt, type the following:

```
dir /w
```

What is the function of the `/w` switch?

9. Multiple switches can be used with a command. At the prompt, type the following command:

```
dir /w/l
```

Using the `dir` command with the `/w` and `/l` switches causes files to display in a wide format, with the information displayed in lowercase.

10. The online help available within Windows varies across the different versions of Windows. To find out the operating system version loaded on the computer, type **ver**.

What is the version number of the Windows operating system used on the computer?

11. At the prompt, type **dir /? | more**. To create the vertical bar used in the command, hold down the **⇧Shift** key and, while keeping it held down, press the key directly above the **↵Enter** key, which is the same key as the backslash (****). A short explanation of the **dir** command appears, followed by the command syntax (that is, the instructions or rules for how the command is to be used). A technician needs to understand command syntax to determine what commands to type when unfamiliar with a command. The **|** symbol is called the pipe symbol. The **| more** command tells the operating system to display the output one page at a time. Perform the following activity and then press any key to continue until you return to a prompt.

Based on the output, list two switches that can be used with the **dir** command.

Write one switch that can be used with the **dir** command and briefly explain its purpose.

12. Type **cd\Windows** at the prompt. The prompt changes to **C:\Windows>**.
13. Type the following command:

```
dir a*.*
```

The **a*.*** is not a switch. This command is directing the operating system to list all files or subdirectories that start with the letter A (upper- or lowercase because filenames and directory names in Windows are not case-sensitive). The directory you chose may not have any files or subdirectories that start with the letter A. If this occurs, the operating system displays the message *File Not Found*.

The ***** is known as a wildcard. The ***** wildcard substitutes for any combination of characters, including no character. Since the combination **a*** comes before the period, it means you're looking for any files that begin with A. Since the second asterisk comes after the period, the files can include any extension, including no extension.

Does the operating system list any files or subdirectories that start with the letter A? If so, write one of them in the following space. If not, did the operating system let you know this? If so, write the message displayed.

14. Type the following command:

```
cd..
```

The `..` tells the operating system to move back (or up, if you think about the structure in File Explorer) one directory in the directory structure. Typing `cd\windows` in step 12 took you one level down from the root. This `cd..` command returns you to the root directory.

To display a list of all files or directories in the root directory that start with the letter C, what command do you type? Try the command you think is right on the computer to see if it works.

Do any files or directories start with the letter C? If so, write down at least one of them.

On Your Own

- 15a. Change to the directory that contains the Windows operating system. (The System32 directory and other important files and directories are located there.) The directory name is normally *Windows*. If you cannot determine what directory contains Windows, use the `dir` command again. Try repeating the lab until it is easier to do this step.

Write the command you used to do this.

List two Windows files or directories that begin with the letter D.

- 15b. Return to the root directory.

Write the command you used.

16. You need to access the flash drive. To do this, you type the drive letter assigned to the flash drive (see the answer to the question in step 2), followed by a colon, and then press the `↵Enter` key. For example, if a flash drive is assigned the letter G, you type `G:` and press `↵Enter`. In this lab, whenever directions are given where the drive letter is not known, *X*: (italicized *X* and then a colon) is used, and you need to substitute your drive letter for *X*. Type the following command, based on your own drive letter:

```
x:
```

Notice that the prompt changes to the drive letter of the flash drive. If it does not, you might have forgotten to press `↵Enter` or may not have replaced the *X* with your own drive letter, documented in step 2.

17. The `type` command allows you to view the text file you created in the root directory. Enter the following command:

```
type ladyvols.txt
```

What is the result of using the `type` command?

Can you edit and change the file by using this command? [Yes | No]

Have your instructor verify that your file displays.

Instructor initials: _____

18. The `del` command is used to delete files. From the root directory, delete the file you created in the root directory by using the following command:

```
del ladyvols.txt
```

Why do you think you did not have to type `del x:\ladyvols.txt` (the full path) in this step?

Lab 15.2 Using the `copy`, `md`, `del`, and `rd` Commands

Objective: To correctly use the `copy`, `md`, `del`, and `rd` commands

Parts: Windows computer with command prompt access
Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

Notes: For each step requiring a typed command, the `[Enter]` key must be pressed to execute the command. This instruction is not given with each step.

The directions given in Lab 15.1 are not repeated here. If you have trouble with this lab, it is recommended that you do Lab 15.1 until you are proficient with the concepts and then do this lab again.

It is critical that you follow the directions in this lab. For example, if the lab directs you to make a directory called `SubFolder1` using the command `md subfolder1`, make sure you type the command exactly as shown, without any extra spaces or other characters. A common mistake is to type the following: `md subfolder 1`. Notice the difference? A space has been added after `subfolder`, and that means that the system created the directory `subfolder` and the directory `1`, not the directory `subfolder1`. When the student has to create `subfolder2` and the command `md subfolder 2` is typed by accident, a message indicates that the directory already exists. Why? The `md subfolder 2` command was giving the computer the direction to create directories called `subfolder` and `2`, but the directory `subfolder` already exists..

1. Power on the computer and log on, if necessary.
2. Using Notepad, create four text files and put any professional data that you want into the files. Name the files with your first initial and last name plus a number, a dash, and another number (that is, `flast#-#.txt`). (For example, for a user named Chris Lee, the files could be named `clee1-1`, `clee1-2`, `clee2-1`, and `clee2-2`.) Save the files to the root directory of your flash drive.

What drive letter does the flash drive use?

What application did you use to verify what drive letter the flash drive uses?

Have an instructor verify that your four files are in the flash drive root directory. Then close File Explorer and Notepad.

Instructor initials: _____

3. Access a command prompt. Multiple methods can be used. Use a previous lab or the textbook for instructions.

At the command prompt, type the command to go to the flash drive and then press `[Enter]`. The command is `X:` (where `X` is the letter of the drive where you are allowed to create files). For example, if your flash drive uses the drive letter `G`, you type `G:` and press `[Enter]`. The prompt changes to the appropriate drive letter, such as `G:\>`.

4. At the command prompt, type the following command:

```
cd\
```

What is the purpose of the `cd` command?

What is the purpose of the `cd\` command?

5. Create a directory (folder) called *Class* by entering the following command:

```
md Class
```

6. Use the `dir` command to verify that the directory is created. If it is not created, redo step 5.

7. When the directory is created, move into the *Class* directory by using the `cd` command:

```
cd class
```

If you use the `dir` command at this point, what entry or entries are automatically created in *Class*?

Windows 10: _____

Windows 11: _____

8. Within the *Class* directory, create a subdirectory (subfolder) called *SubFolder1* by entering the following command:

```
md SubFolder1
```

9. Move from the *Class* folder into the subfolder just created by using this command:

```
cd subfolder1
```

In this step, would the `cd X:\Class\SubFolder1` (where *X:* represents the flash drive you are using) command have worked as well? Why or why not?

10. From the *SubFolder1* directory, move back one directory by entering this command:

```
cd..
```

What does the prompt look like at this point?

11. Make another subdirectory called *SubFolder2* that is located under the *Class* directory.

Have another student verify that both subdirectories have been created by using the `dir` command. Have that classmate sign their name on your answer sheet if the *Class* directory has two subdirectories that have the correct names.

Classmate's printed name: _____

Classmate's signature: _____

12. Return to the root directory of the flash drive. Redo Lab 15.1 if you cannot remember how to do this step.

On Your Own

- 13a.** From the prompt, create two directories on the root directory of the flash drive. Name the directories *Sara* and *Josh*. Use the `dir` command to verify that the *Sara* and *Josh* directories exist in the root directory of the flash drive.

Have another student verify that the two new directories are created in the root directory. Ensure that the two names are correct and are readable.

Classmate's printed name: _____

Classmate's signature: _____

- 13b.** Return to the root directory of the *X:* drive (the flash drive root directory).

Draw a picture of the directory structure that you have created on the flash drive.

You are sitting at the root directory of the flash drive. What do you think would be the results of entering the following command?

```
COPY C:\WINDOWS\SYSTEM32\ATTRIB.EXE
```

- 14.** *Note:* This step assumes that Windows has been loaded in a directory (folder) called *Windows*. If it is loaded in a different directory, substitute the name of that directory for *Windows* in the commands. You also have to substitute the *X:* in *X:\Class* with the flash drive letter you are using.

You will now practice the `copy` command. When using this command, notice that the `copy` command is first, followed by the source (the complete path where the file is located: `C:\windows\system32\attrib.exe`). Last is the destination—where the file is to be placed (in the *Class* directory found on the flash drive). From the root directory, type the following command:

```
copy C:\windows\system32\attrib.exe X:\class
```

If you did this step correctly, a message appears, saying that one file was copied. If you do not get such a message, try the command again. Remember that *X:* is your flash drive letter, and you are supposed to type that drive letter rather than *X*.

To what location do you think the file was copied?

- 15.** From the root directory, verify that the file has been copied by typing the following command:

```
dir \class
```

What is the size of the `attrib.exe` file?

- 16.** To copy the `attrib.exe` command from the *Class* folder into *SubFolder2*, from the root directory, use the following command:

```
copy \class\attrib.exe \class\subfolder2
```

Notice that the command comes first, and because everything is on the flash drive and the prompt is showing the flash drive, the flash drive letter can be omitted from both the source and the destination. The drive letter for the flash drive could precede the backslash (`\`) before the source and the destination part of the command, and it would work just as well (that is, `copy X:\class\attrib.exe X:\class\subfolder2`).

17. Verify that the file copied correctly by using the following command:

```
dir \class\subfolder2
```

Notice that with the `dir` command, you are instructing the computer to show a directory listing starting from the root drive (because the next part starts with the backslash [\]) and then instructing the computer to go into the *Class* directory and then go into the *subfolder2* directory. You are giving the computer the exact path to take to get to the correct directory to show the listing.

The `attrib.exe` file should be listed. If it is not, redo step 16.

Are any other files or folders in the *subfolder2* directory? [Yes | No]

18. Copy the *flast1-1.txt* text file into the *Subfolder1* directory (which is located under the *Class* directory) by using the following command:

```
copy \flast1-1.txt \class\subfolder1
```

Remember that *flast1-1.txt* is your first initial and last name followed by a 1, a dash, and another 1. You created this file in step 2 at the beginning of this lab.

A message should appear that one file copied. If it does not, redo step 18.

19. Verify that the file copied by using the following command:

```
dir \class\subfolder1
```

Write the exact command to copy the *flast1-1* text file from *Subfolder1* into the *Subfolder2* directory. Remember that both *Subfolder1* and *Subfolder2* are subdirectories located under the *Class* directory. The *Class* directory is directly under the root directory.

20. Execute the command documented in step 19. If you do not see a message indicating that one file copied, redo the command or rewrite the command in step 19. Once the file is copied, verify the copy by using the `dir` command.

What is the full command used to verify the copy in step 20?

21. From the flash drive root directory, use the `tree` command to verify your structure:

```
tree /f | more
```

There should be four text files in the root directory with your first initial and last name and 1-1, 1-2, 2-1, and 2-2 as part of the filename. There should be directories called *Class*, *Sara*, and *Josh*. Under the *Class* directory, there should be one file (`attrib.exe`) and two subfolders (*Subfolder1* and *Subfolder2*). Under the *Subfolder2* directory are the files *flast1-1.txt* and `attrib.exe`. Under the *Subfolder1* directory is the file *flast1-1.txt*. If any of these are not correct, use File Explorer to delete any files, directories, and subdirectories you have created and restart the lab.

On Your Own

- 22a. From the flash drive root directory prompt, copy the *flast1-2.txt* file from the flash drive root directory into the *Sara* directory. Use the space that follows to write your command before attempting to type it.

Document the command to copy the *flast1-2.txt* file from the root directory of the flash drive into the *Sara* directory.

- 22b.** From the flash drive root directory prompt, copy the `last2-1.txt` file into the *Josh* directory. Use the space that follows to write your command before attempting to type it.

Document the command to copy the `last2-1.txt` file from the root directory of the flash drive into the *Josh* directory.

- 22c.** From the flash drive root directory prompt, copy the `last2-2.txt` file into the *Class* directory. Use the space that follows to write your command before attempting to type it.

Document the command to copy the `last2-2.txt` file from the root directory of the flash drive into the *Class* directory.

Have another student verify that a file is copied into each of the three subdirectories. Ensure that the names are correct and readable. File Explorer can be used to verify but not to correct. A better option would be to use the `dir` and `cd` commands.

Classmate's printed name: _____

Classmate's signature: _____

- 22d.** Return to the root directory of the *X:* drive (the flash drive root directory). Close all other windows except the command prompt window.
- 23.** A subdirectory can be created within a subdirectory from the root directory. To create a subdirectory called *Fun* within the *SubFolder2* subdirectory (which is under the *Class* directory), use the following command from the root directory. Notice that you must insert the backslashes when you have multiple directories to go through to create the subdirectory.

```
md \class\subfolder2\Fun
```

- 24.** Verify the subdirectory creation by using the following command:

```
dir \class\subfolder2
```

A directory called *Fun* should be listed in the output.

How much space do the files located within *SubFolder2* occupy?

- 25.** Use the `tree` command to verify the *Class* folder structure:

```
tree \class
```

There should be two subdirectories (*Subfolder1* and *Subfolder2*) and one subdirectory (*Fun*) under *Subfolder2*.

- 26.** To copy all the files from *SubFolder2* into the newly created *Fun* subdirectory, use the following command:

```
copy \class\subfolder2 \class\subfolder2\fun
```

A message should appear, indicating that two files copied. If you do not receive this message, do not go any further. Try redoing the command. Make sure there is a space between the `copy` command and the first backslash. Make sure there is a space between the first time you type `subfolder2` and the next backslash (between the source and the destination parts).

27. Use the `dir` command as follows to verify the copy:

```
dir \class\subfolder2\fun
```

28. Wildcards can be used with the `copy` command. To copy all the files that start with the letter *A* from the *Fun* subdirectory into the *Subfolder1* subdirectory, use the following command:

```
copy \class\subfolder2\fun\A*.* \class\subfolder1
```

A message should appear, stating that one file copied. If you do not receive this message, do not go any further. Try redoing the command. Make sure there is a space between the `copy` command and the first backslash (`\`). Make sure there is a space between the last asterisk (`*`) and the next backslash (between the source and the destination parts).

How many files were copied?

Instructor initials: _____

29. The `del` command is used to delete files. Wildcards can also be used with this command. Delete all the files located in the *Fun* subdirectory by using the following command (where the `*.*` is the wildcard representing all files with any extension):

```
del \class\subfolder2\fun\*.*
```

When prompted if you are sure, type **Y** and press `[Enter]`. Verify that the files are deleted with the `dir` command:

```
dir \class\subfolder2\fun
```

30. The `rd` command removes directories and subdirectories. Note that you cannot remove a directory or subdirectory with the `rd` command unless that directory or subdirectory is empty. Type the following command to remove the *Fun* subdirectory:

```
rd \class\subfolder2\fun
```

31. Type the following command to remove the *SubFolder2* subdirectory:

```
rd \class\subfolder2
```

What is the operating system response, and what do you think has to be done as a result?

32. Type the following command to delete the files in the *Subfolder2* subdirectory:

```
del \class\subfolder2\*.*
```

When prompted if you are sure, type **Y** and press `[Enter]`. Verify that the files are deleted with the `dir` command:

```
dir \class\subfolder2
```

- 33a. Type the following command to remove the *Subfolder2* subdirectory:

```
rd \class\subfolder2
```

Type the following command to verify the results:

```
dir \class
```

On Your Own

- 33b. From the command prompt, use the `del`, `rd`, and `dir` commands to delete all files that you have created in the root directory and verify the deletions.

Write each command you are going to use *before* attempting this part. An important part of learning how to use the commands and the prompt is to think about what and how you are going to type something before executing the command.

Write each command used to delete the files in the *Class*, *Subfolder1*, *Sara*, and *Josh* directories and subdirectories.

Write each command used to delete the *Class*, *Subfolder1*, *Sara*, and *Josh* directories and subdirectories.

Have another student verify your work. Have that student sign and print their name to verify that all of the files created during this lab have been deleted.

Classmate's printed name: _____

Classmate's signature: _____

Lab 15.3 Using the `attrib` Command and Moving Around in the Directory Structure

Objective: To use the `attrib` command and to work correctly from a prompt when dealing with directories and subdirectories

Parts: A computer with a Windows operating system loaded
A flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

Note: For each step requiring a typed command, the `[Enter]` key must be pressed to execute the command. This instruction is not given with each step.

1. Power on the computer and log on, if necessary.
2. Using Notepad, create three files, named *Special1.txt*, *Special2.txt*, and *Tickle.txt*, and save them in the root directory of the flash drive.

What drive letter is assigned to the flash drive?

-
3. Access a command prompt. Ensure that the prompt represents the root directory of the flash drive. Do not use File Explorer to verify anything for the rest of the lab. If you are not sure how to use the command prompt for all of this, you should practice the previous labs some more.

What does your command prompt look like? Note that it should be the drive letter of the flash drive, a colon, a backslash, and a greater-than sign. If it is not, review the previous labs before going to step 4.

4. From the root directory of the flash drive, type the following command to create a directory called *Junk*:

```
md junk
```

5. Under the *Junk* directory, make subdirectories called *Sub1*, *Sub2*, and *Sub3* by using the following commands:

```
cd junk
```

```
md sub1
```

```
md sub2
```

```
md sub3
```

6. Return to the root directory. Verify that you are in the correct directory by looking at the command prompt.

What command makes the root directory the current directory?

Write the command prompt as it appears on your screen.

7. Make a new directory called *Trash* from the root directory and within the *Trash* directory, make subdirectories called *Sub1*, *Sub2*, and *Sub3* by using the following commands:

```
md trash
```

```
cd trash
```

```
md sub1
```

```
md sub2
```

```
md sub3
```

8. Return to the root directory of the flash drive.

On Your Own

9. Make a new directory called *Garbage* from the root directory. Within the *Garbage* directory, make subdirectories called *Sub1*, *Sub2*, and *Sub3*. Verify that the directory and subdirectories were created.

Write the commands to create a directory called *Garbage* and the three subdirectories.

10. Copy the *Special1.txt*, *Special2.txt*, and *Tickle.txt* files to the *Garbage\Sub1* subdirectory.

11. Go to the root directory, if you're not there already.

12. Still in the root directory, copy all files that begin with the letter *S* from the *Garbage\Sub1* subdirectory to the *Trash\Sub3* subdirectory.

Write the commands to copy these files from the *Garbage\Sub1* subdirectory to the *Trash\Sub3* subdirectory.

How many files were copied?

- 13. Copy any file that begins with *T* from the *Garbage\Sub1* subdirectory and place it in the *Sub2* subdirectory of the *Junk* directory.

Write the commands to copy files that begin with *T* from one subdirectory to another subdirectory.

How many files were copied?

Draw a diagram of the directory structure that you have created in this lab, including all directories, subdirectories, and files.

Setting/Removing Attributes

- 14. To make all files in the *Sub3* subdirectory of the *Trash* directory read-only, use the `attrib` command with the `+r` switch. From the root directory, type the following command:

```
attrib +r \trash\sub3\*.*
```

- 15. To verify that the read-only attribute is set, type the following command:

```
attrib \trash\sub3\*.*
```

The *Sub3* subdirectory should list two files. Each of them should have an *R* beside it, indicating that the read-only attribute is set. If the two files do not have the read-only attribute set, perform steps 14 and 15 again.

- 16. The best way to prove that the files are read-only is to try to delete them. Type the following command:

```
del \trash\sub3\*.*
```

17. When asked if you are sure you want to delete the files, type **Y** and press **⏎** (Enter). A message should appear on the screen, stating *Access is denied*. Then the command prompt appears. If the access denied message does not appear, the files were deleted, which means the read-only attribute was not set. If this is the case, repeat step 12 to restore the files, then try steps 14 through 17 again.
18. Hide the *Junk\Sub2* subdirectory by using the following command:
attrib +h \junk\sub2
 No message appears on the screen. The command prompt appears again.
19. To verify that the directory is hidden, type the following command:
dir \junk
 The *Sub2* subdirectory should not appear in the list.
20. Use the **attrib** command to verify that the directory is hidden by typing the following command:
attrib \junk\sub2
 The directory listing should appear with an **H** beside the name.
21. Some operating system files are automatically marked as system files when the operating system is installed. Type the following command to see what files are already marked as system files:
attrib c:*.*
 List any files that have the system attribute.

On Your Own

22. Hide the *Special1.txt* file located in the *Sub1* subdirectory of the *Garbage* directory.
 Write the command you used for this step.
-
23. Verify that the *Special1.txt* file is hidden by using the **dir** and **attrib** commands.
 Write the commands you used for this step.
-
- Have another student verify your work. Have that student sign and print their name and write the commands they used to verify that you were in the correct directory.
 Classmate's printed name: _____
 Classmate's signature: _____
 Instructor initials: _____
24. Remove the hidden attribute from the *Special1.txt* file in the *Sub1* subdirectory of the *Garbage* directory. If necessary, use **Help** to find the switch to remove an attribute.
 Write the command used in this step.
-
25. Have a classmate verify that the *Special1.txt* file is no longer hidden.
 Have that student sign and print their name and write the commands they used to verify that the *Special1.txt* file is no longer hidden.
 Classmate's printed name: _____
 Classmate's signature: _____

-
-
-
26. Ensure that you are in the root directory.
27. Moving around within subdirectories can be challenging when you are first learning commands. Move to the *Sub3* subdirectory of the *Trash* directory.
What command did you use to perform this step?
-
28. To move to the *Sub1* subdirectory from within the *Sub3* subdirectory, type the following:
`cd . .`
Then type the following to move into the correct subdirectory:
`cd sub1`
What does the command prompt look like now?
-
29. A shortcut to move up one directory is to type `cd..` from within the *Sub1* subdirectory. The prompt immediately changes to one level up (the *Trash* directory). Type the following:
`cd . .`
The prompt changes to *X: \Trash>*.
30. Using the `cd . .` command again takes you one level back in the directory structure, to the root directory. Type the following:
`cd . .`
The prompt changes appropriately.

Cleanup

31. Still in the root directory, change to the *Sub2* subdirectory of the *Garbage* directory.
Write the command used in this step.
-
- How can you verify that the current directory is *Garbage\Sub2*?
-
32. Still in the *Garbage\Sub2* subdirectory, change the current directory to the *Sub3* subdirectory of the *Trash* directory.
Write the command you used in this step.
-
- Have a classmate verify your work. Have that student sign and print their name and describe how they verified that you were in the correct directory.
Classmate's printed name: _____
Classmate's signature: _____
-
33. Using the `cd . .` command, move from *Trash\Sub3* to *Trash*.
34. Using the `cd . .` command, move from *Trash* to the root directory.

- 35. Using the `attrib`, `del`, and `rd` commands, delete the *Trash* and *Garbage* directories, including all subdirectories underneath them. Write all commands needed for this before you attempt this step at the command prompt.

Write all commands used in this step.

- 36. Using the `attrib`, `del`, and `rd` commands, delete the *Junk* directory and all its subdirectories. Write all commands needed for this before you attempt this step at the command prompt.

Write all commands used in this step.

Instructor initials: _____

Lab 15.4 Windows 10/11 Backup Software and the Archive Bit

Objective: To explore backup options and how they affect the archive attribute, using Windows 10 or 11

Parts: A computer with Windows 10 or 11 installed
Flash drive

Procedure: Complete the following procedure and answer the accompanying questions.

Note: This lab requires both command prompt and Windows skills.

1. Power on the computer and log in to Windows.
2. Attach the flash drive.

What drive letter is assigned to the flash drive?

3. Ensure that there are at least three files in the *Documents* folder on the hard drive. You may have to create three files. This will be the folder that contains the data to be backed up.

What are the names of your three files?

What is the path to your *Documents* folder?

4. Search for `command prompt`. In the resulting list, right-click the words *Command Prompt* > select *Run as Administrator* > *Yes*.
5. Use the `cd` command to move into the directory (folder) chosen in step 3. Hint: You must change into the directory *Users* and the folder with the username used to log in to the computer before you can locate the *Documents* folder. For example, for the username Akil, the prompt is `C:\Users\Akil\Documents>`.

Document the command(s) used to accomplish this step.

6. Use the `dir` command to verify that at least three files are in the folder.
Have another student verify that three files are in the folder.

Classmate's printed name: _____

Classmate's signature: _____

7. Use the `attrib` command to determine the attributes set by default on a file saved on a Windows computer. The attributes are listed to the far left, then there is a space, and then there is the full path to the filename. Leave the command prompt window open.

Document the attributes found for the three files, keeping in mind that A is the archive attribute, R is the read-only attribute, and H is the hidden attribute.

8. Go to *Control Panel* > *Backup and Restore (Windows 7)*.
9. If a backup has been done before, select the *Change settings* link; otherwise, select the *Set up backup* link.
10. Select the appropriate backup destination (the flash drive letter, as specified in the answer to the question in step 2) > *Next*.
11. Select the *Let me choose* button > *Next*.
12. Uncheck any other items that are already selected.
13. Expand folders as necessary by clicking on the arrows. Then locate and select the folder chosen in step 3 > *Next*.
14. Click the *Save settings and run backup* button.
15. When the backup finishes, return to the command prompt window and reissue the `attrib` command.

Did the archive attribute change for the three files? [Yes | No]

Describe the backup file on the flash drive (that is, how Backup and Restore (Windows 7) saves the file).

16. Using File Explorer, copy one of the files from the *Documents* folder to the desktop.
17. In the command prompt window, type `cd\` to return to the root directory.
18. Use the `cd` command to access the *Desktop* directory. A sample command would be `cd \users\akil\desktop` if the person who signed onto the computer used the Akil account.

Document the exact command you used to access the Desktop directory.

19. Use the `attrib` command to determine whether the archive bit changes when a file is copied.
Document your findings.
-

Using the `xcopy` Command for Backups

20. You need to access the flash drive. To do this, you type the drive letter assigned to the flash drive (see the answer to the question in step 2), followed by a colon, and then press the `↵` key. For example, if a flash drive is assigned the letter G, you type `G:` and press `↵`. Type the following command, substituting your own drive letter for X:

X:

21. Go to the root of the flash drive and create a directory called Documents by entering the following:

```
cd\
mkdir Documents
```

22. Return to the C: drive by entering the following:

C:

23. Use the `cd` command to access the *Documents* directory. A sample command would be `cd \users\akil\documents` if the person who signed onto the computer used the Akil account.
24. Unlike Backup and Restore (in Windows 7), the `xcopy \m` command can alter the archive attribute. The `\m` tells `xcopy` to copy only files with the archive attribute set and then clear the flag on the original files after the files are copied. Use the following to copy the files from your *Documents* folder to the documents folder on the flash drive:

```
xcopy /m *.* X:\Documents
```

Instructor initials: _____

25. When the backup finishes, reissue the `attrib` command. The archive attribute should be cleared.

Instructor initials: _____

26. Use the following to copy the files from the *Documents* folder to the flash drive:

```
xcopy /m *.* X:\Documents
```

No files should be copied.

27. Use Notepad to make changes to one of the files in the Documents on the hard disk, such as `C:\Users\Akil\Documents\File3.txt`.

28. Use the following to copy the files from the Documents folder to the flash drive:

```
xcopy /m *.* X:\Documents
```

Select *Yes* at the overwrite request. Only one file should be copied.

Cleanup

29. Permanently delete the file copied to the desktop and the three files created in the *Documents* folder.
30. Close all windows.

Lab 15.5 Setting Windows Environment Variables

Objective: To access environment variables in Windows

Parts: Windows computer and an account with administrator rights

Procedure: Complete the following steps and answer the accompanying questions.

1. Power on the computer and log on using a user ID and password that has administrator rights.
2. Open *Settings > About > Advanced system settings*. Explore the *System Properties* window to answer the following questions.

Which options do you select to find the Environment Variables window?

Which system variable name is used for the PowerShell environment variable?

What is the value of this variable?

Is the PowerShell environment variable a system variable or a user variable?

[System variable | User variable]

Should you edit this environment variable? [Yes | No] Why or why not?

What variable is used for temporary files?

What is the value associated with this variable?

Instructor initials: _____

Describe another way to access environment variables in Windows.

Which option would you use, and why?

3. Use the internet to research how to find Python environment variables.

Document three findings and the URL where you found them.

On Your Own

4. Change the environment variable for one user's program so that it includes a new directory named *TestDir*.

Document how you did this.

5. Do your own research to find out where user environment variables are stored in the registry. Document your findings and be sure to list the specific registry key.

6. Do your own research to find out where system environment variables are stored in the registry. Document your findings and be sure to list the specific registry key.

7. For each of the following environment variables, locate the appropriate value on your computer and record it in the space provided:
 %COMPUTERNAME% _____
 %APPDATA% _____
 %HOMEPATH% _____
 %LOCALAPPDATA% _____
 %PATHEXT% _____

Instructor initials: _____

Lab 15.6 Creating a Batch File

Objective: To create and run a script using the command line and batch files

Parts: Windows computer with Microsoft Office or OpenOffice or access to five user-created files and with an account that has administrator rights
Flash drive

Procedure: Complete the following steps and answer the accompanying questions.

1. Power on the computer and log on.
2. In File Explorer, locate and select the flash drive. Create a folder (directory) on the flash drive named *batchTest*.
3. Next, put five files inside the *batchTest* folder. You can use any files that are already on the computer, or you can create five simple files yourself. The files can be from any application and can contain anything you want; the content is not important. It is recommended that you use at least three different applications to make the results more interesting, such as an Excel file, a Word file, a text file, and so on. OpenOffice is also acceptable. Suggested filenames and contents are provided in Lab Table 15.2.

LAB TABLE 15.2 Suggested batch file contents*

Sample filename	Sample content
drones.docx, drones.odt	A drone is an unmanned aircraft, like a flying robot.
addition.xlsx, addition.ods	2 + 2 = 4 (normally)
scripting.pptx, scripting.odp	My First Scripting Presentation
firstScript.txt	The echo command displays messages on the console.
smile.png, smile.jpg, smil.bmp	Draw a smiley face.

* These are only suggestions. You can create any five files you want.

4. Open Notepad and create a batch file with the text shown below:

```
echo
REM create a list of files in the batchTest folder
dir "X:\batchTest" > X:\file_list.txt
echo "Check out the list of files now!"
```

This batch file should create a new file with a list of all the files that are in the *batchTest* directory. Make sure you replace the X: with the drive letter assigned to the flash drive. For example, if your flash drive is F:, then everywhere you see X: above, use F: instead.

Note: Batch file commands are not case-sensitive. You could substitute ECHO for echo and DIR for dir. The comment command (REM) is normally written in uppercase simply so it is set off from the comment text.

Save the file on the flash drive with the filename batch1xxx.bat, replacing xxx with your initials. When you save the file, be sure to use the drop-down menu under Save as type and select the All Files option. Otherwise, Notepad will add the .txt extension to your file, and the script will not run.

Close the file.

- 5. Search for command prompt to open the command prompt. Then enter the following commands to run your file:

X: (where X: is the drive letter of your flash drive)

cd batchTest

start batch1xxx.bat (where xxx is your initials)

What is displayed on the console?

In File Explorer, locate the file named file_list.txt and open it. What are its contents?

Instructor initials: _____

- 6. Modify your batch file as follows: Locate the batch1xxx.bat file, right-click it, and choose Edit to open it in Notepad. Add or modify the commands to do the following:
> Edit the batch file so it creates a new directory (folder) in the root directory of the flash drive called myFiles. Recall that the command to make a new directory is md or mkdir.
> Edit the batch file so it saves the file_list.txt file to the new myFiles folder.

What changes did you make? List them.

- 7. Add comments to your batch file to explain what each line does.
8. Execute the batch file and then verify that the file_list.txt file is located in a folder called myFiles.

Where is file_list.txt located now? Verify that it is in the location where you want it to be.

Instructor initials: _____



9. Create a second batch file, named `batch2xxx.bat`, to add two numbers. Store the numbers in variables named `number1` and `number2`. Store the sum in a third variable, named `sum`, and then store a message to display the results in another variable, named `message1`. Output only the results. The code is as follows:

```
@echo off
setlocal EnableDelayedExpansion
REM doing math
SET /A number1=5
SET /A number2=3
SET /A sum=!number1! + !number2!
SET message1=The result of adding !number1! and !number2! is !sum!
echo !message1!
```

10. Execute the batch file from a command prompt to verify your code.
What message displays on the screen?

Instructor initials: _____

11. Modify your batch file as follows:
- > Add a third variable, named `product`, to store the results of multiplying the two numbers.
 - > Add a variable named `message2` to store a message that gives the result of the multiplication and output this message.

Your final display should look like this:

The result of adding 5 and 3 is 8.

The result of multiplying 5 by 3 is 15.

Instructor initials: _____

12. Create a third batch file, named `batch3xxx.bat`, to count by twos from 2 through 20, using a loop and an `if` clause. The output should be a vertical list of the following numbers:

```
2 4 6 8 10 12 14 16 18 20
```

Note: Batch files do not actually have a true `while` loop. However, there are several ways to mimic the `while` loop syntax that is available in Python, JavaScript, and shell scripting. A true `while` loop begins with a test condition that compares a variable or an expression to another value. This is followed by a block of statements that are executed over and over until the test condition is no longer

true. In the block of statements, the variable or expression to be tested is changed (normally incremented or decremented). All of this can be simulated in a batch file with a label, an `if` clause, and the `goto` command.

A loop in a batch file begins with a colon (`:`) and a label. The label can be almost anything you choose. It is followed by an `if` clause that tests a condition. If the condition is true, the statements in the `if` clause execute. You must remember to change the test item somewhere in the `if` clause, or the loop will run forever. After these statements have executed, the `goto` command is used with the label name to tell the computer to start again, back at the first line. In general terms, the syntax is as follows:

```
:label
if test condition is true
    do stuff
    change the test variable
    goto :label
```

However, if you use the word `while` as your label, your batch file loop looks a lot like a `while` loop. Type and save this code:

```
@echo off
setlocal EnableDelayedExpansion
REM Using a loop and an if clause to count by two's from 2 through
20
SET /A number=2
SET /A count=1
SET /A limit=10
:while
if !count! LEQ !limit! (
    SET /A result=!number!*!count!
    echo !result!
    SET /A count=count+1
    goto :while
)
```

- Execute the third batch file and ensure that it works properly. Troubleshoot as necessary.

Instructor initials: _____

- Create a fourth batch file, named `batch4xxx.bat`, and save it inside your `batchTest` folder. Use the `forfiles` command to have this batch file output to the console a list of all the files in the `batchTest` folder with the date and time last modified. Here's the code:

```
@echo off
REM use a forfiles loop to create a list of files in the batchTest
folder
forfiles /C "cmd /c echo @file @fdate @ftime"
```

What is displayed?

Instructor initials: _____

On Your Own

15. Create a batch file to output the following, changing the name Funmilayo to your own name:

Hello, Funmilayo. Your operating system is Windows 11.

Do this by creating a variable named name that holds the value Funmilayo. Use a second variable, named systemOS, to hold the value Windows 11.

Write your code below.

16. Modify your batch file from step 15 to detect the computer's operating system version. Search the internet to find out how to do this.

Document your results.

Instructor initials: _____

17. Create a batch file script to output only files created after a specific date. The command to do that is:

forfiles ... [/D [+] {MM/DD/YYYY}]

This command selects files with a last modified date greater than or equal to (+) the specified date using the MM/DD/YYYY format.

Document your results.

Instructor initials: _____

Lab 15.7 Introduction to PowerShell

Objective: To create and run PowerShell scripts using cmdlets and scripting code

Parts: Windows computer with Microsoft Office or OpenOffice or access to five user-created files and with an account that has administrator rights

Procedure: Complete the following steps and answer the accompanying questions.

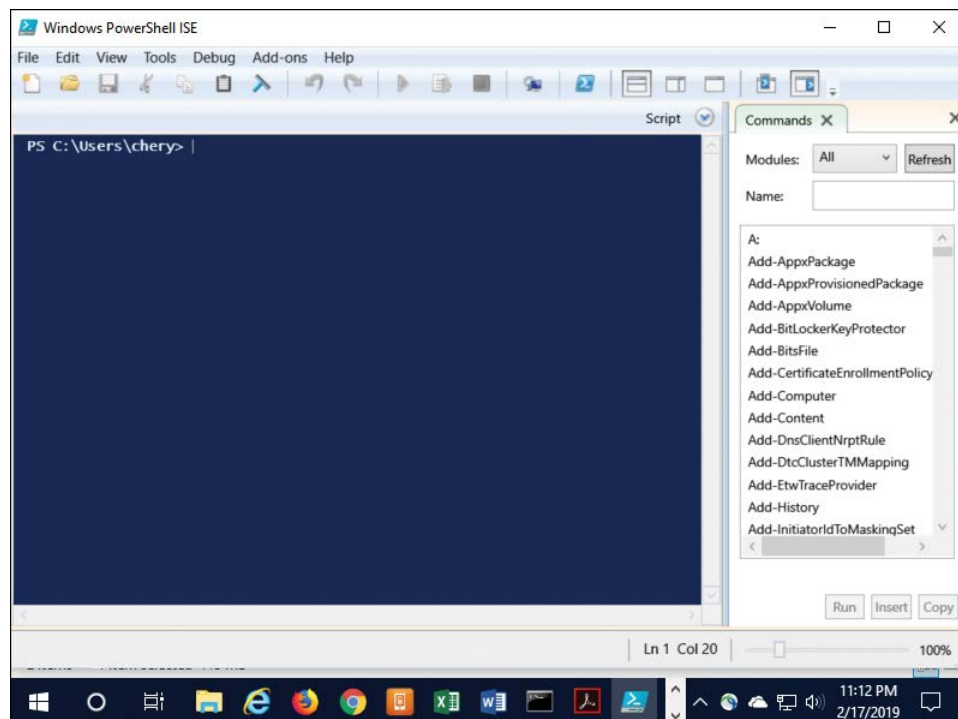
1. Power on the computer and log on.
2. Open File Explorer. Locate the *Documents* folder. In the *Documents* folder, create a folder (directory) named *PowerShellTest*.
3. Next, put five files inside the *PowerShellTest* folder. You can use any files from the user of the computer or you can create five simple files yourself. The files can be from any application and can contain anything you want; the content is not important. It is recommended that you use at least three different applications to make the results more interesting, such as an Excel file, a Word file, a text file, and so on. OpenOffice is also acceptable. Suggested filenames and content are provided in Lab Table 15.3.

LAB TABLE 15.3 Suggested filenames and content for PowerShell*

Filename	Content
drones.docx, drones.odt	A drone is an unstaffed aircraft, like a flying robot.
addition.xlsx, addition.ods	2 + 2 = 4 (normally)
scripting.pptx, scripting.odp	My First Scripting Presentation
firstScript.txt	The echo command displays messages on the console.
smile.png, smile.jpg, smil.bmp	Draw a smiley face.

* These are only suggestions. You can create any five files you want.

4. Search for *PowerShell ISE*. (ISE stands for Integrated Scripting Environment.) Click *Run as administrator* > *Yes*. Your screen should look like the one in Lab Figure 15.1.



LAB FIGURE 15.1 The PowerShell ISE

5. On the right side of the screen, select the *Modules* drop-down > *CimCmdlets*.
Use the internet to research what CIM stands for and record your answer and the URL where you found that information:

6. Using File Explorer, go inside the *PowerShellTest* folder. Click in a blank space in the address bar to see the full path (for example, `C:\Users\student\Documents\PowerShellTest`). While the path is highlighted, use `Ctrl+C` to copy that path.
7. In the PowerShell ISE environment, use the `Get-Childitem` cmdlet to view the files in the *PowerShellTest* folder via either of these two methods:

Option 1: On the left, type the following command after the prompt (all of the text below is one command):

```
Get-ChildItem C:\users\username\Documents\PowerShellTest
```

Option 2: Type `Get-Childitem`, add a space, and then press `Ctrl+V` to paste the path into the command line.

You should see a list of the files you stored in the *PowerShellTest* folder. If you don't, check to make sure you typed the command exactly as shown and try again, if needed. Do not proceed until you accomplish this task.

Instructor initials: _____

8. To create a PowerShell script, open Notepad or any other simple text editor and enter the following:

```
Write-Host "Hello! This is my first PowerShell script."
```

Save the file inside your *PowerShellTest* folder with the filename `powershell1xxx.ps1`, where `xxx` is your initials. When you save the file, be sure to use the drop-down menu under *Save as type* and select the *All Files* option. Otherwise, Notepad will add the `.txt` extension to your file, and the script will not run.

9. Return to the PowerShell window and run the script with the command below, remembering to replace *username* with the username you used to log into the computer. Note that all the text below needs to be typed on one line:

```
& "C:\Users\username\Documents\PowerShellTest\powershell1xxx.ps1"
```

If you get an error, it may be because PowerShell has enforced an execution policy. Be sure you have opened PowerShell as an administrator. (Close PowerShell, rerun the search, right-click on the search results for Windows PowerShell ISE, and select Run as administrator.) Then run the following command:

```
Set-ExecutionPolicy RemoteSigned
```

Select *Yes* in the message that appears. Then try running your script again. You should see the following:

```
Hello! This is my first PowerShell script.
```

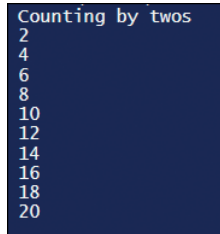
Instructor initials: _____

10. Now let's alter the script to see a list of all the files in the *PowerShellTest* directory. Edit the `powershell1xxx.ps1` file and add the command that you issued in step 7 to the end of the file. Run the script again. What is the result now? You should see the *Hello!* line of text, a line that displays the path to your *PowerShellTest* directory, and a list of all the files in that directory. If you do not see this, start the lab over.

What properties are shown for the files in the directory (that is, what column headings are shown)?

11. On your own, create a second PowerShell script file, named `powershell2xxx.ps1`, to count by twos from 2 through 20, using the `ForEach-Object` command. The output should include a line of text and a vertical list of these numbers, as shown in Lab Figure 15.2:

```
2 4 6 8 10 12 14 16 18 20
```



```
Counting by twos
2
4
6
8
10
12
14
16
18
20
```

LAB FIGURE 15.2 Results of a PowerShell script file

The command to process the numbers is as follows:

```
1,2,3,4,5,6,7,8,9,10 | ForEach-Object -Process {$_*2}
```

Here's the code:

```
Write-Host "Counting by twos"
```

```
1,2,3,4,5,6,7,8,9,10 | ForEach-Object -Process {$_*2}
```

12. To execute the code, press **F5** and change the name of the file from `powershell1xxx.ps1` to `powershell2xxx.ps1` (where `xxx` is your initials). If you can't get this to work, type the full command to execute the script.

[Did the script work? \[Yes | No \]](#)

[If the script did not work, redo the code and execute it again.](#)

Instructor initials: _____

13. In PowerShell ISE, use the `Get-Date` cmdlet to get the current date and time.
14. Create a third PowerShell script file named `powershell3xxx.ps1`.
15. Now you will use the `Get-Date` command to find all files that are more than a year old in your *PowerShellTest* directory. Be sure you have at least one file that was created over a year ago so you can check that your script works. Put the code that follows in your script, replacing `username` with the name you used when you logged into Windows:

```
$time = (Get-Date).AddDays(-365)
```

```
$path = "C:\Users\username\Documents\PowerShellTest"
```

```
Get-ChildItem $path |
```

```
Where-Object {$_ .LastWriteTime -lt $time}
```

Note: There is no space between `(Get-Date)` and `.AddDays`.

Instructor initials: _____

On Your Own

16. Add comments to your PowerShell scripts. In PowerShell, a single-line comment begins with the `#` symbol and ends at the end of that line. A multi-line comment begins with `<#` and ends with `#>`.

[List an example of one of your comments.](#)

- 17. Create a new script, powershell14xxx.ps1, to multiply each number in a list (2, 4, 6, 8) by 100 and divide each number in the list by 4 so the output is as shown in Lab Figure 15.3.

```
Multiplying by 100
200
400
600
800
Dividing by 4
0.5
1
1.5
2
```

LAB FIGURE 15.3 Output of a PowerShell script

List your code.

Instructor initials: _____

- 18. Create a new script, powershell15xxx.ps1, to find all files that are older than 60 days in your PowerShellTest directory. Before you run your script, copy some files that are older than 60 days to the PowerShellTest folder.

List your code.

Instructor initials: _____

- 19. Create a new script, powershell16xxx.ps1, to get all the files in your PowerShellTest directory that have a specific extension. To do this, you use the Select-String command.

List your code.

Instructor initials: _____

Lab 15.8 Introduction to Python Scripting

Objective: To create and run Python scripts using IDLE

Parts: Windows computer with access to the internet and rights to download and install free software

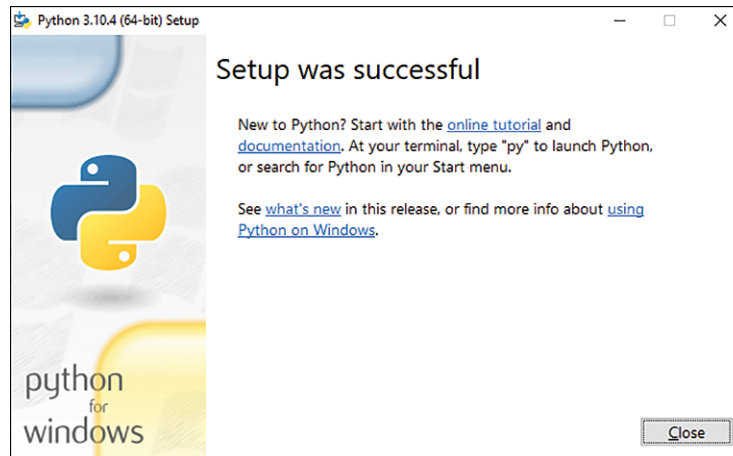
Procedure: Complete the following steps and answer the accompanying questions

1. Power on the computer and log on. Open a web browser.
2. In the browser, go to <https://www.python.org>. Click *Downloads* > Download *Python 3.10.4*. Save the file python-3.10.4-amd64.exe to a place on the computer where you can find it.

Note: At the time of this writing, Python 3.10.4 was the latest version. If that has changed, you can download a later version. However, to do this lab, you must have a version of Python 3 installed (*not* Python 2!).

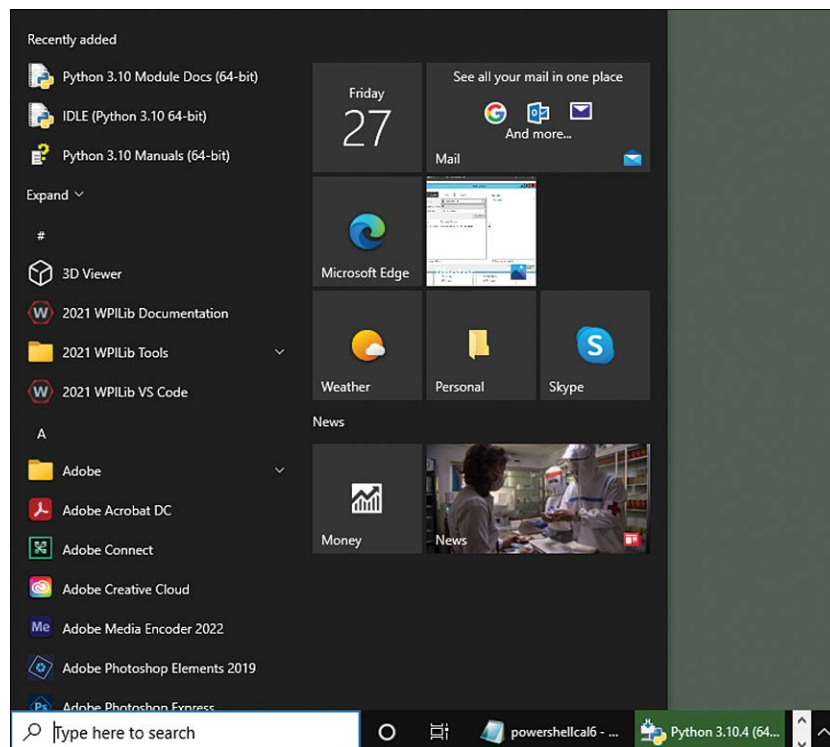
The executable file that you downloaded installs Python on your computer. This will allow you to create programs in the Python language, using the integrated development environment (IDE) named IDLE. (Note: IDE is a generic term for a program used by a language to write programs, and IDLE is the name of the IDE used here to write Python programs.)

3. Run the executable file and follow the prompts. Accept all the default options. If your installation is successful, you should see a verification similar to the one shown in Lab Figure 15.4.



LAB FIGURE 15.4 Successful installation of Python

4. From Windows Start, expand the Python 3.10 folder, if necessary, and click on IDLE (Python 3.10 64-bit), as shown in Lab Figure 15.5.



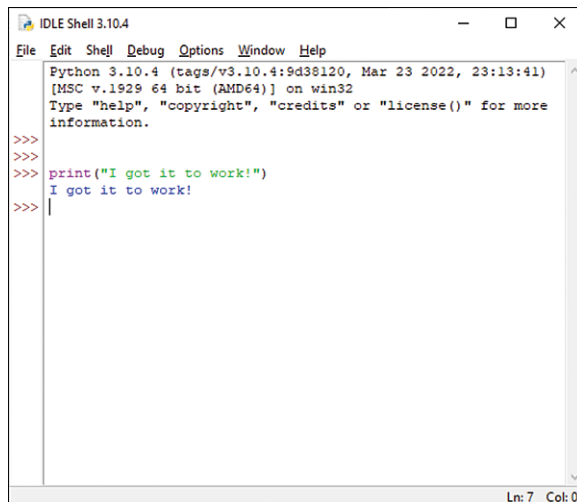
LAB FIGURE 15.5 IDLE (Python 3.10 64-bit) in the Start menu

5. You should see the IDLE Shell 3.10.4 window. This is also called the Python Shell. Make it active by clicking anywhere in its blank area. The cursor should be blinking to the right of the three chevrons: `>>>`. Press `↵` two times, and you should see two more rows of chevrons. This means that Python is working and waiting for you to do something.

6. In the Python Shell window, type the following:

```
print("I got it to work!")
```

Press `↵`, and you should see a screen like the one shown in Lab Figure 15.6.



The screenshot shows the IDLE Shell 3.10.4 window. The title bar reads "IDLE Shell 3.10.4". The menu bar includes "File", "Edit", "Shell", "Debug", "Options", "Window", and "Help". The main text area displays the following text:

```
Python 3.10.4 (tags/v3.10.4:9d38120, Mar 23 2022, 23:13:41)
[MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more
information.
>>>
>>>
>>> print("I got it to work!")
I got it to work!
>>>
```

The status bar at the bottom right indicates "Ln: 7 Col: 0".

LAB FIGURE 15.6 Working in the Python IDLE shell

7. To prepare for your work, create a folder called *PythonTest*. Make sure you know where this folder is located.
8. The Python Shell window is where you see a script run. To create a script, you need to work in the Python editor. From the menu within the Python Shell window, select *File > New File* to open the Python editor.

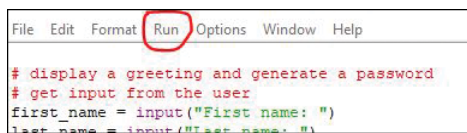
Type the following into the editor:

```
# display a greeting and generate a password
# get input from the user
first_name = input("First name: ")
last_name = input("Last name: ")
id_number = input("Enter your school ID number: ")
# create strings
name = first_name + " " + last_name
temp_password = first_name + "*" + id_number
# display the results
print("Welcome " + name + "!")
print("Your temporary password is: " + temp_password)
```

Be sure to type this code exactly as shown. In Python, indents, spaces, and line spacing are very important:

- > In this program, any line that begins with a hash symbol (#) is a comment and will be ignored by the computer when the program runs.
- > The following are the variable names in this script: `first_name`, `last_name`, `id_number`, `name`, and `temp_password`. The value on the right side of the equals sign is the value stored in the variable on the left side.

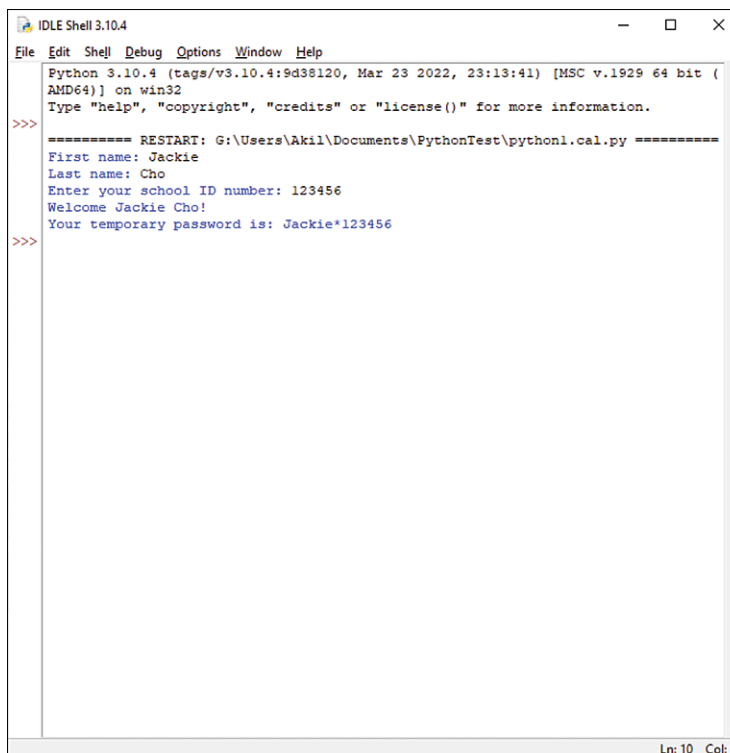
- > In the line `first_name = input("First name: ")`, the variable is `first_name`. The word `input` is a Python function that tells the computer to put a prompt on the screen. The text of the prompt is whatever is enclosed in quotes inside the parentheses. In this case, the text `First name:` is displayed. When the user enters their name, that value is stored in the variable `first_name`.
 - > The `name` variable joins the values of two variables and adds a space between those values because of the space within quotes (" ").
 - > The `print()` command tells the computer to display something on the screen. It can be text, the value of a variable, or a combination of text and variables.
9. Save your program with the filename `python1xxx.py` (where `xxx` is your initials) inside your *PythonTest* folder by going to the *File* tab and selecting *Save As*.
 10. Now you can run your program. Go to the *Run* tab at the top of the Python editor screen, as shown in Lab Figure 15.7, and click on *Run Module*. The program should open in the Python shell and prompt you for your first name.



LAB FIGURE 15.7 The *Run* tab in the Python IDLE editor

If you get an error, go back to the editor and compare your code with the code given above. Fix any errors you find, save the changes, and try again.

11. Nothing happens until you enter something. Enter `Jackie` for the first name and enter `Cho` for the last name. Enter `123456` for the school ID number. You should see the results in the Python shell, as shown in Lab Figure 15.8.



LAB FIGURE 15.8 Results of the first Python script

Did the script work? [Yes | No]

If the script did not work, troubleshoot and edit your code as necessary until it does.

Instructor initials: _____

12. Create a new Python program. Name this new file `python2xxx.py` (where `xxx` is your initials). This new program will use a decision structure to decide whether a user is eligible for a 20%, 10%, or 0% discount on a purchase. In this program, the user will enter the cost of a purchase. If the purchase value is over \$100.00, the discount is 20%. If the purchase value is \$50.00 to \$99.99, the discount is 10%. Anything under \$50.00 is not eligible for a discount. The code for this program is as follows:

```
# prompt user for cost of purchase
cost = float(input("How much is your purchase? $ "))
# check for discount amount
if cost >= 100:
    discount = cost * .20
    percent = "20%"
elif cost >= 50:
    discount = cost * .10
    percent = "10%"
else:
    discount = 0
    percent = "0%"
# display the results
cost = cost - discount
print("You have received a " , percent, " discount")
print("Your final cost is $ ", cost)
```

13. Run the program at least three times to check that all the discount options (0%, 10%, or 20%) work. You can enter any numbers you want, but here are some suggestions for input:

```
105
87
50
34
```

If you enter **87** at the prompt, you should see the results shown in Lab Figure 15.9.

You might notice that there are some things that could be improved in this program:

- > Try entering a negative number. The program will still run, but it makes no sense to have a negative value as an input. You can fix this later as an On Your Own exercise.
- > The output shows a dollar amount but has only one decimal place where you would expect two. There are ways to deal with this issue, but they require more advanced coding, so for now, this is fine.
- > Each time you want to enter a new value, you must run the program again. By using a loop, you can allow the user to enter as many values as desired. You will add this functionality in the next step.

```

IDLE Shell 3.10.4
File Edit Shell Debug Options Window Help
Python 3.10.4 (tags/v3.10.4:9d38120, Mar 23 2022, 23:13:41) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: G:\Users\Akil\Documents\PythonTest\python2.cal.py =====
How much is your purchase? $ 87
You have received a 10% discount
Your final cost is $ 78.3
>>>
Ln: 8 Col: 0

```

LAB FIGURE 15.9 Results of the second Python script

14. Save your `python2xxx.py` file with a new filename: `python3xxx.py`. For this script, you will add a `while` loop so a user can repeat the process of entering values as often as desired.

Add the following lines to the top of the program:

```

# loop to re-enter a new value
choice = "y"
while choice == "y":

```

Next, indent each line of your previous code one time by pressing `Tab` at the start of each line.

Add the following line at the end, also indented once:

```

    choice = input("Enter another value? (y/n) ")

```

An abbreviated version of the code looks like this:

```

# loop to re-enter a new value
choice = "y"
while choice == "y":
    # prompt user for cost of purchase
    cost = float(input("How much is your purchase? $ "))
    # check for discount amount
    if cost >= 100:
        discount = cost * .20
        percent = "20%"
    ... (remainder of code)
    print("Your final cost is $ ", cost)
    choice = input("Enter another value? (y/n) ")

```

Note that your entire program from the previous file must be between the new lines. The first new line of code is a comment. The next line declares a variable named `choice` and sets its value to `y`. The `while` loop tests to see if `choice` has the value `y`. If it does, the loop is entered, and the program proceeds. After running once, you are prompted to enter `y` or `n`. Then control returns to the `while` test. If you entered `y`, the condition is true, and the program runs again. If the entry is anything other than `y`, the condition is false, and the loop statements are skipped. In this case, the program ends.

15. Now save and run your program. If you enter **63** at the first prompt, **y** at the second prompt, **245** at the third prompt, and **n** at the last prompt, you should see the results shown in Lab Figure 15.10 in the Python Shell window.

```

IDLE Shell 3.10.4
File Edit Shell Debug Options Window Help
Python 3.10.4 (tags/v3.10.4:9d38120, Mar 23 2022, 23:13:41) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: G:\Users\Akil\Documents\PythonTest\python3.cal.py =====
How much is your purchase? $ 63
You have received a 10% discount
Your final cost is $ 56.7
Enter another value? (y/n) y
How much is your purchase? $ 245
You have received a 20% discount
Your final cost is $ 196.0
Enter another value? (y/n) n
>>>
Ln: 13 Col: 0

```

LAB FIGURE 15.10 Results of the improved Python script

16. You may have noticed that the user can enter anything when prompted for a decision about whether to run the program again. If the user enters a lowercase `y`, the program loops around again. But any other entry from the keyboard will stop the program. However, the prompt specifies entering either `y` or `n`. This is done mainly for the user's sake because it seems to make more sense to allow the user to say, in effect, yes or no in answer to the question. However, you can change this by changing this line:

```
choice = input("Enter another value? (y/n) ")
```

to the following (all on the same line):

```
choice = input("Enter another value? Type y to
continue or any other key to end. ")
```

Note: Because of space constraints in this text, the code shown above appears on two lines. But you must type the whole thing on a single line.

Add this change to your program and run it again. Be sure it works correctly before continuing.

Instructor initials: _____

- 17. You may also have noticed that a user can type an uppercase Y to continue, but if that happens, the program ends. This is because computers are case-sensitive. If you want to give the user the option to use uppercase or lowercase entries, you can use a logical operator.

Change this line:

```
while choice == "y":
```

to the following:

```
while choice == "y" or choice == "Y":
```

Make this change and test your program with both upper- and lowercase entries.

Instructor initials: _____

On Your Own

Note: Most programming problems can be solved in a variety of ways. Your solution may not be exactly like your classmates’ solutions, but as long as the problem is solved, one method is not necessarily better than another. As you become more proficient with writing scripts, you may find more efficient ways to write code.

- 18. Your next task is to revise the code of your python3xxx.py file to determine whether the purchase price for a 0% discount is both less than 50.00 and greater than 0. One solution is to add an elif clause to check whether the cost entered is greater than 0 and revise the else clause so it will display a message that any other amount is invalid. Updates to the results section will also be needed. Modify the code and save it as python4xxx.py. Execute the program to test it.

Write your code here.

20. Create a new Python program, `python6xxx.py`, to assign a letter grade to a student when a numerical grade is input. The grades should be as follows:

90–100: A
80–89.99: B
70–79.99: C
60–69.99: D
Under 60: F

Write the code you used for this program.

Did the code run properly? [Yes | No]

21. Add a loop to your `python6xxx.py` program that will allow the user to enter information for as many students as desired. Save the new program as `python7xxx.py`. Test the program.

Write the modified program here.

23. Create a new Python program, `python9xxx.py`, that accepts input from the user and generates an email address, as follows:

First name: Sam

Last name: Throckmorton

Welcome Sam!

Your new email address is Sam.Throckmorton@mycollege.edu

The email address should consist of the user's first name, a dot, and the user's last name, followed by @mycollege.edu.

Write the code you used to create the program.

Did the code run properly? [Yes | No]

Instructor initials: _____

Lab 15.9 Introduction to JavaScript

Objective: To create and run JavaScript programs in a web browser

Parts: Windows computer with access to the internet and rights to download and install free software

Procedure: Complete the following steps and answer the accompanying questions.

Notes: JavaScript runs in a browser. A JavaScript program is called from a web page, which is written in HTML. Normally web pages are stored on a server and opened from the internet. However, for this lab, you will create a simple HTML file, add some JavaScript, and open your file in the browser from your computer. An HTML file is a text file. There are many HTML editors available, and many of them are free. But here you will simply use Notepad.

1. Power on the computer and log on.
2. Using File Explorer, create a folder to save your work. Name the folder *JavaScriptTest*.
3. In this step you will be creating a simple web page. All items in web pages are defined by tags, which are keywords that help organize, format, and classify content. Most tags are in pairs, with an opening tag (start tag) and a closing tag (end tag). Everything between the start and end tags will have the formatting associated with that tag. While this can be changed by a web designer, here you can accept the default formatting. All web pages start with an `<html>` start tag and end, at the very bottom of the page, with a `</html>` end tag. Notice that an end tag begins with a slash (/). All web pages have two important parts: a head section and a body section. The head section includes information needed by the browser that is not seen by the user. The body section is where the content within the browser is displayed.

Open Notepad or any other text editor. Type the following text into Notepad to create the web page:

Note: It is very important that you type all punctuation correctly. Also, in the third line from the bottom, `<h1>` and `</h1>` have the number 1 after the h, not a lowercase L.

```
<html lang="en">
<head>
    <meta charset="utf-8" />
    <title>First JavaScript Program</title>
</head>
<body>
    <h1>My First JavaScript Program</h1>

</body>
</html>
```

The `<html>` tag in the first line contains the attribute `lang="en"`. Attributes provide additional formatting and descriptive information associated with the tag. Not all tags contain attributes. The `lang="en"` attribute in this example sets the default language of the page to English, which is important for programs such as screen readers and search engines that may read the page.

The third line, `<meta charset="utf-8" />`, specifies the character set. In this case, `utf-8` is capable of encoding all the characters in Unicode. ASCII is a subset of Unicode. Note that the `meta` tag is a type of tag called an empty tag because it has no end tag. Instead, there is a slash before the closing angle bracket (`>`).

The next line uses the `<title></title>` tag pair to define a page title. The page title is the text that shows up in your browser on the very top whenever you go to a web page. This web page will have `First JavaScript Program` as its title.

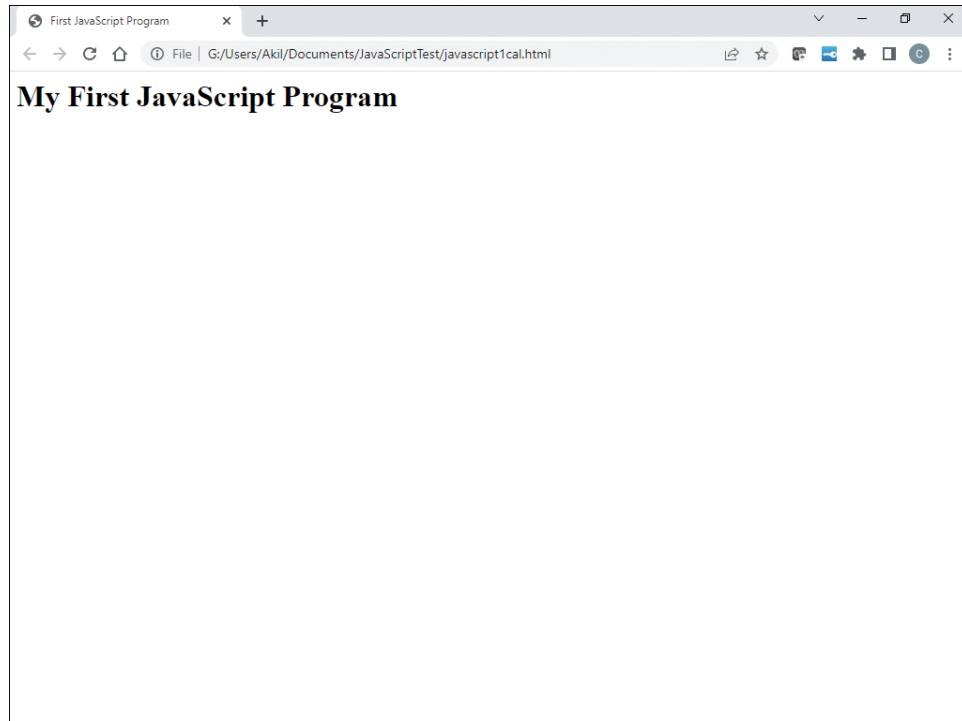
The head section must be closed with the `</head>` end tag before the body section begins with the `<body>` start tag. Anything between `<body>` and `</body>` will be visible when the page is opened in a browser.

This web page has one line only. The text `My First JavaScript Program` will be displayed. Since it is enclosed in `<h1></h1>` tags, by default the text will be large and black. Other tag pairs can be used for different formats.

4. *Note:* Read this entire step before taking action.

Save your file inside the `JavaScriptTest` folder with the filename `javascript1xxx.html`, where `xxx` is your initials. In the Notepad *Save As* window, be sure to use the drop-down menu under *Save as type* to select the *All Files* option. Also, be sure to save your file with the `.html` extension by including the file extension (`.html`) as part of the filename. If you let Notepad use the default extension (`.txt`), your file will not be a web page.

5. Now open your web page in a browser by right-clicking on the `javascript1xxx.html` file in File Explorer and use the *Open With* option to select a web browser such as Microsoft Edge or Google Chrome. If you have done everything correctly, you should see in your browser a page like the one in Lab Figure 15.11.



LAB FIGURE 15.11 HTML code in the Edge browser

Notice the page title in the upper-left corner. Notice the path to the file in the browser's address bar. In this case, the path is `G:/Users/Akil/Documents/JavascriptTest/javascript1cal.html`, but your path will be slightly different, depending on where you saved your file (and your own initials, of course). If your web page appeared properly, you are now ready to add some JavaScript. If it did not appear properly, correct the code using Notepad and rerun it until it does.

Did the proper web page appear? [Yes | No]

Instructor initials: _____

6. In this first JavaScript program, you will return to Notepad and create a button that the user will click to start the JavaScript program. The button and the area where the result of the JavaScript code will appear are enclosed in `<p></p>` tags. The button is nested inside the `<p></p>` tags and enclosed in `<button></button>` tags.

In Notepad, enter the following code under the first line of the body (`<h1>My First JavaScript Program</h1>`):

```
<p>
    <button type = "button" onclick = "welcome()">Click me</button>
    <span id="greet">&nbsp;</span>
</p>
```

Note: While character spacing and line spacing are not essential in JavaScript or HTML, it is important to follow standard spacing and indentation conventions to make reading and debugging code easier: separate operators like `+` and `=` with a space and indent all JavaScript statements inside functions as demonstrated in the next step.

This code puts a *Click me* button on the web page. A space for the result is identified by `id="greet"`, and the result will be placed in the area between the `` tags. When the page initially loads, there is nothing in this space. The entity ` ` is simply a placeholder. It stands for “non-breaking space.”

7. Run the updated program. If you see the *Click me* button, click it. If you do not see the *Click me* button, redo the code. Do not proceed until you see the *Click me* button.

Does the *Click me* button appear? [Yes | No]

Instructor initials: _____

8. Return to Notepad to edit the web page. In the head section, under the `<title>First JavaScript Program</title>` line, add this JavaScript code:

```
<script type = "text/javascript">
    function welcome()
    {
        var name = prompt("What's your name?");
        var greeting = ("Hello there, " + name + "!");
        document.getElementById('greet').innerHTML = greeting;
    }
</script>
```

JavaScript scripts (or programs) are enclosed in `<script></script>` tags. In this small script, the code defines a function named `welcome()`. When the button on the HTML page is clicked, control transfers to the `welcome()` function. All the code to be executed when the `welcome()` function is called is contained between an opening curly brace (`{`) and a closing curly brace (`}`).

The first line of the function declares a variable named `name`. A variable is a named memory location that stores data. In a script, variables are declared in order to tell the JavaScript interpreter to create the memory location that will store the value. A prompt will appear on the screen with the text `What's Your Name?`, and execution of the code will pause until the user types in a name. That value is stored in the variable `name`.

The next line declares a second variable, named `greeting`. The value of `greeting` consists of text (`"Hello there, "`) joined with the value of `name` and then joined with an exclamation point.

Note: The text to be displayed includes a space after the comma. A space is considered a character. Without the space, the output would be something like this:

```
Hello there,Chris!
```

when what you want is this, in order to make the output more readable:

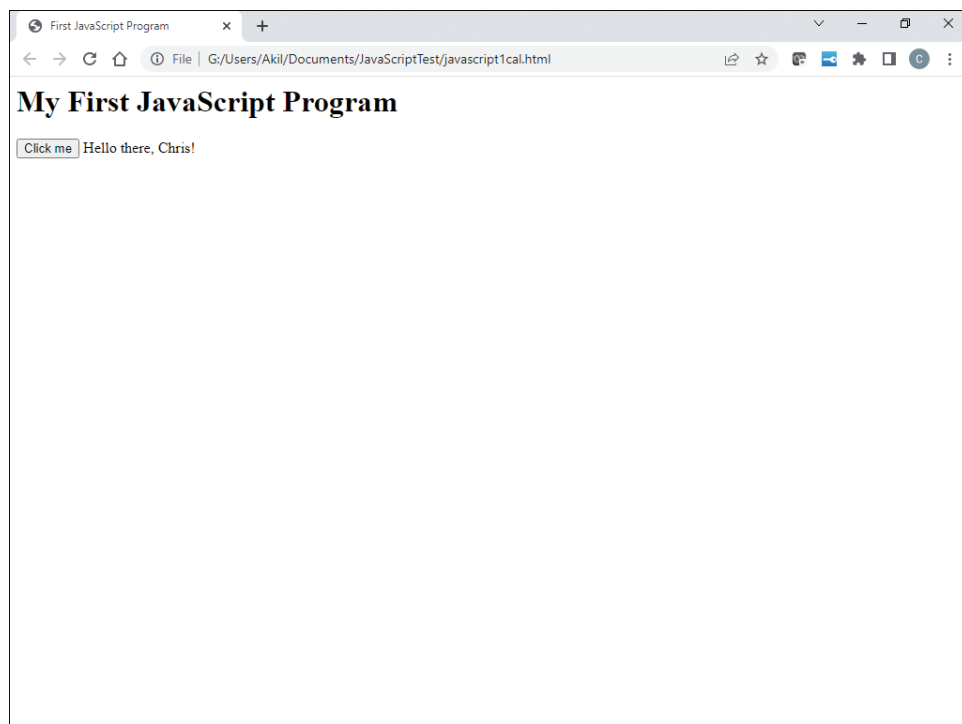
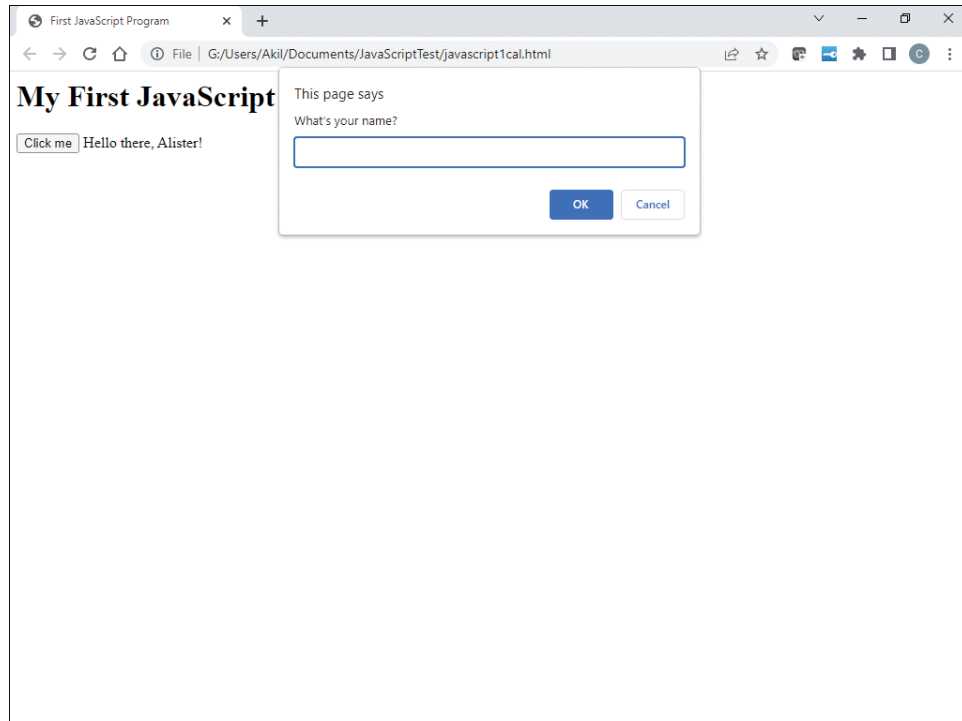
```
Hello there, Chris!
```

The last line of the function outputs the value `greeting` into the space on the web page identified by `id="greet"`. This line has several parts:

```
document.getElementById('greet').innerHTML = greeting;
```

The word `document` refers to an object that represents the current web page. `getElementById()` is a JavaScript function that tells the computer to look for an element with a tag on the page with the `id` attribute that matches what is inside the parentheses. In this case, it is the `` tag with `id="greet"` attribute. The variable `greeting`, which is on the right side of this statement, is assigned to the `innerHTML` property of the element on the left side of the statement using the equal (`=`) sign. This is one way for JavaScript to tell the computer to replace whatever currently is in the `` element with the value of the variable `greeting`.

9. Save your new file with the filename `javascript2xxx.html` inside your JavaScript Test folder. Now open the file in a browser as you did before.
10. Click the *Click me* button. Enter your name and see if it works. If your name is Chris, you should see the prompt and, after you enter **Chris**, the screen should display the correct greeting. Compare your results to Lab Figure 15.12 (which shows the page opened in Edge).



LAB FIGURE 15.12 Enhanced JavaScript program with a button and a prompt

11. Now create a JavaScript program that allows the user to enter two numbers and either add or multiply them. You can start with your first program and make the following changes to the HTML body:
 - > Change the page title to **Second JavaScript Program**.
 - > Change the `<h1></h1>` contents to **Second JavaScript Program**.
 - > In the `<button>` section, change the text on the button from `Click me` to **Do the math!**.

- > In the next step, you'll create a new JavaScript function named `do_math()`. Therefore, in the `on-click=` section of the HTML body, change `welcome()` to `do_math()`.
 - > Change the `id` attribute of the `span` element from `greet` to `'calc'`.
12. Between the `<script></script>` tags in the head section, replace the `welcome()` function with the following `do_math()` function:

```
function do_math()
{
    var num1 = parseFloat(prompt("Enter the first number: "));
    var num2 = parseFloat(prompt("Enter the second number: "));
    var result = prompt("Enter A to add the numbers or M to
multiply them: ");
    if (result == 'A')
        var answer = num1 + num2;
    else if (result == 'M')
        var answer = num1 * num2;
    else
        var answer = "Invalid entry";
    document.getElementById('calc').innerHTML = "The result is " +
answer;
}
```

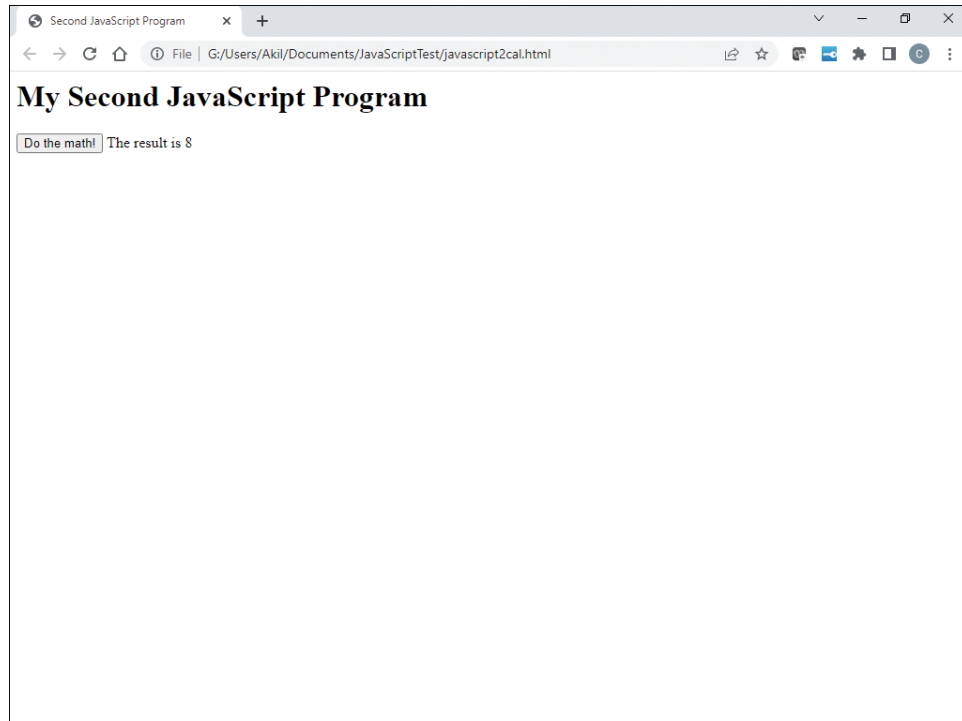
JavaScript does not have strict rules regarding spacing or indentation. In fact, a whole program could be typed on a single line, although this would never be a good idea since the resulting code would be difficult to read. The spacing and indentation you see in the code shown here follows standard coding conventions for readability, which is helpful for developers during debugging. You should make every effort to follow these conventions in your own code.

13. Save this new file inside your *JavaScript Test* folder with the filename `javascript3xxx.html`. There are a few new things worth discussing in this program:
- > It uses an `if/else` decision structure to determine whether to add the numbers or multiply them. It also validates the user input by displaying the error message *Invalid entry* if the user has not selected either `A` to add or `M` to multiply.
 - > You will notice that the `prompt()` statements are enclosed in the JavaScript function `parseFloat()`. When a user types in anything in response to a prompt, it is automatically stored as a string (a sequence of text that is not interpreted as numbers). But, in order to do mathematical calculations, numerical digits must be stored as numbers. The `parseFloat()` function changes the text the user has entered into a floating-point number (a number with a decimal point).
14. Run your new program in a browser. Click on the *Do the math!* button. If the button is not there, redo the code until it appears. Do not proceed until the button appears.

Does the *Do the Math!* button work properly? [Yes | No]

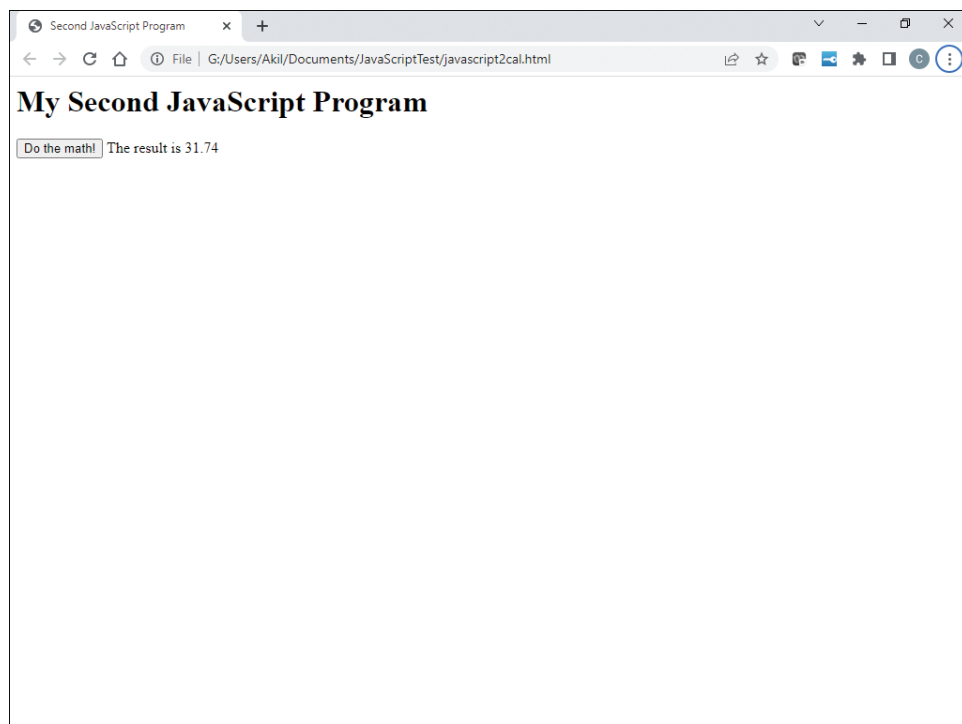
Instructor initials: _____

15. Enter `3` and `5` for the two numbers and `A` to add (ensuring that it is a capital `A`). Lab Figure 15.13 shows the results you should see, given the inputs listed. If you do not see this output, redo your code until you do.



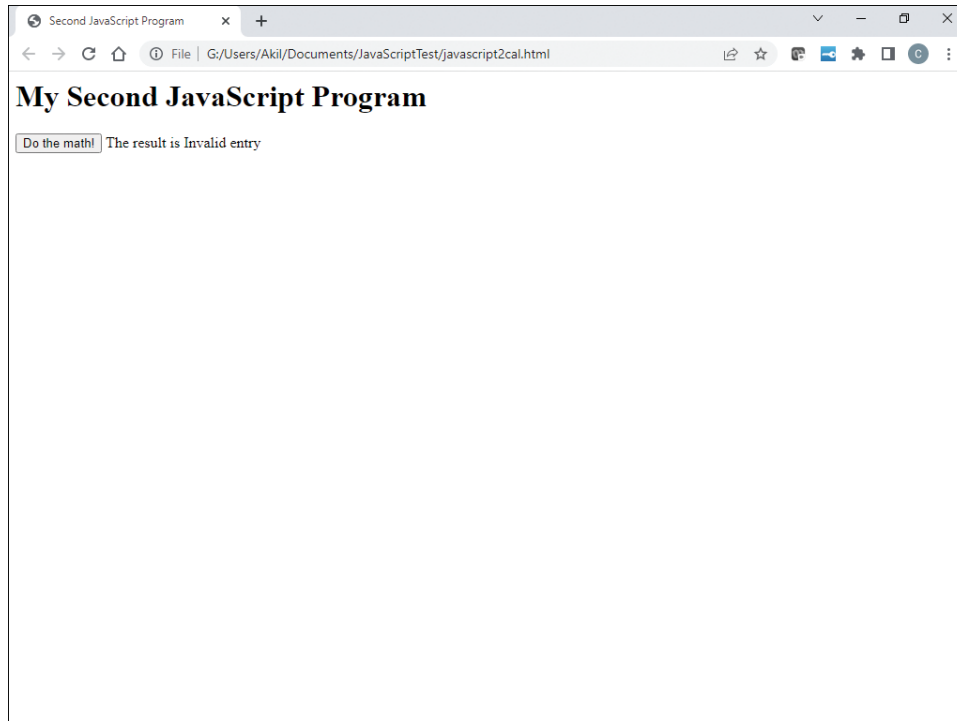
LAB FIGURE 15.13 JavaScript math program using addition

16. Click the *Do the math!* button again. Enter **4 . 6** and **6 . 9** for the two numbers and **M** to multiply (ensuring that it is a capital M). Lab Figure 15.14 shows what you should see now.



LAB FIGURE 15.14 JavaScript math program using multiplication

17. Click on the *Do the math!* button again. Enter **35** and **63** for the two numbers and **m** to multiply. Note that the lowercase m is intentional so you can see the result shown in Lab Figure 15.15.



LAB FIGURE 15.15 JavaScript math program, with an error due to case

18. To deal with the situation that arose in Lab Figure 15.15, where a lowercase letter is entered instead of the required uppercase letter, you can add a logical OR (| |) operator to ensure that both lowercase and uppercase entries are valid. Change the `if` statement in your program as shown below:

```
if (result == 'A' || result == 'a')
```

and change the `else if` as shown here:

```
else if (result == 'M' || result == 'm')
```

There are a few things to be careful about when you make these changes:

- > You can enclose the text within the conditions with either double or single quotes (" " or ' '), but whichever you choose, it should be consistent.
- > The entire condition must be enclosed in parentheses.
- > The two sides of the OR symbol (| |) must be complete conditions.

Consider these examples:

```
if (result == "A" || result == "a") is not correct.
```

```
if (result == 'A') || (result == "a") is not correct.
```

```
if (result == 'A' || 'a') will not work.
```

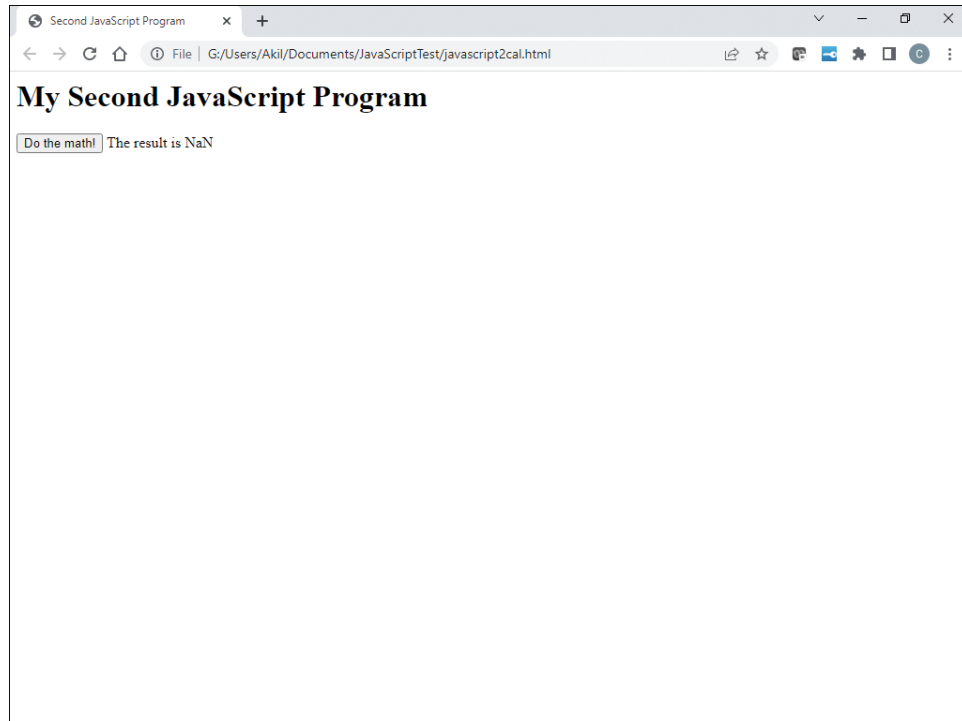
Save your file again with the new filename `javascript4xxx.html`, and run the program several times to make sure all of the entries (A, a, M, and m) are now valid. Troubleshoot your code until it works before proceeding.

Does the *Do the math!* button work with lowercase letters now? [Yes | No]

Instructor initials: _____

19. Click on the *Do the math!* button again. Enter **two** and **six** for the two numbers and **A** to add.

In Lab Figure 15.16, the result is shown as NaN. This stands for “not a number,” and it is what you get when the JavaScript `parseFloat()` function attempts to convert text that has no numerical value to a number. To avoid the NaN error, a developer can validate the input by checking if the value stored in `num1` or `num2` was an actual number and, if necessary, prompt the user for a valid entry.



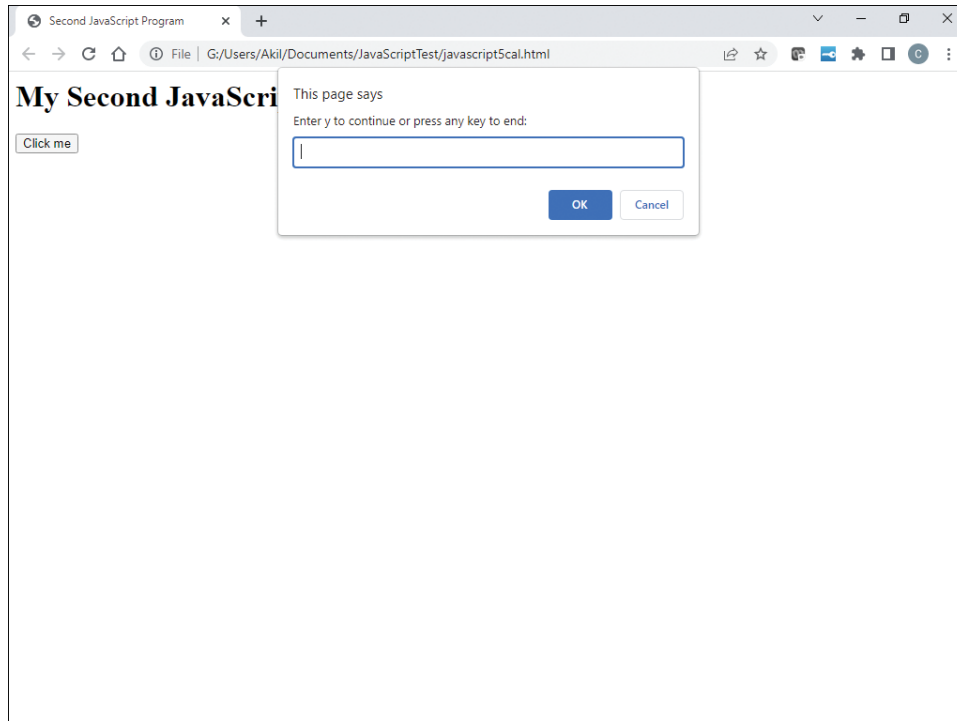
LAB FIGURE 15.16 JavaScript math program, with invalid entries

20. Now you will add a loop to this program to allow the user to run the program as often as desired without having to use the *Back* button or refresh the screen. To do this, you need to add a variable, `rerun`, and set its initial value to `y`. Then you open a `while` loop and enclose the entire block of statements in the loop within curly braces (`{ }`). You will also call the `alert` function to display an alert box containing the result, followed by a prompt asking the user if the program should run again.

The new `do_math` code looks like this:

```
function do_math()
{
    var rerun = 'y';
    while (rerun == 'y' || rerun == 'Y')
    {
        var num1= parseInt(prompt("Enter the first number: "));
        var num2 = parseInt(prompt("Enter the second number: "));
        var result = prompt("Enter A to add the numbers or M to multiply them: ");
        if (result == 'A' || result == 'a')
            var answer = num1 + num2;
        else if (result == 'M' || result == 'm')
            var answer = num1 * num2;
        else
            var answer = "Invalid entry";
        alert("The result is " + answer);
        rerun = prompt("Enter y or Y to continue or enter any other value to end: ");
    }
}
```


Note the two closing curly braces at the end. One closes the `while` loop, and the other closes the `do_math()` function; the indentation should help make this clear. The `parseInt()` function changes any value the user has typed into an integer, if possible. The `parseFloat` function performed a similar conversion in `javascript3xxx.html` in step 13. Save this program as `javascript5xxx.html` and run it in a browser. After you enter two numbers and get the result, you should see a screen like the one in Lab Figure 15.17.



LAB FIGURE 15.17 JavaScript math program with a repeat option

Test your loop by entering **y** and making sure the program runs again.

Does the prompt appear, allowing you to rerun the program? [Yes | No]

Instructor initials: _____

On Your Own

Note: With all scripting languages, there are multiple ways to solve most programming problems. As you become more proficient with writing code, you may find new or more efficient ways to solve problems.

21. Run the `javascript3xxx.html` or `javascript4xxx.html` program, enter the values `3.3` and `3.3`, and select the option to multiply. What is the result? Did you get what you expected? Why or why not? Use the internet to research how floating-point numbers are stored. See if you can explain why the results of doing math with floating-point numbers is not truly accurate.

The expected value is 10.89, but the result is more like 10.889999999999999. Floating-point numbers are stored as sign-exponent-mantissa, and math done with them can never be 100% accurate because of the way decimal (fractional) values are stored. To get a better answer, you would need to specify how many decimal places you want the numbers to use.

22. Change the code of your `javascript3xxx.html` or `javascript4xxx.html` file to offer the user the option to subtract the two numbers. Provide the code that you changed to make this work.

Instructor initials: _____

- 23.** Change the input prompts in the `javascript3xxx.html` file to use integers instead of floating-point numbers. Save this file as `javascript6xxx.html`. Use the `parseInt()` function instead of the `parseFloat()` function. Make sure the program works when integers are input by the user.

Provide the code that you changed to make this work.

Instructor initials: _____

- 24.** Try entering the following in your `javascript6xxx.html` program: **4.5**, **2**, and **M**.

What is the result? Is it what you would expect? Can you explain what happened? Do some research on the internet to find out what happens when a floating-point number is entered in JavaScript when an integer is expected.

- 25.** Consider the `do_math()` function.

What special circumstances might arise if you attempt to include the option to divide two numbers?

16 Advanced Windows Labs



Lab 16.1 Creating a Bootable Windows 10/11 USB Flash Drive

Objective: To be able to create a bootable Windows flash drive. You will need a bootable Windows flash drive in subsequent labs.

Parts: A Windows 10 or Windows 11 computer with access to the internet.
8 GB or higher flash drive (which will be wiped)

Note: The screens may appear a little differently due to Windows updates.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Ensure that the USB flash drive does not contain any data that needs to be preserved. Note that the contents of the flash drive will be erased as part of the process.
Insert the flash drive into the computer.
2. Open *File Explorer* > *This PC*. Make note of the drive letter assigned to the flash drive.
What is the drive letter assigned to the flash drive?

3. Visit <https://www.microsoft.com/en-us/software-download/windows10> for Windows 10 or <https://www.microsoft.com/en-us/software-download/windows11> for Windows 11.
4. Find the *Create Windows 10 Installation media* (or *Create Windows 11 Installation Media*) section of the page. Click *Download Now*. A file that begins with *MediaCreationTool* is saved to your computer, most likely in the *Downloads* folder.
5. Run the file that was downloaded in step 4. If prompted, click *Yes* in the User Account Control dialog box. The Windows 10 Setup (or Windows 11 Setup) window opens.
6. Click *Accept* in the *Applicable notices and license terms* dialog box. The message *Getting a few things ready* appears for a few seconds.
7.
 - a. If you are downloading Windows 10, in the *What do you want to do?* dialog box, select *Create installation media (USB flash drive, DVD, or ISO file) for another computer*. Click *Next*. The *Select language, architecture, and edition* dialog box opens.
 - b. If you are downloading Windows 11, the *Select language and edition* dialog box opens.

8. If necessary, uncheck *Use the recommended options for this PC* and then update the options as needed. Click *Next*. The *Choose which media to use* dialog box opens.
9. Select *USB flash drive*. Click *Next*. The *Select a USB flash drive* dialog box opens.
10. *Warning*: All the contents of the USB flash drive will be erased in this step. Make sure you choose the right flash drive.

Click the flash drive that you inserted into the computer in step 1. Make sure the drive letter matches the drive letter that you recorded in step 2. Click *Next*.

The messages *Getting a few things ready* > *Downloading Windows 10* (or *Downloading Windows 11*) > *Verifying your download* > *Creating Windows 10 media* (or *Creating Windows 11 media*) appear in succession. The time required for these processes to complete depends on your computer, your flash drive, and your internet connection. You can continue to use your computer while the media is being created.

The message *Your USB flash drive is ready* appears when the creation process is complete. Click *Finish*.

11. Use a safe method to properly eject the flash drive, such as the *Safely Remove Hardware and Eject Media* tool in the notification area or *File Explorer* > *This PC* > right-click the flash drive > *Eject*.
12. Physically remove the flash drive from the PC.

Lab 16.2 Windows 10/11 Installation (Clean Install)

Objective: To install Windows 10/11 on a hard drive partition that does not have an existing operating system

Parts: A computer with the minimum hardware requirements for Windows 10/11
Windows 10/11 installation media, such as a bootable Windows 10/11 installation USB flash drive (see Lab 16.1)

Note: The screens may appear a little differently due to Windows updates.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Insert or attach the Windows 10/11 installation media.
2. Turn on the computer and configure the BIOS/UEFI to boot from the installation media.
3. Turn on or restart the computer. If the BIOS/UEFI is configured correctly, the computer boots from the installation media. Watch for the message *Press any key to boot from CD or DVD*. If you see it, immediately press any key on the keyboard. If you don't press a key quickly enough, you will have to restart the computer and try again.

The Windows Setup program starts. Select the appropriate regional options, such as language, time/currency, and keyboard/input method and click *Next*.

4. Select *Install now* to start the Windows installation.
5. Enter the Windows product key given to you by the instructor and then click *Next*. If you don't have a product key, you can select the *I don't have a product key* option.
6. Select the proper edition of Windows. Check with the instructor if you are unsure. The edition must match the Windows product key version. Click *Next*.
7. Read the Microsoft software license terms. Select (enable) the *I accept the license terms* checkbox and click *Next*. Two installation options appear for Windows: to upgrade or to perform a custom installation.
8. To install Windows as a clean installation, click the *Custom: Install Windows only (advanced)* option.
9. If a RAID or SCSI driver is needed, click *Load driver* to install it at this point. Otherwise, delete, create, or configure a partition (as needed) on which to install Windows. Select the desired partition and then click *Next*.

The Windows Setup program copies the required files and folder to the partition and then restarts the computer. When the computer boots up, Windows loads and completes the installation. The computer eventually enters the Windows Out of Box Experience (OOBE), which is similar to what a user sees if they buy a new computer and turn it on for the first time. The first dialog box in the OOBE is *Let's start with region. Is this right?*

Instructor initials: _____

10. Click *Yes* and continue with the remaining dialog boxes (keyboard, second keyboard, network, account, and so on). The dialog boxes that are presented to you depend on the edition of Windows that you selected in step 6. Contact the instructor or lab assistant for specific options to select on each dialog box.
11. Determine the type of access method, such as a username (or Microsoft account) and password. Fingerprint, facial recognition, or PIN can also be used. Contact the instructor or lab assistant for which credentials to use on the *Let's add your account* dialog box, if necessary.

Print the username or account name, if applicable.

Print the exact password to be used, with appropriate uppercase and lowercase letters, if applicable.

12. Enter options for the last dialog box, and the Windows logon or the Windows desktop eventually appears.

Instructor initials: _____

Lab 16.3 Windows 11 Upgrade

Objective: To become familiar with upgrading to Windows 11 from Windows 10

Parts: A computer with Windows 10 installed, internet access, and a user ID that has Administrator rights

Windows 11 installation media, such as a bootable Windows 11 USB flash drive (see Lab 16.1)

Procedure: Complete the following procedure.

1. Power on the computer that is to be upgraded and verify that Windows 10 loads. Log in using the user ID and password provided by the instructor or lab assistant.
2. Before proceeding, back up any important data that is on the computer. If using a virtual machine, create a snapshot that you can revert to if you run into problems.
3. Review the Windows 11 minimum requirements to make sure the computer is compatible.
4. Insert or attach the installation media.
5. Run the `setup.exe` file from the media. If prompted, click *Yes* on the *User Account Control* dialog box. The Windows 11 Setup window opens.
6. If the installer prompts you to download updates and you need to install updates, click *Next*. If you don't need to install updates, click *Change how Setup downloads update > Not right now > Next*.
7. When prompted, click *Accept* to agree to the Microsoft software license terms. The updates are downloaded and installed.
8. When the *Ready to install* dialog box appears, confirm that *Install Windows 11 Pro* (or the appropriate edition that your instructor specifies) and *Keep personal files and apps* are checked and then click *Install*.

The installation begins. The Windows Setup program updates the required files and folders to convert Windows 10 to Windows 11. This can take a few hours to complete, and during this process, the computer may reboot several times. The time required for this process to complete depends on the computer, your flash drive, and your internet connection. When the installation finishes, you will be at a Windows 11 login screen.

- Log in with the same username and password that you used in step 1. The initial login might take several minutes. Upon successful login, you will be at the Windows 11 desktop.

Instructor initials: _____

Lab 16.4 Windows Registry Modification

Objective: To modify the Windows registry when given directions to do so

Parts: A computer with Windows 10 or 11 loaded and a user ID that has Administrator rights

Note: You must be an administrator or a member of the Administrators group to change registry settings. Sometimes, Microsoft or another reliable source gives you instructions to edit the registry to fix a problem. It is important that you follow the directions exactly as stated.

Procedure: Complete the following procedure and answer the accompanying questions.

- Power on the computer and verify that Windows loads. Log onto the computer using the user ID and password provided by the instructor or lab assistant.

- Open *File Explorer*. Right-click any folder within *Documents*. If no folder exists, create one.

Which editing options are available for a folder? (Select all that apply.)

[Cut | Copy | Paste | Copy To Folder | Move To Folder | Delete | Rename | Send To]

- Click the *Start* button > type **regedit** > > *Yes*.
- Expand the `Hkey_Classes_Root` key by clicking the > (greater-than sign) beside the key.
- Scroll down to locate and expand `AllFileSystemObjects`. Note that items beginning with a character such as a . (period) appear before the alphabetized list of other objects.
- Expand the `shellex` object and locate `ContextMenuHandlers`. `shellex` is a shell extension key that lets you customize the Windows interface.
- Right-click `ContextMenuHandlers` > *New* > *Key*. When the new folder (key) appears, type **Copy To** and press . This registry modification adds a new option to the right-click menu called *Copy To*.
- With the *Copy To* object still selected in the left window, double-click the (*Default*) name in the right panel. The *Edit String* window appears.
- In the Value data textbox, type the following value exactly as shown (noting that the 0s are zeros):
{C2FBB630-2971-11D1-A18C-00C04FD75D13}
 Click OK.
- To verify that the change has occurred, open *File Explorer* and right-click any folder. In Windows 11, also click *Show more options*.

Does *Copy To folder* appear as an option? [Yes | No]

If not, redo the lab.

Instructor initials: _____

- Return to the *Registry Editor* window. Using the same process outlined in steps 4–10, create another new key under `ContextMenuHandlers` and name the key *Move To*. The value data for the *Move To* key is as follows:

{C2FBB631-2971-11D1-A18C-00C04FD75D13}

- Use *File Explorer* to create two new folders. Using the new *Copy To* and *Move To* options you just created, place a couple files into each folder.
- Delete any folders/files that you have created.
- To delete keys in the Registry Editor, select the *Copy To* option in the left panel. From the *Edit* menu option, select *Delete* and select *Yes* when asked to verify. Delete the *Move To* key using the same process.

Instructor initials: _____

- Close the *Registry Editor* window.

Lab 16.5 Backup and Restore (Windows 7)

Objective: To back up files, including the operating system, if necessary, using the Backup and Restore (Windows 7) utility

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights
A backup destination, such as a USB flash drive, an external hard drive, or a network drive

Procedure: Complete the following procedure and answer the accompanying questions.

Note: Even though only three files are backed up using this process, you can use the same process to back up the entire computer.

1. Create a new folder called *Stuff* under *Documents*.
2. Create three text files with any names and place them in the new *Stuff* folder.
3. Access *Control Panel* > *System and Security* > *Backup and Restore (Windows 7)* > *Set up backup* link. Note that if the *Set up backup* link has already been configured, the *Change Settings* link can be used to complete the lab. The *Set up backup* link takes a while to initialize.
4. Select a backup destination designated by the instructor or lab assistant > *Next* > select the *Let me choose* radio button > select *Next*.

Note: You can use the *Let Windows choose* radio button to back up the entire operating system and all the files.

5. Deselect all enabled checkboxes > expand *Local Disk (C:)* by clicking the arrow beside it > expand *Users* > expand the username used to log into the computer > expand *Documents* > select the *Stuff* folder to enable it for backup > *Next* > *Save settings and run backup* button.
6. The backup executes. Show the instructor the *Windows Backup has completed successfully* dialog box.

Instructor initials: _____

7. Delete the *Stuff* folder and the three files contained within it.

Lab 16.6 Windows Update Utility

Objective: To configure options for Windows updates.

Parts: A computer with Windows 10 or 11 loaded, a user ID that has Administrator rights, and internet access

Note: You must be an administrator or a member of the Administrators group to change Automatic Updates settings.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and verify that Windows loads. Log onto the computer using the user ID and password provided by the instructor or lab assistant.
2. Click the *Start* button > *Settings* > *Windows Update*. By default Windows is automatically updated to fix functionality, performance, and security issues. However, individual users can use *Pause updates* to temporarily suspend updates. Large organizations may turn off automatic updates altogether and apply updates manually.

Why do you think most large corporations would want to apply updates manually?

When was the last Windows update?

3. Close the *Windows Update* window.
4. Click the *Cancel* button to close the *Automatic Updates* window.

Lab 16.7 Configuring Windows 10 and 11 for Ease of Access

Objective: To configure Windows 10 or 11 for customers who need a customized environment for visual, auditory, and physical reasons

Parts: A computer with Windows 10 or 11 installed

Procedure: Complete the following procedure and answer the accompanying questions. Note that not all steps are shown, and you must explore some settings based on the question asked.

1. Access *Control Panel > Ease of Access > Ease of Access Center*.
2. Select the *Let Windows suggest settings* link. You should be on the *Get recommendations to make your computer easier to use* window.

What recommendations does Microsoft make available to someone at the workplace who has trouble seeing images on the screen because of the office lighting? You do not have to select an option on each of the five screens that presents options. You should only select an option that relates to the scenario given.

Click *Cancel* when you are done answering the question. You should be at the *Ease of Access Center* window, and you should see the *Make your computer easier to use* section and the *Explore all settings* section.

3. Use the *Explore all settings* options to answer the questions.

What is the purpose of the *Make the mouse easier to use* setting?

What is the purpose of the *Make it easier to focus on tasks* setting?

Which option do you think might be used on a Microsoft Surface tablet?

4. Return to the main *Ease of Access* Control Panel category and reselect the *Let Windows suggest settings* link. You should be on the *Get recommendations to make your computer easier to use* window. If applicable, disable (uncheck) the *Lighting conditions make it difficult to see images on my monitor* checkbox.
5. Select the *Images and text on TV are difficult to see (even when I'm wearing glasses)* checkbox. Click *Next* four times and then click *Done* to view Microsoft's recommendations.

What options are recommended (checked) by Microsoft for this situation?

6. In the *Change the color and size of mouse pointers* section, select the *Large Inverting* radio button. Click *Apply*.

7. Move the mouse and open *File Explorer*.

Describe how the mouse pointer changes.

Would office workers who do not have a visual impairment enjoy this feature?

8. Change the mouse pointer back to *Regular White*. Ensure that the Turn on or off *High Contrast when left ALT + left SHIFT + PRINT SCREEN* option and its associated checkboxes are enabled. Click *Apply*.
9. Hold down the left **[Alt]** key, and while keeping the key held down, press and hold the left **[⇧Shift]** key. While holding down both of these keys, press the **[PrtSc]** key (**[Alt]+left [⇧Shift]+PrtSc]**). Release all three keys.

What audio signal do you hear?

Based on information in the message, document how to disable the keyboard shortcut if these keys are used for another application.

10. Click *Yes*.
Describe the difference in screen appearance.
11. Use the same keys again to disable the high-contrast setting. Click *Cancel* in the *Recommended Settings* window.
12. Select the *Get recommendations to make your computer easier to use* link. Deselect the checkbox for *Images and text on TV are difficult to see (even when I'm wearing glasses)* and click *Next*.
13. In the *Dexterity* window, select the *Pens and pencils are difficult to use* checkbox. Click *Next* or *Done* until you reach Microsoft's recommendations.

What option or options are recommended (checked) by Microsoft?

Turn on Toggle Keys by holding down the **[Num Lock]** key for five seconds.

What is the Toggle Keys setting? What happens when a toggle key is pressed?

14. Open *Notepad*. Notice the appearance of the blinking cursor in the top-left corner.
15. Leave *Notepad* open and return to the *Recommended Settings* window. Notice the setting for *Set the thickness of the blinking cursor*. Change the thickness of the blinking cursor to **5**. Click *Apply*.
16. Return to *Notepad* and notice the difference in the blinking cursor.
17. Return to the *Recommended Settings* window and return the thickness to the default setting of **1** and click *Apply*. Close *Notepad*.
18. Return to the *Recommended Settings* window.

What is the *Sticky Keys* setting?

Who might benefit from the *Sticky Keys* setting?

19. Select the *Set Up Filter Keys* link.

What is the *Filter Keys* feature?

What is the default amount of time the  key has to stay pressed to toggle on *Filter Keys*?

By default, do you see a warning message, do you hear a tone, or do you get both a message and a tone when *Filter Keys* is active?

[Warning message | Tone | Both]

What is the *Bounce Keys* feature?


What is the default time between keystrokes if the *Bounce Keys* feature is enabled?

Is this setting adjustable? [Yes | No]

20. Click in the *Type text here to test settings* textbox and type **hello**.

What happened?

21. Click the *Set up Repeat Keys and Slow Keys* link.

22. Click in the *Type text here to test settings* textbox. Click and hold the  key down until it appears in the textbox. Finish typing the word **hello** in the textbox. Note that in a virtualized environment, this option does not work. If you are in such an environment, simply write *virtualization used* in answer to the question below.

What indication did you get, in addition to seeing it appear in the textbox, that the letter “took”?

Instructor initials: _____

23. Click *Cancel* to return to the *Set Up Filter Keys* screen.

What are the other settings this window offers?

24. Click *Cancel* to return to the *Ease of Access Center*.

25. Return to the *Ease of Access* Control Panel category and select the *Let Windows suggest settings* link. Return to the *Dexterity* window and clear the checkbox for the *Pens and pencils are difficult to use* option. Click *Next*.

26. On the *Hearing* window, select the *Conversations can be difficult to hear (even with a hearing aid)* checkbox. Click *Next* or *Done* until you reach the Microsoft recommendations.

What options are available?

27. Enable *Turn on visual notifications for sounds (Sound Sentry)*. Select the visual warning *Flash active window*. Click *Apply*.

28. Leave that window open and access the *Hardware and Sound* Control Panel utility in a separate window. In the *Sound* section, select the *Change system sounds* link. On the *Sounds* tab, select a Windows notification that has a speaker beside it. Click the *Test* button.

Even if your computer does not have speakers, what visual clue do you get that a sound is being made? Note that this option may not function in a virtual environment; if you are in such an environment, simply write *virtualization used* in answer to the question below.

29. Close the *Sound* window. Return to the *Recommended Settings* window. Remove the check from *Turn on visual notifications for sounds (Sound Sentry)*. Click *Apply*. Click *Cancel* to return to the *Ease of Access Center*.

30. Return to the *Ease of Access* Control Panel category and select the *Let Windows suggest settings* link. Return to the *Hearing* window and disable the *Conversations can be difficult to hear (even with a hearing aid)* option. Click *Next* to advance to the *Speech Options* screen.
31. Enable the *Other people have difficulty understanding me in a conversation (but not due to an accent)* option. Click *Next* or *Done* until you reach Microsoft's recommendations.

What is Microsoft's recommendation?

32. Click the *Completing the questionnaire again* link. Return to the *Speech* page and enable the *I have a speech impairment* checkbox. Continue to the recommendations.

Did this change Microsoft's recommendations? If so, what are the recommendations?

33. Return to the questionnaire and disable all options from the *Speech* page and click *Next* to advance to the *Reasoning* window. Select the *I have a learning disability, such as dyslexia* option. Click *Done*.

What does Microsoft recommend for this type of person?

Instructor initials: _____

34. Click *Cancel*. Ensure that all *Ease of Access* options are disabled. Close the *Ease of Access Center* window.

Lab 16.8 Windows System Restore Utility

Objective: To configure and use the System Restore utility

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights

Note: You must be an administrator to perform a system restore. If the System Restore utility has been disabled, this lab may have to be done over two class periods. One class period would be used to enable it and schedule a restore point, and the next class period to perform the system restore. Also note that an antivirus update or a Windows update might have to be reinstalled as a result of the system restore.



Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and verify that Windows loads. Log onto Windows using the user ID and password provided by the instructor or lab assistant.
2. The System Restore utility is disabled by default. In order to use System Restore, system protection has to be enabled. Open *Settings > System > About > System protection*. The *System Properties* window opens with the System Protection tab open.
3. In the *Protection Settings* window, notice that the C: drive has a protection status of off. Select the C: drive in the *Protection Settings* window and click the *Configure* button.
4. In the *Restore Settings* section, enable the *Turn on system protection* radio button. Using the *Max Usage* slide bar, adjust the drive space allocated for restore points to approximately 15% of the drive. Click the *OK* button.
5. On the *System Protection* tab, click the *Create* button to create a restore point. A *Create a restore point* dialog box will open. Name the restore point and click *Create*. The restore point is created.

What did you name the restore point?

What message did you get?

Instructor initials: _____

6. Click the *Close* button and then the *OK* button. Close the *System > About* window.
7. Hold down the  key and press the  key. In the *Run* box, enter **rstrui** and click *OK*. Note that an alternate way of bringing up System Restore is to type **rstrui** in the *Type here to search* textbox.
8. In the *System Restore* window, read the explanation of System Restore.

What are two reasons that System Restore might be used?

True or false: System Restore does not affect personal data documents. [T | F]

Can a recently installed application be affected by using the System Restore utility? [Yes | No]

9. Click the *Next* button.

Are any restore points available? If so, list the latest one. [Yes | No]

Look at the latest restore point. What type of restore point is it? [Automatic | System | Manual]

Can you create a restore point from this screen? [Yes | No]

Instructor initials: _____

Using a Restore Point

10. To use a restore point to take a system back to an earlier point in time, select the newest restore point (the first one in the list) and then click *Next*.
11. Select *Finish* to continue. Read the final warning and note.

Under what conditions can the System Restore changes not be undone?

Instructor initials: _____

12. Click *Yes* to start the restore process, which might take several minutes. The computer restarts as part of the process.
13. Log into Windows. A *System Restore* dialog box shows the status of the restoration, including the time and date to which the system has been restored. Ensure that the system works. Click the *Close* button.
14. Do not forget that after the system has been restored to an earlier time, you should install any anti-virus or Windows updates that have been affected by this system restore.

Lab 16.9 Upgrading a Hardware Driver and Using Roll Back Driver

Objective: To install an updated driver under the Windows operating system

Parts: A computer with Windows 10 or 11 installed, a user ID that has Administrator rights, and internet access

Note: In this lab, a new driver is loaded, and then the old driver is reinstalled with the Roll Back Driver feature.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by the instructor or lab assistant.
2. Select an installed hardware device whose driver you want to upgrade.

What device did you select to upgrade?

3. Open *Device Manager*.
4. Expand the hardware category that contains the device being upgraded by clicking on the arrow beside the category.
5. Right-click the device name and click the *Properties* selection.
6. Select the *Driver* tab.

What are the current *Driver Provider*, *Driver Date*, and *Driver Version* settings?

7. Download the driver to the hard drive. Note that some drivers may come in a compressed file and must be uncompressed before you can continue the procedure. Also note that drivers can have one of several extensions, such as `inf`, `exe`, `dll`, or `sys`.

What is the full path of the folder where you saved the driver file(s) on your computer?

What is the extension on the driver file(s)?

Instructor initials: _____

Installing the Driver

8. If your driver file(s) does not have the extension `exe`:
 - a. Open *Device Manager*.
 - b. Expand the hardware category that contains the device being upgraded by clicking on the arrow beside the category.
 - c. Right-click the device name and click the *Properties* selection.
 - d. Select the *Driver* tab.
 - e. Click *Update driver* and then use the *Browse my computer for drivers* link to locate the driver that you downloaded in step 7.
 - f. Click *Browse* and then locate the folder that you recorded in step 7. Click on the folder that contains the driver file(s). Click *OK*.
 - g. Click *Next*. The system installs the updated drivers.

If your driver file(s) has the extension `exe`:

- a. Use *File Explorer* to open the folder that you recorded in step 7.
 - b. Double-click the `exe` file. The system installs the updated drivers. The installation program might present dialog boxes to help you configure the new driver. Also, additional software might be installed during the driver upgrade. You might need to restart the computer.
9. Return to the *Driver* tab in *Device Manager* (see steps 3 through 6 in this lab). The *Driver Provider*, *Driver Date*, and/or *Driver Version* settings should be different.

What are the new *Driver Provider*, *Driver Date*, and *Driver Version* settings?

If the driver was not updated, repeat steps 1 through 9.

Instructor initials: _____

Using Roll Back Driver

10. In *Device Manager*, right-click the device name again and select *Properties*.
11. Click the *Driver* tab and click the *Roll Back Driver* button. Select a reason for the rollback. Click the *Yes* button to roll back the driver. The *Driver Provider*, *Driver Date*, and/or *Driver Version* settings should be the same as in step 6.

What are the *Driver Provider*, *Driver Date*, and *Driver Version* settings now?

Instructor initials: _____

12. Close all windows and power off the computer properly.

Lab 16.10 Disabling a Hardware Driver

Objective: To disable a driver under the Windows operating system

Parts: A computer with Windows 10 or 11, a user ID that has Administrator rights, and a network adapter installed

Note: In this lab, a driver is disabled and then re-enabled. Sometimes Windows can install the wrong driver, in which case the driver must be disabled and then manually reinstalled.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by the instructor or lab assistant.
2. Using *Device Manager*, expand the *Network adapters* category.

What network adapter is installed in the computer?

3. Right-click a network adapter and select the *Disable device* option.

What message displays on the screen?

4. Click the *Yes* button.

In *Device Manager*, how is a device that has its driver disabled displayed differently from any other device?

Instructor initials: _____

5. In *Device Manager*, right-click the same network adapter and select the *Enable device* option. The device is re-enabled and appears normally in the window.

6. Close the *Device Manager* window and all other windows.

Lab 16.11 Installing Hardware

Objective: To install a new hardware component under the Windows operating system

Parts: A computer with Windows 10 or 11 installed, a user ID that has Administrator rights, and access to the internet

A new device to install

Note: In this lab, the internet is used to obtain the device's installation instructions and latest device installer and/or driver, and then the new hardware device is installed.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Ensure that the computer is properly shut down.
 2. Using the internet, locate the manufacturer's instructions for installing the device.
Who is the device manufacturer?

 3. Using the internet, locate the latest device driver that is compatible with the version of Windows being used.
Does the device have an appropriate driver for the version of Windows being used? [Yes | No]
What device driver version is being downloaded?

 4. Connect the device to the computer or install it inside the computer using the proper installation procedures.
 5. Boot the computer. Usually, Windows automatically detects the new hardware and begins the Found New Hardware Wizard. If it does not present this wizard and if the hardware device vendor supplied an installation program, use that program to install the device. If no vendor-supplied installation program is available, use Device Manager or the *Add a device* link in *Devices and Printers* to install the device and install the device driver based on the device type and manufacturer's instructions.
Did the Found New Hardware Wizard begin? [Yes | No]
 6. Test the device.
- Instructor initials: _____

Lab 16.12 Installing and Removing Windows Components

Objective: To install and remove Windows components

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by your instructor or lab assistant. Ensure that the user ID is one that has Administrator rights.

Verifying and Installing Windows Features

2. Open *File Explorer*, right-click *This PC*, and select *Properties*. Select the *System protection* link. If necessary, enable system protection as follows: click on the C: drive, select *Configure*, enable the *Turn on system protection* radio button, and click *OK*.
3. Create a system restore point by clicking the *Create* button. In the description textbox, type **class** followed by the current date. Click *Create*. A dialog box appears when the restore point has been successfully created. Click *Close*.
4. Click *OK* in the System Properties window.
5. Access the *Programs* Control Panel category and select the *Turn Windows features on or off* link in the *Programs and Features* section.

List three enabled Windows features.

List three Windows features that are turned off.

6. Notice that the Internet Information Services option is controlled through this section. Expand the *Internet Information Services* option or another option that can be expanded.
7. Check with your instructor or lab assistant for a specific feature to turn on. One option would be to turn on the TFTP client if it is not enabled.

Write the name of the program to be enabled.

8. Select the checkbox for the feature to be enabled and click *OK*. Note that enabling the feature might take a few minutes.
9. Re-access the *Turn Windows features on or off* link to verify that the feature now shows as enabled.

Instructor initials: _____

10. Remove the check from the feature you just enabled and verify that the feature is disabled successfully.
11. Access the *Programs > Default Programs in the Control Panel*. Select the *Set your default programs* link.

What can be done from this window?

12. In Windows 10, click *Choose defaults by app > Microsoft Edge > Manage*. In Windows 11, select *Microsoft Edge* from the *Set defaults for applications* list. Microsoft Edge is used as an internet browser.

List the extensions that are automatically opened by Microsoft Edge.

List protocols that are automatically recognized from the address line in Internet Explorer or Microsoft Edge. Note that you might need to scroll down to see the protocols.

13. Close the Microsoft Edge settings window and return to the *Default Programs* window.
14. Select the *Associate a file type or protocol with a program > Choose default apps by file type (Choose defaults by file type in Windows 11)*.

List one program extension that does not have a program associated with it (that is, has *Choose a default* instead of a program).

15. Close the *Default Programs* window.
16. Create and save a Notepad document called *Superdog.txt*.

Document the location where this document is saved.

17. Open File Explorer and locate the *Superdog.txt* file. Select the *View* menu option.

What is the current view?

18. Select the *List* view. Reselect the *View* menu option.
In Windows 10, select *Options* (located on the far right) > *Change folder and search options* > *View* tab.

In Windows 11, click the three dots to the right of *View* > *Options* > *View* tab.

What is the current setting for *Hide extensions for known file types*? [Enabled | Disabled]

19. Ensure that the *Hide extensions for known file types* option is disabled (unchecked). Click *OK*.
20. Return to *File Explorer* and ensure that the *.txt* extension is visible on the *Superdog.txt* filename. Right-click the *Superdog.txt* filename and select *Rename*. Rename the *.txt* extension to *.cal* (or your own initials, if they are not a common file extension). When the message window appears, select *Yes*.

How did the appearance of the file change?

21. Right-click the *Superdog* filename and select *Properties*.

What application does Windows assign to open the document?

22. Click *Change* > *More apps* > *Notepad* > *OK* > *OK*.
23. Locate the *Superdog* file in *File Explorer* and double-click or double-tap the icon.

Does the file open? [Yes | No]

If so, what application opens the file?

Instructor initials: _____

24. Close the *Superdog* file. Return to the *Change default apps by file type* (*Change defaults by file type* in Windows 11) window. Scroll down until you see the extension you used when you renamed the *Superdog* filename. Show your instructor or lab assistant the file extension.

Instructor initials: _____

25. Permanently delete the file by holding down the **⇧** key while pressing **Del**. Click *Yes* to permanently delete the file.
26. On your own, create another file that ends in the same file extension. Try to open it.

What happens?

27. Close the file and permanently delete it.
28. Reopen the *System Restore* utility. Click *Next*.
29. Select the *classdate* restore point that was created at the beginning of the lab and click *Next*. Click *Finish*. Read the message that appears and click *Yes*. The *System Restore* utility restores the system to the time before this lab was started. This process can take a long time. The system reboots, and a dialog box appears, telling you whether the return to the restore point was successful. Click *Close*.
30. Reopen *Default Programs Control Panel* > *Associate a file type or protocol with a program* > *Choose default apps by file type* (*Choose defaults by file type* in Windows 11).
31. Scroll through the list.
Is the unique file extension used in this lab located in the list? [Yes | No]
32. Close all the windows.

Lab 16.13 Microsoft Management Console

Objective: To access and use the major utilities available in the Microsoft Management Console

Parts: A computer with Windows 10 or 11 installed, a user ID that has Administrator rights, and internet access

Note: You must be an administrator to utilize the Microsoft Management Console utilities.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and verify that Windows loads. Log onto Windows using the user ID and password provided by the instructor or lab assistant.

2. Right-click the *Start* button > select *Computer Management*.

Determine the subcategories for each of the major Computer Management sections. Document the subcategories in Lab Table 16.1.

LAB TABLE 16.1 Windows Computer Management console

Computer Management section	Subcategories
System Tools	
Storage	
Services and Applications	

3. Return to the *Computer Management* window and, if necessary, select the arrow beside *System Tools* to expand the section. If necessary, select the arrow beside *Shared Folders* to expand that section. Click the *Shares* folder. When the computer is in a network environment, shares allow other users on different computers to access resources on this computer. When networking is enabled, default administrative shares are created for each hard drive partition. Administrative shares can be easily identified by the \$ (dollar sign) after the share name.

List two default shares located on this machine. If none are available, document the fact.

4. If necessary, expand *Local Users and Groups* and click the *Users* folder.

List the users shown in the Computer Management window.

5. To add a new user who will have access to this computer, click the *Action* menu option and select *New User*. The New User window opens. Click the ? icon located in the upper-right corner of the window. An arrow with an attached question mark appears as a pointer. Move the pointer to inside the *User name* textbox and click. Assuming that you have an internet connection, this launches a web browser to docs.microsoft.com with an article on users and groups.
6. In the *User name* textbox, type **Keith Ellison**. In the *Full name* textbox, type **William Keith Ellison**. In the *Description* textbox, type **Brother**. In the *Password* and the *Confirm* password textboxes, type **test**. Note that if a local policy is applied, you may have to strengthen this password to something like **Test1234%**. Ensure that the *User must change password at next logon* checkbox is disabled (that is, not checked). Select the *User cannot change password* checkbox to enable this option. Select *Create* > *Close*. The Keith Ellison user icon appears in the Computer Management window.

Have a classmate verify the Keith Ellison user icon. Have the classmate double-click the icon to verify your settings. Are the settings correct? If not, redo step 6.

[Yes | No]

Classmate's printed name: _____

Classmate's signature: _____

7. Log off the computer and log back on using the Keith Ellison account with the password `test` (or the stronger password `Test1234%` if it was set).

Did the login process work correctly? If not, log back in and redo step 6. [Yes | No]

8. Log off the computer and log back in using the user ID and password given to you by the lab assistant or instructor (the original user ID and password). Access the *Computer Management* window and double-click the Keith Ellison user icon. Select the *Member Of* tab.

To what group does the Keith Ellison user automatically belong?

[Administrators | Power users | Staff | Users]

9. Click the *Add* button. The *Select Groups* window opens. In the *Enter the object names to select* text box, type **Administrators** and click the *Check Names* button. Click the *OK* button. The properties window shows that user Keith Ellison now belongs to both the Users group and the Administrator groups.

Instructor initials: _____

Click *OK*.

10. Reopen the Keith Ellison user window and select the *Profile* tab.

The *Profile* tab is used to specify a home directory for the user, run a logon script that sets specific parameters for the user, input a path that specifies where the user stores files by default, or input a shared network directory where the user's data is placed.

The *Profile Path* textbox is where you type the location of the profile using a universal naming convention (UNC) path. An example is `\\users\profiles\kellison`.

The *Logon Script* textbox is where you type the name of the logon script file (for example, `startup.bat`).

The *Local path* textbox is where you type the full path for where the user's data is stored by default. An example is `C:\users\kellison`. The *Connect* radio button is used to assign a network drive letter and specify the location of a network directory where the user's data is stored. An example is `\\users\kellisondata`.

Click the *Cancel* button to return to the *Computer Management* window. Notice that users that are disabled have a small down arrow on their icon.

Are any users disabled? [Yes | No]

11. In the *Computer Management* window, select the *Groups* folder.

List two default groups.

12. Double-click the *Administrators* group icon. The Administrators group has total control of the local machine.

Are any users listed as part of the Administrators group? If so, list them.

Fill in Lab Table 16.2 with the purpose of each group type. Use the *Help* menu item to get more information than is shown in the window.

LAB TABLE 16.2 Windows User Groups

Group	Description
Administrators	
Backup operators	
Guests	
Users	

13. Exit Help and then click the *Users* folder in the Computer Management window. Select the *Keith Ellison* user icon. Click the *X* icon or click the *Action* menu item and select *Delete*. A message appears, asking if you are sure that you want to delete this user. Click *Yes* > *Yes*.
14. Go into the *Administrators* group and verify that Keith Ellison no longer appears there.
 Have a classmate verify that the Keith Ellison user icon is deleted. Is the Keith Ellison user icon deleted? If not, redo the previous step. [Yes | No]
 Classmate's printed name: _____
 Classmate's signature: _____
 Click *Cancel*.
15. Select the *Device Manager* option in the Computer Management window. This utility can also be accessed by typing `devmgmt.msc` in a Run box, in a Search textbox, or at a command prompt. Device Manager is used to access and manage hardware devices installed on a computer. It is also used to load a new driver and to roll back to an older driver.
16. In the right panel, select the arrow by the computer name if the list is not already expanded. Expand the *Computer* category.
 Is this computer 32- or 64-bit based? [32-bit | 64-bit]
17. Expand the *Storage* category in the left pane of the Computer Management window. Select the *Disk Management* subcategory. The top window in Disk Management shows information about each disk partition, including total capacity, file system, free space percentage, and so forth. The bottom windows show the drives and partitions in graphical form.

18. Right-click the first volume (usually C:) in the upper window and select the *Properties* option. An alternative method is to select the volume and then click *Action > All Tasks > Properties*. The local disk properties window opens.
19. On an NTFS partition, the *General* tab contains a *Disk Cleanup* button that can be used to clean up temporary files and delete applications that are not being used, Windows components that are not being used, log files, and old system restores.

How much free space is on the selected drive?

Which checkboxes are enabled? (Select all that apply.) [Compress this drive to save disk space | Allow files on this drive to have contents indexed in addition to file properties]

20. Select the *Tools* tab.

What tools are listed on the *Tools* tab?

Match each of the following tools with its associated task.

- | | |
|--|---|
| <input type="checkbox"/> Disk Cleanup | a. Scans the disk for damage |
| <input type="checkbox"/> Error checking | b. Used to detect and removed unneeded files |
| <input type="checkbox"/> Defragmentation | c. Locates file clusters that are not consecutive (contiguous) and places the clusters in order |

21. Close the volume's properties window. Right-click *Disk 0*. Note that the Disk Management tool can create disk volumes, delete volumes, convert volumes to NTFS, create logical drives, and convert basic disks to dynamic disks. Chapter 7 explores these tasks in detail. Click the *Cancel* button.
22. Expand the *Services and Applications* Computer Management category. Select the *Services* subcategory. A service is an application that runs in the background; you do not see it on the taskbar. The *Services* window is used to start, stop, pause, resume, or disable a service. You must be a member of the Administrators group to use this tool.

List two services that start automatically and two services that require manual startup.

23. Double-click the *Data Usage* service. The *General* tab is used to start, stop, pause, or resume a service (depending on its current state). The buttons in the *Service status* section are used to control these actions. The *General* tab is also used to set whether the service starts when the computer boots. Select the *Startup type* down arrow to see a menu of startup options.

Instructor initials: _____

24. Close the Data Usage service's properties window without making any changes to the service and close the *Computer Management* window.

Lab 16.14 Exploring Windows Boot Options

Objective: To explore Windows boot options that are used to troubleshoot startup problems

Parts: A computer with Windows 10 or 11 installed that has the capability to boot from a USB flash drive

The user ID of a user that has Administrator rights

Windows 10 or 11 USB installation flash drive

Note: In this lab, you will boot to Recovery Console, examine commands using the command prompt, boot without startup services loaded, boot to Safe Mode, boot to Safe Mode with the command prompt, boot with boot logging enabled, and examine the `ntbtlog.txt` file.

Procedure: Complete the following procedure and answer the accompanying questions.

Recovery Environment


1. Power off the computer and insert the Windows installation USB flash drive into the computer. Power on the computer. If prompted, press a key to start Windows from the flash drive. A menu appears, with default language settings selected. Adjust the settings as needed and click *Next*. If the computer does not boot from the Windows media, the BIOS settings probably need to be adjusted.
2. Select *Repair your computer*. The Windows Recovery Environment appears. Select *Troubleshoot*. List the recovery tool options.

Which option would be used to repair a system file?

Which option do you think would be for advanced technicians who can work without a GUI?

Which option configures the system to an earlier time, such as before a Windows update?

Instructor initials: _____

3. In steps 1 and 2, you entered the Windows Recovery Environment (WinRE) by booting from the Windows installation media. WinRE is also accessible from within Windows.
Remove the flash drive from the computer. Click the left arrow at the top of the screen beside *Advanced options*. Click *Continue* to boot into Windows. Log into Windows using the user ID and password provided by your instructor or lab assistant.
In Windows 10, select *Settings > Update & Security > Recovery*. In Windows 11, select *Settings > System > Recovery*.
In the *Advanced startup* section, click *Restart now*. The computer reboots to WinRE.
4. Click the left arrow at the top of the screen beside *Advanced options*. Click *Continue* to boot into Windows. Do not log into Windows.
5. To access WinRE in a different way, press and hold the **(⇧)Shift** key. Click the  icon. While continuing to hold the **(⇧)Shift** key, click *Restart*. The computer reboots to WinRE. You can also use this method if you've already logged into Windows.
6. Click the left arrow at the top of the screen beside *Advanced options*. Click *Continue* to boot into Windows. Log into Windows using the user ID and password provided by your instructor or lab assistant.

7. To access WinRE via the command prompt, open an elevated (administrator) command prompt and enter these commands:

```
reagentc /bootore
```

```
shutdown /r
```

Click *Close*. The computer reboots to WinRE.

Using Boot Options

8. Select *Troubleshoot > Advanced options > Startup Settings > Restart*. After the restart, choose *Enable Safe Mode*. After the computer restarts, log in if necessary. The computer is in Safe Mode.

When would a technician use the Safe Mode option as opposed to the Safe Mode with Command Prompt option?

How does the look of the screen in Safe Mode differ from the look of the normal Windows desktop?

How can you easily tell you are running in Safe Mode?

9. Right-click the *Start* button > *Computer Management > expand Services and Applications > access the Services* option.

10. Notice that quite a few services are automatic services that did not start in Safe Mode.

List two services that did not automatically start because Safe Mode was used.

11. Close *Computer Management* and any *Control Panel* windows and restart Windows.

12. Access WinRE and then navigate to *Startup Settings* again.

List the boot options available.

Match each of the following definitions to the appropriate boot option:

___ Safe Mode

a. Starts the system with minimum files and drivers, and only typed commands can be used

___ Safe Mode with Command Prompt

b. Records the boot process into a text file that can later be viewed and used for troubleshooting

___ Enable Boot Logging

c. Starts the system with minimal files and drivers, including the default video drivers

___ Disable Automatic Restart on System Failure

d. Allows a technician to have time to document an error that occurs

13. Select the *Enable Boot Logging* option.

How does the desktop appear when using the *Enable Boot Logging* option?

14. Use the *Search* function to locate and access the `ntbtlog.txt` file.

List two drivers that loaded properly.

List two drivers that did not load. Note that you may have to scroll through the list to see these drivers.

Instructor initials: _____

15. Close all windows.

Lab 16.15 Windows System Configuration Utility

Objective: To use the System Configuration utility to troubleshoot boot problems

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights

Note: In this lab, you will create a shortcut to an application and then use the System Configuration utility to prevent it from loading. You will also explore various options that can be used in the System Configuration utility.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by the instructor or lab assistant. Ensure that the user ID is one that has Administrator rights.

Creating an Application Shortcut in the Startup Folder

2. Open *File Explorer*. You need to confirm that hidden items (files and folders) are shown. To do this in Windows 10, select the *View* menu option > ensure that the *Hidden items* option is enabled. In Windows 11, select the *View* menu > *Show* > ensure that the *Hidden items* option is enabled.
3. Use *File Explorer* to navigate to the folder `C:\Users\username\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Startup`, where *username* is the name you used to log into the computer.
4. In a separate *File Explorer* window, use the *Search* feature to locate the original Notepad application (`notepad.exe`) on the C: drive. It's likely in `C:\Windows`. Create a shortcut to the Notepad application and place it in the *Startup* folder that you opened in step 3.

Have a classmate verify that your shortcut exists and that it is a shortcut and not a copy of the application or the application itself.

Classmate's printed name: _____


Classmate's signature: _____

Is the icon in the Startup folder a shortcut icon? [Yes | No]

5. Restart the computer and verify that the Notepad program starts automatically when the computer boots. If it does not, redo the lab from the beginning.

Instructor initials: _____

System Configuration Utility

6. Hold down the  key and press **[R]**; type **msconfig** and press **[Enter]**. Alternatively, search for **msconfig**. The System Configuration utility window opens.

What is the purpose of the System Configuration utility?

What tabs are available in the System Configuration utility?

7. Click the *Diagnostic startup* button. Click the *Apply* button and then click the *OK* button. A System Configuration message box appears. Click the *Restart* button. When the computer restarts, log in with the same user ID used previously.

Did the Notepad application automatically start?

8. Return to the System Configuration (**msconfig**) utility. Select *Diagnostic startup* and then select *Selective startup*. Checkboxes are now available so that you can select the startup files that are to be loaded the next time the computer boots. Select the *Load startup items* checkbox. Click the *Apply* button and then click *OK*. Click the *Restart* button, and the system restarts. Log in using the same user ID and password as before.

Did the Notepad application automatically start? Why or why not? [Yes | No]

9. Return to the System Configuration utility and select the *Normal startup* option on the *General* tab.
 10. Select the *Startup* tab.
 11. Select the *Open Task Manager* link. Task Manager (*Startup* tab) opens. Select *Notepad* and click the *Disable* button.
 12. Restart the computer. When the computer restarts, log in using the same user ID and click *OK*.

Did the Notepad application automatically start? Why or why not? [Yes | No]

Reopen the System Configuration utility to determine what is different about the *General* tab. Document your observations.

Match each System Configuration utility tab to a characteristic. Note that not all characteristics are used. Each characteristic that does match a tab is used only once.

- | | |
|--------------|--|
| ___ General | a. Has an Advanced options button so that you can control the number of processors used to boot the system. |
| ___ Boot | b. Contains applications that begin every time the computer boots |
| ___ Services | c. Contains a section called Boot Loader that details operating system boot options |
| ___ Tools | d. Has an option to choose which boot files are processed |
| ___ Startup | e. Contains an Application Management option |
| | f. Provides an easy way to launch System Restore and Registry Editor |

13. Select the *General* tab and select the *Normal Startup* radio button > click *Apply* > *OK* > *Restart*. Log in using the same user ID as before.
 14. After the computer reboots, remove the shortcut to the Notepad application from the *Startup* folder.
 Is the Notepad shortcut (and not the original application) deleted? [Yes | No]

Instructor initials: _____

Lab 16.16 Halting an Application by Using Task Manager

Objective: To use Task Manager to halt an application

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights

Note: At times, it may be necessary to halt an application that is hung or stalled. Windows provides a method to accomplish this, through the Task Manager utility.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by the instructor or lab assistant. Ensure that the user ID is one that has Administrator rights.
2. Open the *Notepad* utility.
3. Open *Task Manager* by right-clicking *Start* button > select *Task Manager*.

What type of things can you view from Task Manager?

4. Select the *Processes* tab.

What applications, if any, are listed as open? Note that you might need to click the down arrow by the *More details* option.

Instructor initials: _____

5. Select the *Notepad* item in Task Manager and click the *End task* button. Notepad closes.
Could you close the Notepad application from within Task Manager? [Yes | No]
6. Close the *Task Manager* window.

Lab 16.17 Task Manager Features in Windows

Objective: To use Task Manager technical features

Parts: A computer with Windows 10 or 11 installed

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by the instructor or lab assistant. Ensure that the user ID has Administrator rights.
2. Open Task Manager by right-clicking *Start* button > select *Task Manager*. *Note:* You might have to select the *More details* link to see the Task Manager data.

Match each Task Manager tab to a characteristic. Each characteristic matches to only one tab, and all characteristics are used.

___ Processes	a. Shows the data usage of a particular application on a metered account
___ App history	b. Displays the impact an app has on the system when the system powers on
___ Users	c. Identifies which user is using a particular app or service and displays the process identifier (PID)
___ Services	d. Used to show what apps are open and the amount of CPU, memory, disk space, and power usage each one takes, as well as other information about each app
___ Performance	e. When expanded, shows the apps a particular person is using
___ Startup	f. Shows the average response time of the hard disk
___ Details	g. Indicates whether a service is running or stopped

3. Select the *Startup* tab. This tab gives a technician great insight into apps used as part of the startup process and the impact that each one has on the startup process. A device's boot time can be impacted by lengthy profiles and multiple profiles being applied in a corporate environment, but it is also impacted by apps and services during the startup process.

Do any applications show a high startup impact? If so, list one. [Yes | No]

Instructor initials: _____

4. Locate the *Last BIOS* time.

What is the last BIOS time shown?

What do you think is the significance of this value? You might want to search on the internet, if possible, to see what the value is telling you.

5. Select the *Users* tab.

A company has two shifts, and some employees use the same computer that a person on the previous shift used. Oftentimes to reduce boot times, the users will just log off but not power down the computer. Do you think if two users were logged onto the machine at the same time (but only one was actually using it), the *Task Manager > Users tab* would show both users? Why do you think this would be important to a technician? Be sure to answer both questions.

6. Open several apps and then select the *Processes* tab.

Which category has the highest percentage of utilization? [CPU | Memory | Disk | Network | GPU]

Why do you think this is the case on this particular computer?

Instructor initials: _____

7. Select the *App history* tab.

A user has complained about computer performance. A technician has been using the *App history* tab to see the applications being used. The technician noticed that the computer is a Windows 10 computer and noticed some of the app statistics. For example, Cortana has used almost 23 minutes of CPU time, and Microsoft Photos has used over 5 hours. The technician also noticed that the user had the Firefox browser up and states that this is the browser most often used, but Firefox is not shown in the Name list on the *App History* tab.

Do you think that the values for each app are relevant to computer performance? Why or why not?

Can the technician specify the point at which app data is collected on the *App History* tab? [Yes | No]

If yes, how would a technician do that?

Do you think that there is something wrong with the values shown on the *App history* tab since Firefox isn't showing up there? [Yes | No]

Can you find any way that you might make it appear?

8. Use the *Options* menu option and select *Show history for all processes*.
What changed on the App History tab?

Instructor initials: _____

9. Select the *Details* tab. By default, apps and services are listed in alphabetical order. You can click on the title of any column in order to view the items sorted by that particular parameter. For example, click on the *Memory (active private working set)* column name, and you see the apps listed, from the app that is currently using the most memory to the app that is using the least amount of memory.
What app is using the most memory and appears at the top of the list?

10. Select the *PID* column name. PID stands for process ID. Each Windows process is assigned a unique number. You can stop an application by using the `taskkill` command from the command line along with the PID.
11. Select the *Name* column heading on the *Details* tab. A technician might use this to see if there are multiple instances of a particular application running. Note that multiple browser tabs would result in multiple instances of that particular browser being listed, with details about each tab. This is normal operation. A technician would also be interested in instances of an app being open but not being used. This might be causing poor computer performance, and the particular app instance can be stopped.
12. Right-click on the name of any particular app.
List an example of when a technician might use the *Set priority > High* option.

13. Right-click on the name of an app and select *Analyze wait chain*.
What is the purpose of the *Analyze wait chain* function?

14. Click *Cancel*. Right-click on the name of an app again.
Can you terminate the app from the context menu? [Yes | No]
If yes, what option would you use? [End task | Set affinity | Create dump file]

15. Select the *Services* tab. Select the *Status* column header and scroll to the bottom to see all the services that have stopped.
List any stopped service that you are surprised is stopped or that you are surprised is a Windows service.

16. Close *Task Manager*.

Lab 16.18 Using Event Viewer

Objective: To use the Event Viewer program to troubleshoot problems

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights

Note: In this lab, you will analyze a computer event to see how to gather information using Event Viewer.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by your instructor or lab assistant. Ensure that the user ID is one that has Administrator rights.
2. Event Viewer monitors and logs various events, such as when drivers and services load (or fail to load and have problems). Right-click the *Start* button > select *Event Viewer*. The Event Viewer window opens to the *Overview and Summary* window.

How many total warning events occurred on this computer in the last 24 hours?

3. In the left pane, expand the *Windows Logs* section > select *Security*. The most recent events are listed at the top. You might need to expand the window or reduce the size of the left and right panes in order to see the center pane better. Locate and double-click on the most recent event that shows as *Logon* in the *Task Category* column.

From the *General* tab, what was the account name?

What time did the logon occur?

Was the logon successful? In other words, did Event Viewer show this as an Audit Success or as an Audit Failure? [Yes | No]

4. Close the logon event's properties window. The Audit Success line in the center pane is still selected. In the right panel, select *Attach Task To This Event*. Type your first initial and last name as the name of the basic task (for example, **clee**). Click *Next* on the following two windows.

What three actions can be taken from this screen?

5. Click *Cancel*.
6. In the left panel, select the *Application* option from the *Windows Logs* category.

What application caused the first event?

7. Select the *Windows Logs* > *Security* subcategory from the left panel.

Scroll through the list of events logged and pay attention to the *Task Category* column. What type of task categories are most common?

Does Windows log an event when a user logs off a Windows computer? [Yes | No]

8. Select the *Windows Logs* > *System* subcategory from the left panel. Double-click the first event listed. List the source of the first event.
-

9. Click the *Copy* button.
10. Open the *Notepad* application > access the *Edit* menu item > select *Paste*.

What appears in *Notepad*?

Instructor initials: _____

11. The event information can be saved as a text file and referenced later; this is especially helpful when there is a problem. Close *Notepad* without saving the document. Close the *Event Properties* window.
12. In *Event Viewer*, expand *Applications and Services Logs*. Expand the *Microsoft* folder and the *Windows* folder. Expand the *Task Scheduler* and locate and click the *Operational* event log.

What is the first informational Task Scheduler event logged? Note that on a virtual machine, there might not be an event. If this is the case, just document that you were in a virtualized environment as your answer.

13. Close *Event Viewer*.

Lab 16.19 Using Task Manager to View Performance

Objective: To use the Task Manager program to evaluate basic computer performance

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights

Note: In this lab, you will evaluate a computer event to see how to gather information using Event Viewer.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by the instructor or lab assistant. Ensure that the user ID is one that has Administrator rights.
2. Open Task Manager: Right-click the *Start* button > select *Task Manager*. *Note:* You might have to select the *More details* link to see the Task Manager data. Click the *Performance* tab to view CPU, memory, disk, network and power usage.
3. Open *Notepad*, access the internet (if possible), open a game (if possible), and start other applications.

What happens to the CPU usage, as shown in Task Manager, as each application is opened?

What is the memory usage?

What is the total physical memory?

How much memory is available?

Instructor initials: _____

4. Using Task Manager is a great way to see a snapshot of the status of two of the most important pieces of hardware: the CPU and RAM (even though the Task Manager application increases both the CPU and memory usage). If the CPU and memory utilization stay consistently high, you should add more RAM. If the CPU stays consistently level and at a high value, a more powerful processor is in order. Close all windows.

Lab 16.20 Performance and Reliability

Objective: To use Windows tools to verify performance, measure reliability, and troubleshoot startup problems

Parts: Access to Windows 10 or 11 with a user ID that has Administrator rights

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log into Windows using the user ID and password provided by your instructor or lab assistant. Ensure that this user ID has full Administrator rights.
2. Access the *System and Security* Control Panel category > *Administrative Tools* (Windows Tools in Windows 11) > double-click *Performance Monitor* > select the *Open Resource Monitor* link. The information shown on the *Overview* tab is known as the key table. It always contains a complete list of running (active) processes for the system. You can filter the data and look at the information more granularly by using the specific tabs.
3. Select the *CPU* tab. Notice the individual programs and processes listed in the *Processes* section. Select a particular process by selecting the checkbox by the process name. The top graph shows that particular process in relationship to the total CPU usage.

How many CPU threads are used by the Performance Monitor application (`perfmon.exe`)?

4. Deselect any individual process(es) in the *Processes* section. Expand the *Services* section. Notice the last column, *Average CPU*, which shows the average percentage of CPU consumption by a particular service.

What service is taking the most CPU power?

5. Select the *Memory* tab. Notice the *Commit (KB)* column, which shows the amount of virtual memory reserved by Windows for a particular process.

List two processes and the amount of virtual memory reserved by the system for each process.

6. Locate the *Working Set (KB)* column to see the amount of physical memory used by a particular process.

Which process is using the most motherboard RAM?

7. Select the *Disk* tab. Open any file and save it to a different location on the hard drive, if possible. Return to the *Disk* tab and notice the disk activity.

8. Select the *Network* tab. Connect to the internet, if possible, and then return to this tab.

How many TCP connections are active?

9. Close the *Resource Monitor* window and return to the *Performance Monitor* window.

10. Ensure that the top object, *Performance*, is selected in the left panel. Notice the *System Summary* section in the center of the right panel.

What is the available memory, in megabytes?

Scroll down to the *PhysicalDisk* section. What is the percentage of idle time?

Locate the *Processor Information* section. What is the total percentage of processor time?

11. Expand the *Monitoring Tools* object in the left panel. Select the *Performance Monitor* tool.

What is the default counter shown?

12. Select the green plus symbol (+) from the graphical menu at the top of the chart. Scroll through the counters list until you locate and select the *PhysicalDisk* counter down arrow (⌵). Click once on the *Disk Reads/sec* counter. In the *Instances of Selected Object* window, select the number that corresponds to your primary hard drive partition. Click *Add*. Continue using the same process to add the following counters:

PhysicalDisk	Disk Writes/sec
LogicalDisk	% Free Space
Memory	Available Bytes
Memory	Cache Bytes
Processor	% Processor Time (All instances)

13. Click *OK*. If a message appears, saying that one of the counters is already enabled, click *OK*.
14. Allow the system to run at least two minutes. Do things on the computer during this time. Afterward, select the *Freeze Display* menu icon that looks like a pause button on a media player.
15. In the *Change graph type* drop-down menu, select *Histogram bar*. *Change graph type* is the third icon from the left on the graphic menu at the top of the graph. Select the *Available Bytes* counter.

What is the average number of available bytes of memory?

16. Select the *Cache Bytes* counter row.

What is the maximum number of bytes in cache memory?

Look at the bar graph. Which is higher: the number of disk reads per second or the disk writes per second?

Instructor initials: _____

17. Change the graph type to the *Report* view.

Which one of these views do you think will be most used by a technician?

18. Close the *Performance Monitor* window.

19. Search for **view reliability history** and select *View reliability history* from the resulting list.

Describe any event that the system considered important enough to potentially affect the computer's reliability.

20. Close all windows.

Lab 16.21 Windows Remote Desktop Connection

Objective: To configure a computer for remote access using the Remote Desktop tool

Parts: Two computers with Windows 10 or 11 loaded and connected to the same network

Note: The Remote Desktop tool is disabled by default. You can connect to (take over) computers running only Windows Professional, Education, or Enterprise, but all Windows computers since Windows 7 can initiate the Remote Desktop connection.

You must have the ability to create users on the remote computer or must have a user ID already created and with a password assigned.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on both computers and verify that Windows loads. Log in using the user ID's and passwords provided by the instructor or lab assistant.
2. If both computers have a user ID with full Administrator rights and a password, this step can be skipped. Otherwise, this step needs to be completed on both computers.

Access *Settings > Accounts > Family & other users > Add someone else to this computer (Add account in Windows 11) > I don't have this person's sign-in information > Add a user without a Microsoft account.*

Type **tester** in the *Who's going to use this PC* textbox > type **tester** in the *Enter password* box > type **tester** in the *Re-enter password* box. Select three security questions and enter **none** as the password for each question. The **tester** account is created, and it appears in the *Other users* section of the *Family & other users* page.

In Windows 10, click *Change account type* for the **tester** account. In Windows 11, select **tester** > *Change account type*. In Windows 10 or 11, select *Administrator* as the account type and then click *OK*.

3. On both computers, right-click the *Start* button > select *System*.

Document the full device name for both computers. Note that it is very important to have the full computer name.

Computer 1 (the computer that will remotely control the other computer)

Computer 2 (the computer that will be controlled remotely)

4. On both computers, select *Remote desktop*. The *Remote Desktop* window should open.
What is the current setting for *Enable Remote Desktop* (simply *Remote Desktop* in Windows 11)?
[Off | On]
5. On both computers in the *Remote Desktop* window, set *Remote Desktop* to *On*. Click *Confirm*.
6. On both computers, access *File Explorer* (not the web browser). In the left panel, select *Network*. A message states that network discovery is turned off. Click *OK*. Another message appears, stating that network discovery and file sharing are turned off. Click inside that message and select *Turn on network discovery and file sharing > Yes, turn on network discovery and file sharing for all public networks*. Be sure to do this for both computers.
7. On computer 1, use the search function to search for **remote desktop connection** and select *Remote Desktop Connection*.
8. On computer 1 in the *Remote Desktop Connection* window, type the other computer's full computer name in the *Computer* textbox. Click *Connect*.

9. Enter a username/password. Click *Yes* on the request for a certification or if a certificate warning appears.

What happened to the remote computer?

10. Using computer 1 (which is controlling computer 2), add a new shortcut to the desktop of the remote computer. When finished, click the *Close* button (X) in the blue Remote Desktop panel located in the top center of the screen. Click *OK*.
11. Log in directly on the remote computer. That is, use the keyboard and mouse on computer 2 to log in to computer 2. Notice the new desktop shortcut.

Instructor initials: _____

12. Delete the newly installed desktop shortcut on the remote computer.
13. From computer 2, do the same procedure: Remote into computer 1, create a desktop shortcut on computer 1, release control of computer 1, and verify the desktop shortcut on computer 1.

Instructor initials: _____

14. Return the *Enable Remote Desktop* setting to the original configuration (refer to the step 4 answer).
15. Remove the `tester` user account from any computer if it was created.

Lab 16.22 Windows Task Scheduler

Objective: To become familiar with the Task Scheduler tool and the `at` command

Parts: A computer with Windows 10 or 11 installed and a user ID that has Administrator rights

Procedure: Complete the following procedure and answer the accompanying questions.

Using Task Scheduler

1. Create a Notepad file and enter the following text, including the quotation marks:


```
msg * "Attention students, faculty, and staff. Our scheduled
maintenance window will begin in 15 minutes. The server will be
down for approximately 2 hours. Thanks for your patience."
```

 Click *File > Save > Documents*. Type `maintenance_message.bat` in the Filename textbox. Select *All Files* for *Save as type*. Click *Save*. Close Notepad.

2. Search for `task` in the Search textbox and select *Task Scheduler* from the resulting list. Task Scheduler opens.

Based on the information shown in the *Overview of Task Scheduler* pane, where are tasks stored?

3. In the *Actions* pane, select *Create Basic Task*. In the *Name* textbox, type your last name > *Next*. Notice that *Trigger* is highlighted, and *Daily* is the default task frequency. Select the *One time* radio button > *Next* > set the time to start to be *5 Minutes* from the current date and time > *Next*.

What three actions can you take using this wizard?

4. Select the *Start a program* radio button and click *Next*. Click *Browse > Documents*. Select the `maintenance_message.bat` file (the `bat` extension might not be visible). Click *Open > Next > Finish*. The message should appear at the selected time.

5. Create another scheduled task that runs an application one time at a specific time. Show the instructor this task's credentials through the Task Scheduler Library and show the task working.

Document the scheduled task and start time.

Instructor initials: _____

Lab 16.23 Windows Steps Recorder

Objective: To become familiar with the Steps Recorder app

Parts: A computer with Windows 10 or 11 installed

Procedure: Complete the following procedure and answer the accompanying questions.

1. In the *Search* textbox, type **steps** and open the *Steps Recorder* app. An alternate method is to run the `psr` command or locate the app through *Accessories*. The *Steps Recorder* app can be used to show a user how to do something or have a user capture the problem they are having to share it with you in order to provide more information. The recorder can record the screen and timestamp the recording, and comments can be added.
2. Select the down arrow by the question mark. Select *Settings*. Lab Table 16.3 shows the purpose of each option.

Note: Modifications to the *Settings* options are relevant only while the app is open. They return to the default once the app is closed and have to be changed again when the app is reopened.

LAB TABLE 16.3 Steps Recorder Settings options

Option	Description
Output File	This is the default location where recordings are saved.
Enable screen capture	The Yes option is the default, which captures what is shown on the screen. The No option is used to provide a text-based description and is commonly used if there is confidential or personal information shown on the screen.
Number of recent screen captures to store	The number can be lowered to save space or increased when more screen captures are needed.

What is the default number of screen captures to store? [5 | 10 | 15 | 25]

3. Click *OK*. Open one of your favorite Windows tools. If you can't think of one, open *Task Manager*.
4. In the *Steps Recorder* window, select *Start Record*.

What options do you have while recording? (Select all that apply.)

[Continue Recording | Delete Recording | Pause Record | Stop Record | Add Notation | Add Comment]

5. Select the *Add Comment* option. Point to an interesting area of the screen and drag the window to create a rectangle around that interesting area. In the *Highlight Area and Comment* textbox that appeared, type **Help me!** And then click *OK*.
6. Select the *Stop Record* option. The resulting window has the following main sections: *Recorded Steps*, *Steps*, and *Additional Details*, including the day, time, operating system, and applications being used.

7. In the *Recorded Steps* section, select *Review the recorded steps as a slide show*.

Is Microsoft PowerPoint required to view the recording? [Yes | No]

Describe how you think this option might be used in a corporate environment.

Instructor initials: _____

8. Use the *Close* box in the upper-right corner to close the *Steps Recorder* app. When prompted to save the recording, click *No*.

17 macOS and Linux Operating Systems Labs



Lab 17.1 Using the macOS Graphical User Interface

Objective: To work with the macOS graphical user interface, including the Dock, Finder, Notification Center, and widgets

Parts: A computer with macOS installed

Procedure: Complete the following procedure and answer the accompanying questions.

1. Open a *Finder* window. On the left side, you see a sidebar containing shortcuts to different parts of the file system.
2. Right-click (or, on a trackpad, click or tap with two fingers) the *Applications* shortcut and select *Add to Dock*.

You should now have a new shortcut on the right side of the Dock.

What happens when you click it?

This type of shortcut on the Dock isn't limited to just the *Applications* folder. You can create a similar shortcut for nearly any folder or application, such as *Downloads*, *Documents*, and so on. In addition to using the method described above, you can drag and drop items to the Dock to create a shortcut.

Creating a shortcut is a quick way to get access to your applications, but what other ways could you quickly access your applications?

-
3. To remove a Dock shortcut, either to a folder or an application, simply drag it off the Dock, hold it with your cursor until it shows the word *remove* above it, and let go of it.
 4. Click the time in the menu bar to open the Notification Center. The Notification Center holds widgets, which are usually shortcuts, mini applications, or reminders.
 5. Scroll to the bottom of the Notification Center and click *Edit Widgets*.
 6. Use the *Search* field or click a category on the left side of the screen to find a widget.
 7. Add the widget to the Notification Center by hovering over the widget and clicking the + button that appears. To remove a widget, click the - button.

8. Scroll to the bottom of the Notification Center and click *Done* to exit *Edit Widgets*.

Which useful widgets did you find on the Apple widget repository?

Lab 17.2 Introduction to macOS System Preferences

Objective: To explore the macOS *System Preferences* option

Parts: A computer with macOS installed

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log in.
2. On the Dock that runs along the bottom of the window, select the *System Preferences* icon (which has the gears on it). An alternative way of getting into System Preferences is to click on the Apple icon in the upper-left corner > *System Preferences*.

3. Click once on the *General* icon.

Which of these settings is the *General* icon used for?

- a. To control how many recent items are shown in *Documents*
- b. To show how much RAM is installed
- c. To set an administrator password
- d. To view installed devices and resources

4. Click the left arrow to return to the main System Preferences window. Access the *Desktop & Screen Saver* settings. To change what the desktop looks like, ensure that the *Desktop* option at the top of the window is selected and choose either *Colors* or *Desktop Pictures* from the left menu. Then choose the specific option in the right window.
5. To select a screen saver (which is a best practice for protecting your data when you walk away from your desk for a moment), select the *Screen Saver* option from the top center of the window. Specific options are available to select on the left, and a preview displays in the right window.

What is the current setting for the screen saver to start after inactivity?

6. Click the left arrow to return to the main System Preferences window. Access the *Dock and Menu Bar* settings. Here you can control where the Dock is located on the screen, how big it is, and specialized effects for how screens close. You can also control the content and behavior of the menu bar and specify which items appear in the Control Center (which you access via the icon to the left of the date and time).
7. Click the left arrow to return to the main System Preferences window. Access the *Mission Control* settings. Mission Control gives an overview of all open applications and virtual desktops.

What keystroke is used to show Mission Control?

8. Click the left arrow to return to the main System Preferences window. Access the *Accessibility* settings, which make it possible to have the computer speak to you and for you to control the computer via voice commands. The *Spoken Content* option in the left pane allows configuration of the system voice, the speed of the voice, and what actions or items are spoken. Use the *Voice Control* option in the same pane to operate the computer by speaking to it (for example, “Undo that”).

9. Click the left arrow to return to the main System Preferences window. Access the *Security & Privacy* settings.

What is the current setting for requiring a password after the computer goes to sleep?

[Enabled | Disabled]

10. Access the *FileVault* option at the top of the screen. This option allows you to encrypt the hard drive.
11. Access the *Firewall* option at the top of the screen. In order to change these settings, you have to click the lock in the bottom-left corner. Go ahead and click the lock and enter the username and password required to make changes to the computer.
What is the current setting for the firewall? [Off | On]
12. If the firewall is currently off, select the *Turn On Firewall* option. Click the *Firewall Options* button. This is where you can block all incoming connections or put the computer in stealth mode. Click *Cancel*.
13. Click the *Advanced* button.
What is the default setting for logging out due to inactivity?
[Note enabled | 15 minutes | 30 minutes | 60 minutes | 90 minutes]
14. Click the *OK* button to return to the *Security & Privacy* settings. If you turned on the firewall in step 12, select *Turn Off Firewall* to disable it.
15. Select the *Privacy* option. Among other things, you can enable location services here for any apps that use your location. Click the lock in the bottom-left corner to lock the system and prevent further changes if it was locked when you started.
16. Click the left arrow to return to the main System Preferences window. Access *Spotlight*. These settings allow you to control where searches are performed on your computer.
17. Click the left arrow to return to the main System Preferences window. Double-click the *Displays* icon. You can use *Displays* to adjust the resolution, brightness, profile (*Presets*), and refresh rate of your display. *Presets* automatically configures settings that cameras, printers, and other displays use to ensure uniform color presentation across devices. If you have multiple displays, you will have additional options, such as extending or mirroring the displays.
18. Click the left arrow to return to the main System Preferences window. Access *Network* settings. This is where you can select and configure a wireless network. You can also configure wired, VPN, and other types of network connections.
19. Click the left arrow to return to the main System Preferences window. The *Users & Groups* section allows you to configure the computer for another user and to automatically login to apps when you login to the computer. *Screen Time* allows you to implement restrictions for younger children. You can set the correct time and configure other time-related options through the *Date & Time* icon.
20. Click the left arrow to return to the main System Preferences window. Access the *Keyboard* settings. Across the top you see *Keyboard*, *Text*, *Shortcuts*, *Input Sources*, and *Dictation*.
21. Select the *Text* option. Here, you control what typed characters will create other text or special symbols (such as the registered trademark symbol). You can also configure spell checking, capitalization, and smart quote behavior.
22. Select the *Input Sources* option from the top of the window. Click + at the bottom left of the window to see all the keyboard layouts for different languages and regions.
23. Select the *Dictation* option from the top of the window. The *Dictation* option allows the computer to convert speech to text wherever you can type.
24. Click the left arrow to return to the main System Preferences window. Review any remaining settings that you would like to explore, like *Time Machine*, *Siri*, *Startup Disk*, and *Passwords*. (See Lab 17.3 for more on working with Time Machine.)
25. Close the System Preferences window when you are finished by clicking the red circle (in which an X appears when you hover over it) in the upper-left corner.

Lab 17.3 Using the macOS Terminal and Time Machine

Objective: To work with the macOS graphical user interface, including the Dock and Finder, the command line, and Time Machine

Parts: A computer with macOS installed and a Time Machine backup drive

Procedure: Complete the following procedure and answer the accompanying questions.

1. Open the Terminal application by selecting *Finder > Applications > Utilities > Terminal*.
2. Type in the command `pwd`, and you see that you are located in the `/Users/YOURUSERNAME` directory.
3. Type the command `ls` to see what folders are in your current directory.
4. Navigate to the *Documents* folder. (If prompted, allow Terminal to have access to the folder.)

What command did you use to do this?

5. Create a blank file with the extension `.txt`. Name the file something unique that does not already exist.

What command did you use to do this?

6. If you do not have a Time Machine backup drive set up, follow these steps:
 - a. Connect an external drive to the Mac.
 - b. Open the Time Machine preferences by selecting *Finder > Applications > System Preferences > Time Machine*.
 - c. Click *Select Disk*.
 - d. Select your external drive.
 - e. Click *Use Disk*. Answer the prompts to prepare your drive for use by Time Machine. You are returned to the main Time Machine window.
 - f. Disable (that is, remove the check mark from) *Back Up Automatically*.
 - g. Enable (that is, place a check mark by) *Show Time Machine in menu bar*.
 - h. Close Time Machine preferences.
7. In the right corner of the menu bar, click the circular clock icon and select *Back Up Now*.
8. If this is the first time running a Time Machine backup on this machine, it may take a while to complete. You can check the status by clicking the same *Time Machine* icon in the menu bar. When it shows as completing a backup, return to the Terminal application.
9. Make sure you are still in the *Documents* folder and delete the file you created in step 5.

What command did you use to do this?

10. Type the command `ls` to confirm that the file was removed.
11. Open *Finder > Documents* as a second confirmation.
12. Open *Finder > Applications*.
13. Double-click the *Time Machine* icon. This should bring up the Time Machine interface, which is used to recover files.
14. In the Finder window, select the *Documents* folder on the left side. Then use the timeline on the right side to go back to the most recent Time Machine backup. Select the file you created and deleted earlier and then select *Restore* at the bottom of the screen.

Does the file appear in Documents after you click Restore? [Yes | No] If it does not, the Time Machine backup did not complete before you tried to delete the file.

Lab 17.4 Creating a Bootable Ubuntu USB Flash Drive (Live USB) Using macOS

Objective: To be able to create a bootable Linux-based flash drive

Parts: A computer with an Intel-based processor and macOS installed
4 GB or higher flash drive (which will be wiped)
A downloaded Ubuntu ISO file or access to the internet
The free balenaEtcher application or access to the internet

Note: This lab is intended only for Macs with Intel-based processors. It will not work on Macs with Apple Silicon such as the M1 chip. At the time of this writing, native Linux operating systems for Apple Silicon were still in the developmental phase. See Lab 17.5 to learn how to install a Linux virtual machine on a Mac with Apple Silicon.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Download an Ubuntu ISO file. The latest ISO can be downloaded from <http://www.ubuntu.com/download/desktop>.
2. Ensure that you have the free open source balenaEtcher application installed. You will use balenaEtcher to create the bootable Linux flash drive; this process is called “burning the ISO file onto the drive.” If you don’t already have it, download balenaEtcher from <https://etcher.io> and install it on your Mac. You may have to enable the *App Store and identified developers* option in *System Preferences > Security & Privacy > General > Allow apps downloaded from*.
3. Ensure that the USB flash drive does not contain any data that needs to be preserved and insert it into the Mac computer. Note that the contents of the flash drive will be erased as part of the process.
4. Open the *Disk Utility* tool (by using Finder or Spotlight). Select *View > Show All Devices* to show the physical disks on the Mac.
5. Locate the USB drive in the left pane. You may have to expand the external drives to see it.
6. Select the flash drive (not a volume on the flash drive) from the left menu and select *Erase* from the top toolbar.
7. Set the format type to *MS-DOS (FAT)*. Set the scheme to *GUID Partition Map*.

What Disk Utility format types are available as options?

Why do you think the Ubuntu ISO would require the MS-DOS (FAT) option?

8. Click *Erase*.
9. Start the balenaEtcher application. Click *Flash from file* to select the ISO file that was already downloaded.
10. Click *Select target* and select the flash drive as the target device.
11. Click *Flash!* to begin the burning process. If prompted, enter your password to give balenaEtcher privileged access to the flash drive. If you receive a message saying that the disk is not readable, eject the drive. Do not select the *Initialize* option.
12. Reinsert the flash drive, if necessary.
13. Hold down the **Option** key. Restart the Mac. Select the *EFI Boot* option.
14. After the USB disc loads, when the two options *Install Ubuntu* and *Try Ubuntu* appear, select the *Try Ubuntu* option to load the live USB environment.

Were you able to boot to the live USB drive? If so, show the instructor. A functioning Ubuntu environment is a requirement for subsequent labs. If you cannot get it to work, consult with your instructor.

Instructor’s initials: _____

Lab 17.5 Creating a Bootable Ubuntu USB Flash Drive (Live USB) Using Windows

Objective: To be able to create a bootable Linux-based flash drive

Parts: A Windows computer with an account that has administrator rights
4 GB or higher flash drive (which will be wiped)
A downloaded Ubuntu ISO file or access to the internet
The free balenaEtcher application or access to the internet

Note: This lab is intended only for Windows computers. It will not work on Macs. See Lab 17.4 to learn how to create a bootable Ubuntu flash drive on a Mac with Intel-based processors, or Lab 17.6 to learn how to install an Ubuntu virtual machine on a Mac with Apple Silicon or Intel-based processors.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Download an Ubuntu ISO file. The latest ISO can be downloaded from <http://www.ubuntu.com/download/desktop>.
2. Ensure that you have the free open source balenaEtcher application installed. You will use balenaEtcher to create the bootable Linux flash drive; this process is called “burning the ISO file onto the drive.” If you don’t already have it, download balenaEtcher from <https://etcher.io> and install it on your PC.
3. Ensure that the USB flash drive does not contain any data that needs to be preserved and insert it into the computer. Note that the contents of the flash drive will be erased as part of the process.
4. Start the balenaEtcher application. Click *Flash from file* to select the ISO file that was already downloaded.
5. Click *Select target* and select the flash drive as the target device.
6. Click *Flash!* to begin the burning process. If prompted, click *Yes* on the User Account Control window. If you receive a message saying that the disk is not readable, eject the drive. Do not select the *Initialize* option.
7. Reinsert the flash drive, if necessary.
8. Restart the PC and enter the BIOS/EUFI. Select the USB drive as the boot device.
9. Restart the PC. The computer boots from the USB drive. When the two options *Install Ubuntu* and *Try Ubuntu* appear, select the *Try Ubuntu* option to load the live USB environment.

Were you able to boot to the live USB drive? If so, show the instructor. A functioning Ubuntu environment is a requirement for subsequent labs. If you cannot get it to work, consult with your instructor.

Instructor’s initials: _____

Lab 17.6 Linux Virtual Machine on Apple Silicon

Objective: To be able to install a Linux virtual machine on a Mac with Apple Silicon.

Parts: A computer with an Apple Silicon processor and macOS installed
64 GB or higher free disk space on the hard drive
A downloaded Ubuntu ISO file for ARM processors or access to the internet
A UTM hypervisor application or access to the internet

Note: This lab can be modified to install Linux virtual machines on Macs with Intel-based processors.

1. Download a Ubuntu ISO file for ARM processors. At the time of this writing, only Ubuntu Server was available for ARM processors. Ubuntu Server can be downloaded from <http://www.ubuntu.com/download/server/arm>.

2. Install the UTM hypervisor application if it is not already installed on the Mac. A hypervisor is used to configure and run virtual machines on a virtual host. UTM can be downloaded from <https://mac.getutm.app>.
3. Open UTM. Select *Create a New Virtual Machine* > *Virtualize* > *Linux*.
4. Click *Browse* and select the Ubuntu Server ISO file that you downloaded in step 1.
5. Click *Continue* (*Hardware* dialog opens) > *Continue* (*Storage* dialog opens) > *Continue* (*Shared Directory* dialog opens) > *Continue* (*Summary* dialog opens). Click *Save* (UTM home screen opens).
6. Click the play button beside the new Linux virtual machine. The *GNU GRUB* window opens. After several seconds, the *Welcome* page opens.
7. Press `Return` on each of the following screens: *Welcome* > *Keyboard configuration* > *Choose type of install* > *Network connections* > *Configure proxy* > *Configure Ubuntu archive mirror*.
8. On the *Guided storage configuration* screen, press `Tab` to highlight *Done*. Press `Return`.
9. Press `Return` on the *Storage configuration* screen. The *Confirm destructive action* dialog opens. Press `Tab` and then `Return`.
10. Enter the requested information on the *Profile setup* screen. Press `Tab` and then `Return`.
11. On the *SSH Setup* and *Featured Server Snaps* screens, press `Tab` and then `Return`.
12. UTM installs the Linux Server operating system on the virtual hard disk that was created in step 5. This might take several minutes. When you see *Reboot Now* at the bottom of the screen, press `Tab` twice and then press `Return`. The screen goes blank, and a flashing cursor appears in the upper-left corner.
13. Close the Linux virtual machine window to return to the UTM home screen.
14. At the bottom of the UTM home screen, click *CD/DVD* > *Clear*.
15. Click the play button beside the new Linux virtual machine.
16. At the `ubuntu login:` prompt, enter the username and password that you created in step 10.
17. Enter the following commands:


```
$ sudo apt update
$ sudo apt install ubuntu-desktop
```

 The second command takes several minutes to run. When the *Package configuration* dialog opens, press `Tab` and then `Return`.
18. Enter the following command:


```
$ sudo reboot
```

 The virtual machine reboots with a GUI.
19. Click your user icon. Click the gear icon in the lower-right corner and select *Ubuntu on Xorg*.
20. Enter your password. The desktop appears.

Lab 17.7 Linux Command-Line Basics

Objective: To learn commands in the Linux environment

Parts: A computer with a Ubuntu Live USB drive (see Lab 17.4 or Lab 17.5) or with Ubuntu loaded (Lab 17.6)

Procedure: Complete the following procedure and answer the accompanying questions.

1. Log in with a username and password, as necessary.
2. Open the *Terminal* application. The onscreen prompt shows your username and the name of the computer.
3. Type `pwd` to determine your current directory.

4. Notice the time, which is usually displayed in the center of the top of the screen. To determine what time zone you are in, type the following commands:

```
date  
timedatectl
```

5. To find any files that have the word *timezone* in them, use the `locate` command:

```
locate timezone
```

You might get a message indicating that the `locate` command cannot be found. If necessary, run the recommended command to install `locate`, such as `sudo apt install plocate`, and then run the `locate` command again.

6. Type the following command:

```
ls
```

This command is used to list files that may be in the home directory. Items in blue are directories.

7. To show hidden files on the screen, add the `-a` option to the `ls` command. Type the following to verify whether there are any hidden files in the home directory:

```
ls -a
```

Hidden files and directories in Linux have filenames that begin with a period (`.`).

[Document any hidden files or directories.](#)

8. To make a directory, type the following exactly as it is shown, including the capital letters `CTS`:

```
mkdir CTS1133
```

9. To verify that the directory is there, use the `ls` command again by typing the following:

```
ls
```

10. To direct the operating system to move or change into that directory, you use the `cd` command. Type the following, ensuring that you type the letters `cts` in lowercase so you can see how the operating system handles this:

```
cd cts1133
```

[What happened?](#)

11. Now type the command correctly and notice how the prompt changes:

```
cd CTS1133
```

12. To move back one directory to the home directory, you use the `cd ..` command. Notice the space between the command `cd` and the two periods. You do not need a space like this in the Windows environment. Note that you can just type the `cd` command to return to the home directory no matter how many subdirectories down in the directory structure you are. For now, just move back one directory by typing the following:

```
cd ..
```

13. Move back into the `CTS1133` directory by using a command you have used previously in this lab.

[How can you tell you are in the correct directory?](#)

14. From the `CTS1133` directory, use the `touch` command to create a file (that is not going to contain any information):

```
touch fileone
```

15. Use a command you have used earlier in this lab to verify that the file has been created.

[What command did you use? \[cd | cd .. | ls | touch \]](#)

16. Create a second file by copying the first file and renaming the file at the same time, using the `cp` command:

```
cp fileone mysecondfile
```

17. Verify that there are now two files in the `CTS1133` directory (`fileone` and `mysecondfile`).
18. From the `CTS1133` directory, use the `rm` command to remove the `mysecondfile` file:

```
rm mysecondfile
```

19. Use a command used previously in the lab to move back to the home directory.

What command did you use? [`cd` | `cd ..` | `ls` | `cp`]

20. Use the `rmdir` command to remove the `CTS1133` directory:

```
rmdir CTS1133
```

What happened?

21. Use a command previously used in this lab to move back into the `CTS1133` directory. Once there, remove the file named `fileone` by using another command you have already used in this lab. Finally, return to the home directory and remove the `CTS1133` directory.

List all the commands used in this step.

22. Close the Terminal program.

Linux Operating System Challenge

23. Access the system settings. There is commonly a desktop icon for this, but you might need to do a search. Change the wallpaper to a different setting.

What setting did you use?

24. See if there is a setting you can use to configure the mouse for a left-handed person.

What setting did you use, if any?

Lab 17.8 Ubuntu Command-Line Challenge

Objective: To demonstrate knowledge of commands in the Ubuntu environment

Parts: A computer with Ubuntu loaded (Lab 17.6) or with an Ubuntu Live USB drive (see Lab 17.4 or Lab 17.5)

Procedure: Complete the following procedure and answer the accompanying questions.

1. Log in with a username and password, as necessary.
2. Open the *Terminal* application.

How did you open the Terminal?

What is the current directory your Terminal session started in, and what command did you use to find out?

3. Notice that the time in the upper-right corner of the screen is likely different from your current local time. To find what time zone the system is set to, find the file named `timezone` and see what is written in it.

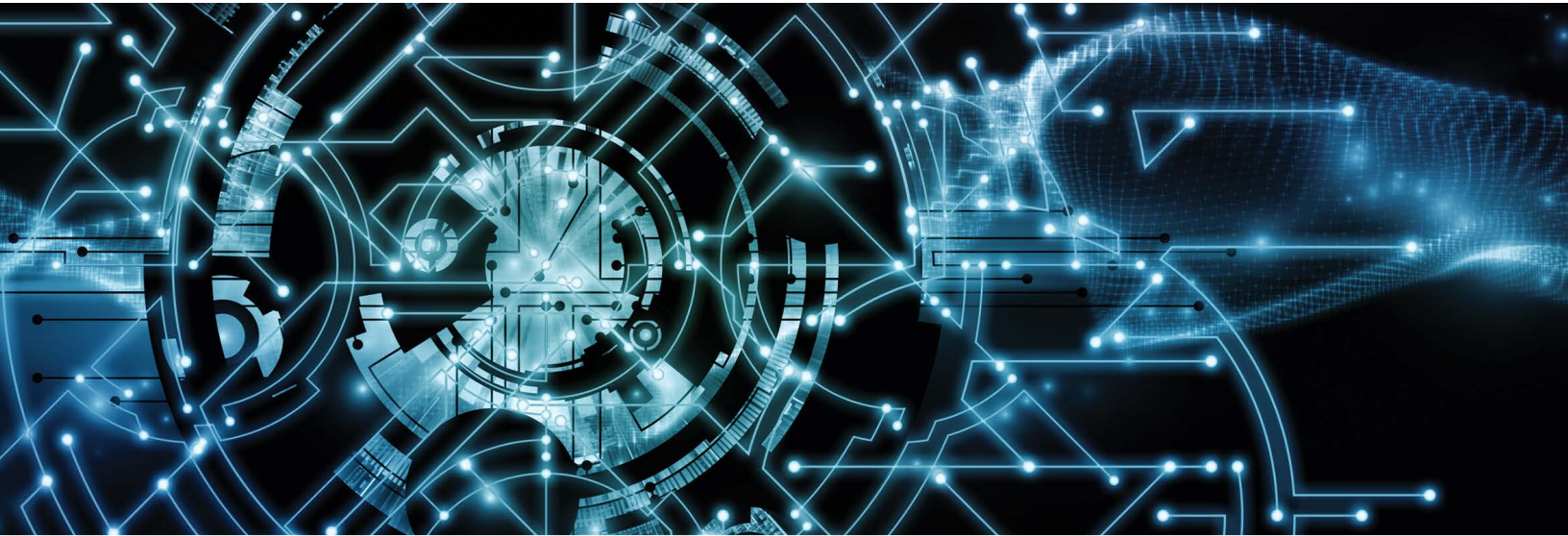
How did you find the `timezone` file, and where was it located? What did it contain?

List the commands you ran to install the `locate` command, if required.

4. Use the man page for the `apt-get` command to uninstall the `screen` utility.

What command did you use?

18 Computer and Network Security Labs



Lab 18.1 Encrypting a File and a Folder in Windows

Objective: To provide security for a particular file and folder, enable encryption using Windows 7, 8, 10, or 11.

Parts: A computer with Windows 7, 8, 10, or 11 that has at least one NTFS partition

Note: Two user accounts are needed and possibly created for this exercise: one account that encrypts a file and the other account to test the encryption. If two user accounts are not available, most of the lab can still be performed or a second user account can be added. This lab is best demonstrated with two accounts that have local administrator rights.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on using the user ID and password provided by the instructor or lab assistant.
2. Access the Computer Management console by searching for and opening *Computer Management* tool.
3. Expand the *Storage* option and select *Disk Management*.

How many disk partitions are available?

Do any drive partitions use NTFS?

If so, how many?

Note that if no drive partitions use NTFS, this exercise cannot be completed.

4. Close the *Computer Management* window. Open *Windows Explorer/File Explorer*. Create a text file called *Security Test.txt* and save it in the *Documents* folder.
5. Right-click on the *Security Test.txt* file and select *Properties*. On the *General* tab, click the *Advanced* button.

6. Enable the *Encrypt contents to secure data* option > *OK*. Select the *Apply* button, and the warning message shown in Lab Figure 18.1 appears.



LAB FIGURE 18.1 Windows encryption warning message

7. The default would be to encrypt the *Security test.txt* file and to encrypt the *Documents* folder. This is not what you want to do in this case, so select the *Encrypt the File Only* radio button > *OK* > *OK*.
8. In *Windows Explorer/File Explorer*, click an empty spot in the right pane.

Is there any indication that the file is encrypted? If so, what is it? Note that you might need to create an unencrypted file to answer this question.

9. In *Windows Explorer/File Explorer*, access the *Properties* window of the *Security Test.txt* file again. Click the *Advanced* button. In the *Advanced Attributes* window, click the *Details* button. If this is not available, ensure that you are on a file (and not a folder).

What user(s) can access the encrypted file?

10. Notice the certificate thumbprint number to the right of the user. EFS can request a digital certificate from a CA (certificate authority) such as a server. If a digital certificate from a CA is not available, EFS can use a self-signed certificate.

What are the first 16 hexadecimal digits used for the digital certificate? Note that you may have to expand the Certificate Thumbprint area in order to see the digits.

Compare these digits with the digits found by a classmate. Are the digital certificates the same? If so, why do you think they are the same? If they are different, why do you think they are different?

11. Select the *Cancel* button on three different windows to exit the *Properties* window.
12. From *Windows Explorer/File Explorer*, open the *Security Test.txt* file, modify it, and save it.

From *Windows Explorer/File Explorer*, does the file appear to still be encrypted?

13. Log off the computer and log on as a different user. If a different user does not exist, create one by using the *User Accounts* section of the Control Panel, if possible.

14. Use *Windows Explorer/File Explorer* to locate and open the *Security Test.txt* file located under the other username (commonly found in *C:\users\username\Documents*). Modify the file and save it, if possible. Look back to step 9 to determine the username.

Are there any problems opening, modifying, or saving the file?

In one or more complete sentences, explain what happened and why you think it occurred this way.

15. Log off the computer and log on as the original user.
16. Access the *Documents* folder and create a new folder called *Test*. Copy the *Security Test.txt* file into the new *Test* folder.

Is the copied file encrypted in the *Test* folder?

17. Within the *Test* folder, create a new text file called *Security Test2.txt*.

Is the newly created file encrypted?

Instructor initials: _____

18. Encrypt the *Test* folder using the default encryption setting *Encrypt the file and its parent folder (recommended)/Encrypt contents to secure data*. Apply changes to folder, subfolders, and files.

Does encrypting the folder change anything within the folder?

If so, what does it change?

19. Within the *Test* folder, create and save a new file called *Security Test3.txt*.

Is the newly created file encrypted?

20. Delete the *Security Test.txt*, *Security Test2.txt*, and *Security Test3.txt* files.

Do you get any indication that the files were encrypted when they were deleted?

21. Permanently delete the *Test* folder and any files created in the *Documents* folder.

Lab 18.2 Using Windows 7/8/10/11 System Protection

Objective: To manually control the settings involved with system restore points using System Protection

Parts: A computer with Windows 7, 8, 10, or 11 loaded with at least one NTFS partition

Note: This lab requires local administrator rights.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on using the user ID and password provided by the instructor or lab assistant.
2. Access *Windows Explorer/File Explorer*. Right-click *Computer (Windows 7)/This PC (Windows 8/10/11)* > *Properties* > *System Protection* link > *System Protection* tab.

Look at the *Protection Settings* section and document the available drives.

Document whether protection is currently on or off for each of the available drives.

3. Select *Configure*.

What options are available for *Restore Settings*?

Microsoft says, “System Protection can keep copies of system settings and previous versions of files.” Do you think this means system files, user data files, or both? Explain your reasoning.

Thinking as a technician, which setting is optimum for most users?

What is one situation in which a technician would recommend using the *Turn off system protection* option?

4. In Windows 7, ensure that the *Restore system settings and previous versions of files* radio button is selected.

In Windows 8/10/11, ensure that the *Turn on system protection* radio button is selected. Note that if the option is grayed out, cancel out of the window temporarily. Open PowerShell with the *Run as administrator* option. At the prompt, type the following:

```
Enable-ComputerRestore -Drive "C:\"
```

Return to the window to enable the *Turn on system protection* radio button and apply the setting.

By default, Windows uses a maximum of 10% of the hard drive for system protection. However, the system enables you to adjust this amount in the Disk Space Usage section. Note that if you turn off system protection, you cannot use system restore points.

What is the current *Max Usage* setting?

Describe a situation in which a technician would want to configure a machine for more than 10% of the hard disk space reserved for system protection.

5. Click *Cancel*.

On Your Own

6. Create a system restore point.

Instructor initials: _____

7. Close all windows.

Lab 18.3 Sharing a Folder in Windows 10/11 and Assigning Security Permissions

Objective: To share a folder and understand the permissions associated with a network share

Parts: Access to two Windows 10 or 11 computers with a user ID that has administrator rights

Note: You must have a password assigned to the login account for this lab to work.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on both computers and verify that the operating system loads. Log in using the same account username and password that has full administrator rights and that is provided by your instructor or lab assistant.

Document the user created on both computers that has the same password.

Username used that is the same on both computers and used to log in before doing any remaining steps: _____

2. On Computer 1, use *File Explorer* to create two subfolders within the *Documents* folder. Name the folders *READ* and *WRITE*.
3. Within the *READ* folder, create a text document called *readme*. Within the *WRITE* folder, create a text file called *changeme*.
4. Use any and all of the following to discover the computer name/device name as well as the domain or workgroup name.

- > *System Control Panel*
- > *PC Settings* link
- > *System Settings* link > *About*
- > *Advanced system settings* link (System Properties window)

Document the current settings. Write None if the information is not shown:

Original Computer 1 name: _____

Original Computer 2 name: _____

Original full Computer 1 name: _____

Original full Computer 2 name: _____

Is Computer 1 on a workgroup or domain? [workgroup | domain]

Is Computer 2 on a workgroup or domain? [workgroup | domain]

Original workgroup/domain name for Computer 1: _____

Original workgroup/domain name for Computer 2: _____

5. On Computer 1, use the *System Control Panel* to access the *Advanced system settings* link (located in the left menu). Use the *Computer name* tab > *Change* button and locate the *Member of* section and select the *Workgroup* radio button > name the workgroup something unique but remember that both computers must be within the same workgroup (that is, the workgroup name must be the same). Click *OK*, and a *Computer Name/Domain Changes* window appears. Click *OK* and/or *Close* until prompted to *Restart Now*. Do the same on Computer 2.

New workgroup name for both Computer 1 and Computer 2: _____

6. When both computers have rebooted, the current IP addresses need to be documented. Open the command prompt and type `ipconfig /all`.

On Computer 1, what is the IPv4 address on the Ethernet adapter?

On Computer 1, what is the IPv4 subnet mask?

On Computer 1, what is the default gateway?

On Computer 2, what is the IPv4 address on the Ethernet adapter?

On Computer 2, what is the IPv4 subnet mask?

On Computer 2, what is the default gateway?

7. On both computers close the *Command Prompt* window. On both computers, access the *Network and Sharing Center* Control Panel > access the *Change Advanced Sharing Settings* link in the left pane. Expand the *Private* or *Home* or *Work* profile section so you can see the sharing options. Also explore the *All Networks* section and expand it as well.

Document the current sharing and discovery settings for both computers. Note that all options may not be available in Windows Home versions, but the lab still works. You may also have to expand some sections to find them in the particular type of network currently being used.

	Computer 1	Computer 2
Network discovery	_____	_____
File sharing	_____	_____
Printer sharing	_____	_____
Password protected sharing	_____	_____
Media sharing/streaming	_____	_____
Public folder sharing	_____	_____

8. On both computers, select *Cancel*. On both computers, from the *Network and Sharing Center* section of the Control Panel, select the *Change Adapter Settings* link. Right-click *Local Area Connection* or *Ethernet Adapter* > *Properties*. Locate and select *Internet Protocol Version 4 (TCP/IPv4)* > *Properties* button.

Document the settings for Computer 1 and Computer 2:

Is Computer 1 configured with an IP address, mask, and default gateway, OR is Computer 1 configured to obtain an IP address automatically?

Is Computer 1 configured with preferred and alternate DNS server IP addresses, OR does Computer 1 obtain DNS server address information automatically?

Is Computer 2 configured with an IP address, mask, and default gateway, OR is Computer 2 configured to obtain an IP address automatically?

Is Computer 2 configured with preferred and alternate DNS server IP addresses, OR does Computer 2 obtain DNS server address information automatically?

9. On Computer 1, select the *Use the following IP address* radio button and type in the following information:
IP address: 10.1.1.1
Subnet mask: 255.255.255.0
Default gateway: 10.1.1.254
Click the *OK* button. Click the *OK/Close* button at the bottom of the *Local Area Connection Properties* screen.
 10. On Computer 2, select the *Use the following IP address* radio button and type in the following information:
IP address: 10.1.1.2
Subnet mask: 255.255.255.0
Default gateway: 10.1.1.254
Click the *OK* button. Click the *OK/Close* button at the bottom of the *Local Area Connection Properties* or *Ethernet Properties* window.
 11. On both computers, using previously described procedures, open a command prompt and use the `ipconfig` command to verify that the IPv4 address has been applied. Note that you may have to scroll up to see the IPv4 address assigned to the Ethernet adapter.
 12. From a Computer 1 command prompt, type `ping 10.1.1.2`.
What was the response? Note that the default Windows Firewall behavior is to deny pings. When File and Print Sharing is enabled, the firewall automatically enables ICMP messages that include pings.
-

Sharing and Accessing a Shared Folder

Note: This section can take a little patience, depending on the type of network the computer uses. Also note that in some settings, the network status cannot be changed to a private network in Step 13. If you do not have these, options, just make a note that it shows as a public network and make sure you use that network type to configure the settings in Step 14.

13. To configure a computer to be part of a private network, use the *Network and Sharing Center* Control Panel on both computers to locate the *View your active networks* section. On the left side, it will say *Public network* or *Private network*. If possible, select that link to change to *Private network* as this is a trusted network. Another way of putting a computer on a private network is to access the *System Control Panel > Advanced system settings* link on left > *Computer Name* tab > *Network ID* button > select the *This is a home computer, it is not part of a business network* radio button > *Next* > *Finish* > *OK* > *Restart Now* button. If the link cannot be selected, just make a note of the type of network as that is the profile area you will need to be in for step 14.

Which sharing options profile is currently being used?

[Private | Guest or Public | All networks]

14. On both computers, access the *Network and Sharing Center* Control Panel > *Change Advanced Sharing Settings* link. Configure the following settings in the appropriate profile area:

- > Network Discovery: *Turn on Network Discovery*
- > File and Print Sharing: *Turn on File and Print Sharing*

Click the *Save Changes* button.

15. At a Computer 1 command prompt, type `ping 10.1.1.2`.

What was the response? Note that the ping should be successful, and you should get a reply from 10.1.1.2 with a specific number of bytes and a time value.

Instructor initials: _____

16. On both computers, search for and access the *File Explorer Options* Control Panel > *View* tab > from within the *Advanced Settings* window, locate the *Use Sharing Wizard (Recommended)* option.

What is the current setting for the *Use Sharing Wizard* option? [Enabled | Disabled]

17. Ensure that the *Use Sharing Wizard* option is enabled. Apply changes as necessary.

18. In File Explorer on Computer 1, right-click the *READ* folder (located within the *Documents* folder) > *Properties* > *Sharing* tab.

19. Select the *Advanced Sharing* button > enable the *Share this folder* checkbox > select the *Caching* button.

What is the purpose of caching?

Is offline availability enabled by default for a shared folder? [Yes | No]

What command can be used from a command prompt to configure caching options for a shared folder? Note that you may have to refer to Chapter 15 to answer this question.

20. In the *Offline Settings* window, leave the default settings.

What is the default setting for offline access?

21. Select *Cancel*. In the *Advanced Sharing* window, click the *Permissions* button. Notice that the *Everyone* group is listed by default.

Notes: If you want to share with someone who is not listed, use the *User Accounts* section of the Control Panel to create the account; then select that account name in the *Permissions* window.

If the *Everyone* user account is selected and password protection is used, a user account is still needed to gain access.

What permissions are enabled by default for the *Everyone* group?

[Full Control | Change | Read]

22. Click *OK* on two consecutive windows.

Document the share network path that appears in the window.

23. Select the *Close* option at the bottom. While still working on Computer 1, open the *Computer Management* console. In the left window, expand *System Tools* and *Shared Folders*. Select *Shares* in the left pane. The *READ* share (along with other shares) should be listed in the right pane.

Is the *READ* share present? [Yes | No]

If the share is missing, redo this lab from the beginning. Close the *Computer Management* window.

24. On Computer 2, open *File Explorer*. Select *Network* in the left pane. Note that if you don't have a left pane, select the down arrow in the address bar to select *Network*. Locate and double-click the name of Computer 1.

Notes: If the computer does not show in the list, use the search textbox and enter `\\computer_name` (where `computer_name` is the name of Computer 1). Press **Enter**. You might also need to put the full share network path into the search textbox.

25. On Computer 2, locate the *readme.txt* document within the *READ* share. Double-click the *readme.txt* file to open it.

Does the file open? [Yes | No]

26. Add a few words to the file. Select the *File > Save* menu option. Leave the filename the same and click the *Save* button. When asked if you want to replace the file, click *Yes*.

Is the file saved? [Yes | No]

27. Click *OK*. Close the file and close the window that contains the file. Note that you cannot save it due to the read-only permission you set earlier. Click *Don't save and close all windows*.

28. On Computer 2, open *File Explorer*. Right-click *This PC* in the left pane and select *Map network drive*. Use the *Drive* drop-down menu to select a drive letter. In the *Folder* textbox, type the share path for the *READ* share documented in step 22. Click *Finish*. The share opens with the drive letter documented in the path at the top of the window.

Which drive letter was selected?

Instructor initials: _____

29. On Computer 2, again access *File Explorer* and locate in the left pane the drive letter that was just mapped to a network drive. Note that you may have to expand the left window by moving the pointer over the dividing line between the left and right panes. When the pointer changes to a double arrow, click and move the line to the right. Because Windows share paths can be lengthy, a common practice is to use a mapped network drive for the share.

How can you easily identify mapped drive letters in *File Explorer* (in addition to a quite high drive letter, in some cases)?

30. Close all windows on Computer 2.
31. On Computer 1, in *File Explorer*, locate the *WRITE* subfolder of *Documents*. Right-click the *WRITE* folder icon > *Properties > Sharing* tab.
32. Select the *Advanced Sharing* button > enable the *Share this folder* checkbox.
33. Click the *Permissions* button.
34. Select the correct username or group. Select the *Change Allow* checkbox. Select *OK* on two consecutive windows.

Document the share network path that appears in the window.

35. Click the *Close* option at the bottom.
36. On Computer 2, type the full network path in the *Search* textbox to access the *Write* folder. Locate the *changeme.txt* document on Computer 1.

37. Open the *changeme.txt* document, modify the text inside the file, and save the *changeme.txt* file.

38. On Computer 1, open the *changeme.txt* file. After answering the question, close the file

Is the file changed? [Yes | No]

39. On Computer 2, try changing the name of the *changeme.txt* file to *changeme2.txt*.

Can you change the name of the *changeme.txt* file? [Yes | No]

40. Verify whether the filename changed on Computer 1.
Does the filename change on Computer 1? [Yes | No]
If so, what is the new name?
-

Instructor initials: _____

41. On Computer 1, create a subfolder under the *READ* folder. Name the folder *SUB_READ*. Create a text file in the *SUB_READ* folder called *sub_file.txt*.
42. On Computer 2, type the full network path in the *Search* textbox to access the *Write* folder. Locate and right-click the *SUB_READ* shared folder. Select *Properties*.
What attributes does this folder have?
[Read-only | Hidden | Archive | Compress | Encrypt | None]
Based on your reading in the chapter, why does this folder have this particular attribute?
-

43. On Computer 2, in *File Explorer*, locate the *sub_file.txt* file. Select *Properties*.
What attributes, if any, are enabled by default?
[Read-only | Hidden | Archive | Compress | Encrypt | None]
44. Click *Cancel*. Try to modify the *sub_file.txt* file.
Can you change the *sub_file.txt* file? [Yes | No]

Instructor initials: _____

45. On Computer 1, create a subfolder in the *WRITE* folder. Create a .txt file within the *WRITE* folder.
What did you name the subfolder? _____
What did you name the file within the subfolder?
-
46. From Computer 2, access the *WRITE* subfolder and examine the current permissions. You might try to change the file within the subfolder to test whether the permissions are working as they should.
What did you discover about the permissions for the subfolder and the file located within the subfolder?
-

47. On Computer 2, remove the mapped drive (and any drive that you created on your own) by using *File Explorer* to locate the mapped drive letter under *This PC* in the left pane. Right-click the mapped drive and select *Disconnect > Yes*. Close *File Explorer*.
48. On Computer 1, permanently delete the *READ* and *WRITE* folders and all files and subfolders contained within them.
49. On Computer 1, put the *Advanced Sharing Settings* options back to the original configuration, as documented in steps 7 and 8. Put the *Use Sharing Wizard* back to the original setting, as documented in step 16. Show your lab partner the documented settings and the current profile configuration. Have your lab partner use the table that follows to document that the computer has been put back to the original configuration.

Computer 1 (permanently deleted folders/sharing settings)

Printed name of lab partner _____

Signature of lab partner _____

50. On Computer 2, put the *Advanced Sharing Settings* options back to the original configuration, as documented in steps 7 and 8. Put the *Use Sharing Wizard* back to the original setting, as documented in step 16. Show your lab partner the documented settings and the current configuration. Have your lab partner use the table that follows to document that the computer has been put back to the original configuration.

Computer 2 (permanently deleted folders/sharing settings/IP address)

Printed name of lab partner _____

Signature of lab partner _____

Lab 18.4 Creating a Local Security Policy for Passwords in Windows 10/11

Objective: To provide additional security by requiring certain password parameters as a local computer security policy

Parts: A computer with Windows 10/11 Professional or higher loaded

Notes: Local administrator rights are required for this lab. The computer should be part of a workgroup, not a domain. However, even though domain policy requirements override local policy, the lab may still work as written.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Power on the computer and log on using the user ID and password provided by the instructor or lab assistant.
2. Access the *Local Security Policy* console by accessing the *Administrative Tools* (Windows 10) or *Windows Tools* (Windows 11) Control Panel > double-click on *Local Security Policy*.
3. Expand the *Account Policies* option in the left pane.
What two options are available?

4. Select the *Password Policy* subcategory. Lab Table 18.1 details these options.

LAB TABLE 18.1 Windows *Password Policy* option descriptions

Option	Description
<i>Enforce password history</i>	Specifies the number of unique and new passwords that must be used before an old password can be reused.
<i>Maximum password age</i>	Specifies the number of days a password must be used before it has to be changed.
<i>Minimum password age</i>	Specifies the smallest number of days for which a user can use the same password.
<i>Minimum password length</i>	Specifies the fewest characters required for the password. The fewest characters the password can be is 0. The more characters required, the better the security. A common setting is 7 or 8; 14 characters is the most you can require in this setting.
<i>Password must meet complexity requirements</i>	Sets higher standards for the password, such as not being the same as the username, being six characters or more, or requiring uppercase and lowercase letters, numerals, and symbols such as # or !.
<i>Store passwords using reversible encryption for all users in the domain</i>	<i>If enabled, passwords are stored using reversible encryption. Used only if an application uses a protocol that requires knowledge of a user password for authentication purposes.</i>

Use Lab Table 18.2 to document the current settings.

LAB TABLE 18.2 Current *Password Policy* settings

Option	Current setting
<i>Enforce password history</i>	
<i>Maximum password age</i>	
<i>Minimum password age</i>	
<i>Minimum password length</i>	
<i>Password must meet complexity requirements</i>	
<i>Store passwords using reversible encryption</i>	

- Change the password policy settings to the options shown in Lab Table 18.3 by double-clicking on each option and selecting the given setting.

LAB TABLE 18.3 New *Password Policy* settings

Option	New setting
<i>Enforce password history</i>	One password remembered
<i>Minimum password length</i>	Eight characters
<i>Passwords must meet complexity requirements</i>	Enabled

- Select the *Account Lockout Policy* subcategory. Lab Table 18.4 details these options.

LAB TABLE 18.4 Windows *Account Lockout Policy* option descriptions

Option	Description
<i>Account lockout duration</i>	Indicates the number of minutes someone is locked out if a password is mistyped. A value of 0 requires an administrator to unlock it. Requires the <i>Account lockout threshold</i> to be configured.
<i>Account lockout threshold</i>	Indicates the number of failed logon attempts that can cause a user account to be locked. A value of 0 will never lock out a user, no matter how many times he mistypes his password.
<i>Reset account lockout counter after</i>	Indicates the number of minutes that have to pass before the logon attempt counter is reset to 0 bad logon attempts. Requires the <i>Account lockout threshold</i> option to be configured.

- Minimize the *Local Security Policy* console. Create a new user account by accessing *Settings > Accounts >* select the *Family & Other Users* link from the left pane > in the *Other Users* section, select the *Add someone else to this PC* link > type **Teststudent** for the username and **Student234%** as the password > type **student 234 percent** in the *Password Hint* textbox > select the *Next* button.
 - Log off as the current user. Log in as *Teststudent* with the password **Student234%**.
What message appears upon logon?
-
- Try to access the *Local Security Policy* console *Administrative Tools* option.
Can the *Teststudent* user change the password policy? [Yes | No]
 - Log off as *Teststudent* and log back in using the original user account.

11. Return to the *Local Security Policy* console. Expand *Local Policies* and select *Audit Policy*.
 What is the current setting for *Audit account logon events*?
 [No Auditing | Success | Failure | Success and Failure]
 List three other items that can be audited.
-
-
-
12. Double-click the *Audit account logon events* option. The two options are *Success* and *Failure*, and both options can be enabled. *Success* logs every time someone logs in to the computer. *Failure* logs every failed logon attempt.
 What are the current settings?
 Success [Enabled | Disabled]
 Failure [Enabled | Disabled]
-
13. Enable both the *Success* and *Failure* checkboxes > *Apply* button > *OK* button.
14. Log off as the current user and log in as *Teststudent* but using the password *CatchMe123*. (This is an incorrect password—but use it anyway.)
 What message appears upon logon?
-
15. Click *OK*. Log in as *Teststudent*, using the correct password, *Student234%*.
16. To see events that have been enabled and logged, such as the ones just set as the local policy, access the *Administrative/Windows Tools* section of the Control Panel > *Event Viewer* > expand the *Windows Logs* category on the left and select *Security*.
 Can the *Teststudent* user access *Event Viewer* details that were enabled in the local security policy?
 [Yes | No]
17. Log off as *Teststudent*. Log back on as the original computer user.
18. Access the *Administrative/Windows Tools* Control Panel > *Event Viewer* > expand the *Windows Logs* category on the left and select *Security*. Scroll down to select a line that shows as an *Audit Failure*. Note that you may need to expand the *Keywords* section by moving the pointer over the dividing line between the *Keywords* header and the *Date and Time* column header. When the pointer changes to a bar with two arrows extending from the bar, click and drag the bar to the right to expand the *Keywords* section. Look for a lock graphic instead of a key on the left.
19. Notice that when you select a security event, information about that event appears in the bottom window.
 What event number is the audit failure?
-
- Does the *General* tab show the computer name for the violation? [Yes | No]
- Instructor initials: _____
20. Close *Event Viewer*. Return to the *Local Security Policy* console. Set the *Audit Account Logon Events* setting to the original setting (refer to step 11).
 Have a classmate verify your setting and print and sign his or her name on your answer sheet.
 Classmate's printed name _____
 Classmate's signature _____

21. Configure the *Password Policy* settings to their original configuration (refer to step 4).
Have a classmate verify your password policy settings by printing and signing his or her name.
Classmate's printed name _____
Classmate's signature _____
22. In the *Local Security Policy* window, expand *Local Policies*. Select the *User Rights Assignment* option. Use Lab Table 18.5 to document the current settings for various commonly used options.

LAB TABLE 18.5 Windows *User Rights Assignment* settings

Option	Current setting
<i>Access this computer from the network</i>	
<i>Allow log on through Remote Desktop Services</i>	
<i>Deny log on locally</i>	
<i>Force shutdown from a remote system</i>	
<i>Generate security audits</i>	
<i>Load and unload device drivers</i>	
<i>Restore files and directories</i>	
<i>Shut down the system</i>	
<i>Take ownership of files or other objects</i>	

23. Select the *Security Options* in the left pane of the *Local Security Policy* window. Use Lab Table 18.6 to document the current settings for various options.

LAB TABLE 18.6 Windows *Security* settings

Option	Current setting
<i>Accounts: Administrator account status</i>	
<i>Accounts: Guest account status</i>	
<i>Accounts: Rename administrator account</i>	
<i>Devices: Allow to format and eject removable media</i>	
<i>Devices: Prevent users from installing printer drivers</i>	
<i>Interactive logon: Message text for users attempting to log on</i>	
<i>Interactive logon: Prompt user to change password before expiration</i>	
<i>Network access: Let Everyone permissions apply to anonymous users</i>	
<i>Network access: Shares that can be accessed anonymously</i>	
<i>Network security: Force logoff when logon hours expire</i>	
<i>Shutdown: Allow system to be shut down without having to log on</i>	

24. Close the *Security Policy* console. Access *User Accounts* and remove the *Teststudent* user account by selecting the account name > *Delete the account* link > *Delete files* > *Delete account*.

Have a classmate verify your setting and print and sign his or her name on your answer sheet.

Classmate's printed name _____

Classmate's signature _____

25. Close the *User Accounts* window and reboot the computer.

Lab 18.5 Using Windows Defender in Windows 10

Objective: To be able to use System Configuration and Windows Defender to troubleshoot boot and spyware problems

Parts: Computer with Windows 10 installed
User logon that has administrator rights

Note: In this lab, you will explore various options that can be used within the System Configuration and Windows Defender windows. If the computer has a third-party security suite such as Norton or McAfee that has antispyware or anti-malware, the Windows Defender application may not be enabled.

Procedure: Complete the following procedure and answer the accompanying questions.

1. Turn on the computer and verify that the operating system loads. Log in to Windows.
2. Open the *File Explorer Options* Control Panel > *View* tab.

What is the current setting for the *Hidden files and folders* section?

[Do not show hidden files and folders | Show hidden files and folders]

What is the current setting for the *Hide extensions for known file types* option? [Enabled | Disabled]

What is the current setting for the *Hide protected operating system files (Recommended)* option?
[Enabled | Disabled]

3. Configure the following *File Explorer* settings and remember to click the *Apply* or *OK* button when finished:
 - > *Show hidden files, folders, and drives radio button*—enabled (checked)
 - > *Hide extensions for known file types*—disabled (unchecked)
 - > *Hide protected operating system files (Recommended)*—disabled (unchecked)
4. Access the *Windows Defender Firewall* section of the Control Panel. If a note appears, saying that Windows Defender is turned off, select the *Click here to turn it on* option. If needed, obtain updates before continuing. Expand the *Private networks* section.

Was Windows Defender Firewall disabled? [Yes | No]

What is the status for incoming connections?

Are there any active private networks? [Yes | No]

What is the current notification state?

5. Select the *Advanced settings* link.

Which three profiles are shown in the Overview section?

6. From the left pane, select *Inbound Rules*.

Scroll to the right and locate an inbound rule that uses a specific local port number (and has a number in the *Local Port* column). Note that you may need to maximize the window to be able to see this column. Select that row so that it is highlighted. What is the name of the inbound rule?

Does the particular rule use TCP, UDP, or any protocols?

What local port number is this inbound rule applied to?

7. In the left pane, expand the *Monitoring* option.

List the monitoring options.

8. Select the *Monitoring* option from the left pane. Expand the *Public Profile is Active* section.

What is the name of the file that contains logged firewall events?

Are dropped packets logged when the public profile is in use? [Yes | No]

When a successful connection is made from this computer and the public profile is active, are the successful connections logged? [Yes | No]

9. Return *Windows Defender Firewall* to its original state (refer to step 4).
10. Return *File Explorer* to its original settings (refer to step 2).
11. Close all windows.

Lab 18.6 Sharing Files with Windows 10 Public Folders

Objective: To be able to access a file from another computer that has been shared through a Windows 10 *Public* folder

Parts: Two Windows 10 computers on a wired or wireless network

Procedure: Complete the following procedure and answer the accompanying questions.

1. Ensure that the two computers have IP addresses on the same network (so you will be able to ping between the computers).
2. On both computers, make a shortcut on the desktop to the *Public* folder. The public folder is commonly located at `C:\Users\Public`.
3. On Computer 1, create a text document and put it in the *Public Documents* subfolder.

What did you name the text document?

4. Ensure that both computers are visible from File Explorer by accessing *Advanced sharing settings* from the *Network and Sharing Center* Control Panel and turning on *Network discovery* and *File and print sharing*. Turn off *Password-protected sharing*.
5. Ensure that both computers can share files using the public folder by enabling the *Turn on sharing so anyone with network access can read and write files in the Public folders* option in the *All Networks* profile.

6. From Computer 2, access and change the text document.

Are you able to change the document across the network? [Yes | No] If not, redo the lab.

Instructor initials: _____

Lab 18.7 Configuring a Secure Wireless Network

Objective: To be able to configure a secure wireless AP (access point) or router and *attach it* a wireless client

Parts: One wireless access point or router

A computer with an integrated wireless NIC or a wireless NIC installed as well as an Ethernet NIC

One straight-through cable

Procedure: Complete the following procedure and answer the accompanying questions.

1. Obtain the documentation for the wireless AP or router from the instructor or the internet.
2. Reset the wireless AP or router as directed by the wireless device manufacturer.

Document the current Ethernet NIC IPv4 setting. [DHCP | Static IP Address]

If a static IP address is assigned, document the IP address, subnet mask, default gateway, and DNS configuration settings.

-
3. Attach a straight-through cable from the computer's Ethernet NIC to the wireless AP or router.
 4. Power on the computer and log on, if necessary.
 5. Configure the computer with a static IP address or DHCP, as directed by the wireless device manufacturer.
 6. Open a web browser and configure the wireless AP or router with the following parameters:
 - > Change the default SSID.
 - > Disable SSID broadcasting for this lab.
 - > Configure the most secure encryption and authentication supported by both the wireless NIC client and the wireless AP or router.
 - > Change the default password used to access the wireless AP or router.

Document the settings after you have configured them:

SSID:

Is SSID broadcasting disabled? [Yes | No]

Password for wireless device access:

Type of security used:

-
7. Save the wireless AP or router configuration.
 8. Disconnect the Ethernet cable.
 9. Enable the wireless NIC and configure it for the appropriate SSID.
 10. Configure the wireless NIC for a static IP address or DHCP, as directed by the wireless AP/router manufacturer.

11. Open a web browser and access the wireless AP or router. If access cannot be obtained, troubleshoot as necessary or reset the wireless AP or router to the default configuration and restart the lab.

What frequency (channel) is being used by the wireless AP or router and the wireless NIC for connectivity?

12. Show the instructor the connectivity.

Instructor initials: _____

13. Open a command prompt and type `netsh wlan show settings` to see the wireless network settings.

14. Reset the wireless AP or router to the default configuration settings.

15. Reset the computer(s) to the original configuration settings.

Instructor initials: _____

Lab 18.8 Examining Windows 10/11 Windows Security Options

Objective: To become familiar with common settings applied to Windows Security

Parts: Windows 10/11 computer with administrator access

Procedure: Complete the following procedure and answer the accompanying questions.

1. Sign in to the computer and access the *Windows Security* Settings link > *Open Windows Security* button.

Which options are available within the *Security at a glance* window? (Select all that apply.)

[Device security | Event security | Security policy | Device performance & health | App & browser control | Logon security]

2. Select *Virus & threat protection*.

What can you do within the *Current threats* section? (Select all that apply.)

[Remediate device | Isolate device | Quick scan | Full scan]

3. Select the *Scan options* link. Read the information that describes each option.

Which option would you use for malware that is proving to be difficult to remove?

[Quick scan | Full scan | Custom scan | Microsoft Defender Offline scan]

4. Select the *Protection history* link.

What actions are you able to take regarding OneDrive and file recovery options?

5. From the left pane in Windows 10, select the *Firewall & network protection* link. For Windows 11, return to the *Windows Security* window to select the *Firewall & network protection* link. Select the *Allow an app through firewall* link. Note that you may be redirected or a blinking icon on the taskbar might show that you need to go to a specific Control Panel window.

From the list shown, which app is enabled for private, but not the public profile?

Is *Take a Test* allowed through the firewall if the public profile is being used?

[Yes | No]

Is *Take a Test* allowed through the firewall if the private profile is being used?

[Yes | No]

Instructor initials: _____

6. Click *Cancel*. From the left menu in Windows 10, select the *Device Security* option. For Windows 11, return to the *Windows Security* window to select the *Device Security* option.

Does this machine have any TPM capabilities? [Yes | No]

Is standard hardware security supported? [Yes | No]

What is the purpose of core isolation device security?

7. Select the *Core isolation details* link.

Is memory integrity currently enabled or disabled? [Enabled | Disabled]

What is the purpose of memory integrity core isolation?

Instructor initials: _____

8. From the left menu in Windows 10, select the *Device performance & health* option. In Windows 11, return to the *Windows Security* window to select the *Device performance & health* option.

Are there any recommendations within the health report?

What is the purpose of the *Fresh start* option?

- a. It allows the system to apply Windows updates and the machine to be restarted.
 - b. It allows all security rules to be reset to the default values.
 - c. It allows only outbound security rules to be reset to the default values.
 - d. It allows a new Windows installation.
9. Close the *Windows Security* window and any Control Panel windows that might be open.

Lab 18.9 Configuring Windows 7, 8, 10, or 11 with a DNS Server IP Address

Objective: To be able to configure a DNS server IP address on an Ethernet adapter

Parts: Windows 7, 8, 10, or 11 computer with administrator access

Procedure: Complete the following procedure and answer the accompanying questions.

1. Sign in to the computer and access the *Network and Sharing Center* the Control Panel > *Change adapter settings* link.
2. Right-click on the *Ethernet* connection > *Properties*.
3. Double-click on the *Internet Protocol Version 4 (TCP/IPv4)* option.

Document the current Ethernet NIC IPv4 settings.

[DHCP (*Obtain an IP address automatically* radio button) |
static IP address (*Use the following IP address* radio button)]

[DHCP-provided DNS server (*Obtain DNS server address automatically* radio button) |
static DNS server address (*Use the following DNS server addresses* radio button)]

If a static IP address or DNS server address is assigned, document the IP address, subnet mask, default gateway, and DNS configuration settings.

4. Because a DNS server might be down, might be under attack, or might have been hacked, you might be required to manually configure a DNS server IP address. In this case, select the *Use the Following DNS Server Addresses* radio button.
5. In the *Preferred DNS Server* textbox, type the IP address **208.67.222.222**, which is an OpenDNS server address hosted by Cisco Systems, Inc. > *OK*.
6. Open a web browser and access a web page that probably hasn't been used before. Some suggested ones are ThinkGeek.com, uncommongoods.com, and goodreads.com.

Are you able to access at least one different website by using the new DNS server setting?

[Yes | No]

Instructor initials: _____

7. Return to the Ethernet connection and set it back to the settings documented in step 3. Ensure that you click *OK* to save the settings.
8. Open a web browser and access a web page that probably hasn't been used before. Some suggested ones are brainyquote.com, wired.com, and codinggame.com.

Are you able to access at least one different website by using the original DNS server setting?

[Yes | No]

Are you able to tell the difference in the speed of the access using the new DNS server setting compared to the original setting ? [Yes | No]