



Nursing Entrance Exam **Study** GUIDE

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Welcome to Medical Prep Institute of Tampa Bay!

Business Office Hours

The office hours are from 8:30am – 7:00pm, Monday through Friday. The Administrative Offices are not open on weekends.

Appointments

Should you require a meeting with the staff, an appointment is recommended. To make an appointment, please call our Admissions Offices at 813-932 1710

Students Point of Contact

Administrative Policies.....Student Service Officer
Academic Programs (Scheduling, Withdrawal, Transcripts.....Registrar Office
Financial Billing.....Financials Services
Job Placement Assistance..... Student and Career Services
Admissions, Books & Supplies.....Admissions Department
Academic Counseling.....Registrar/Dean/ Remediation Coordinator
Clinical Scheduling Clinical Department

Medical prep Institute of Tampa bay makes every effort to ensure the accuracy of the information contained in this catalog. The Institution reserves the right to change policies, regulations, fees and courses during this catalog period upon direction from the administration and the Dean of Academics of the School. The most current and complete information is available from the Campus President. All information contained in this catalog is current and correct as of the publication date: July 2015

Any concerns regarding the Medical Prep Institute of Tampa bay or this catalog and that have not been satisfactorily answered by the institution may be directed to:

Commission for Independent Education
325 West Gaines Street Suite 1414
Tallahassee FL 32399
(888)-224-6684

History and Ownership

Medical Prep Institute of Tampa bay is owned and operated by a corporation called F. Jenar Inc and is authorized to do business in the State of Florida. The Company is run and managed by the Administrator, Jena Fadziso. Medical prep Institute of Tampa bay was founded in 2008 and began as Test Preparation School and Continuing Medical Education provider for healthcare professionals. Soon after, the company recognized there was a need in the community to provide affordable high quality medical training education for individuals seeking entry level careers into the healthcare industry. Medical prep Institute of Tampa bay made the decision to transition into an institute of higher learning and officially began offering diploma and degree program in 2010. In August 2015 Medical Prep Institute of Tampa Bay was Accredited by Accrediting Bureau of Health Education Schools (ABHES)

Description of School Facility

Medical prep Institute of Tampa bay is located at 2304 E. Busch Blvd in Tampa, Florida between Nebraska and 30th Street just east of 1-275. The institute is conveniently situated along the city bus line. The facility occupies about 8000 square feet and includes a reception area, business and administrative offices, student break area, four (4) classrooms, a laboratory classroom, a Library and computer lab. The campus is equipped with computers for student use located in the Library. Projectors are installed in each of the classrooms to assist in lectures and video demonstrations. The lab areas consist of hospital beds, mannequins, charts and other medical supplies to facilitate the hands on instruction found in each of the programs. Students will also find that the campus is handicap accessible.

Values

Medical prep Institute of Tampa bay prides itself on the following values: Quality, Simplicity, Affordability, Inclusiveness and Excellence!

Mission Statement

Medical Prep Institute is committed to increasing the quality of health care education in the greater Tampa Bay area and beyond by developing in our students the knowledge, skills and professionalism required of today's workforce. We are committed to providing our students with an affordable and comprehensive education. It is our belief that this commitment to excellence will empower our students with the fundamental skills necessary to either gain entry level employment in their chosen field or allow them the opportunity to advance in their current career.

Licensure, Accreditation and Approvals

Agency	Location	Phone Number
LICENSED -Commission for Independent Education	325 West Gaines Street Suite 1414 Tallahassee FL 32399	(888)-224-6684
APPROVED - Florida Board of Nursing	4052 Bald Cypress Way Bin C-02 Tallahassee, FL 32399	(850)-488-0595
APPROVED -American Safety and Health Institute (Providing Continuing Education)	1450 Westec Drive Eugene, Oregon 97402	(800)-447.3177
APPROVED -National Healthcare Association (Certified National Testing Site)	11161 Overbrook Road Leawood, Kansas 66211	(800)-499-9092
ACCREDITED -Accrediting Bureau of Health Education Schools (ABHES)	7777 Leesburg Pike, Suite 314 N. Falls Church, VA	(703) 917-9503

Healthcare Industry

What is the Healthcare Delivery System?

A network of Agencies, facilities and providers designed to work together coherently in a specified geographic area. Healthcare workers operate within this system. Healthcare professionals operate within this system.

The US healthcare System

▶ Secondary care

Concerns with treatment of disorders requiring specialist opinion or hospitalization. The patients are usually referred from Primary care and the physicians are affiliated to a hospital or a group practice.

▶ Tertiary care

Provides medical and/or surgical management of complex disorders in an inpatient setting and usually requiring collaboration between multiple specialties. These are super-specialized standalone hospitals or specialty departments in a multi-specialty hospital

Regulation of United Healthcare System

Department of Health and Human Services (HHS): The principal agency in the United States government for protecting the health and safety of all Americans and for providing essential human services, especially for those people who are least able to help themselves. The agency oversees Public Health service agencies (PHS) at both local and state levels. These agencies constantly oversee public health matters.

Healthcare system is the system that provides healthcare services.

Key Words to Remember

Health – this is the physical, mental and social wellbeing of human being and the absence of illness.

Medicine-Art and science of diagnosis, treatment, prevention of disease and the maintains of good health

Environment- The setting for the nurse (healthcare worker) patient interaction.

Wellness – the highest level of optimal health

Illness –the diminished or impaired state of health.

Continuity of Care-Continuing of established patient care from setting to another

The Tiered System

The USA Healthcare system is divided into the tiered system. This system is made up of regionalized systems of healthcare delivery divided into Primary care, Secondary care and Tertiary care.

Primary care

Refers to the activities concerned with prevention and treatment of common medical problems in outpatient setting.

Wellness –illness Continuum-This is the range of the person's total health.

The person's range of health is always changing thus the person's range on that continuum is constantly changing.

The person's range of health and environment determines the services the patient receives and the healthcare workers provide.

Wellness –illness continuum

- ▶ Maintaining one’s continued health in the wellness-illness continuum is important.
- ▶ Balance is an essential aspect of maintaining one’s health.

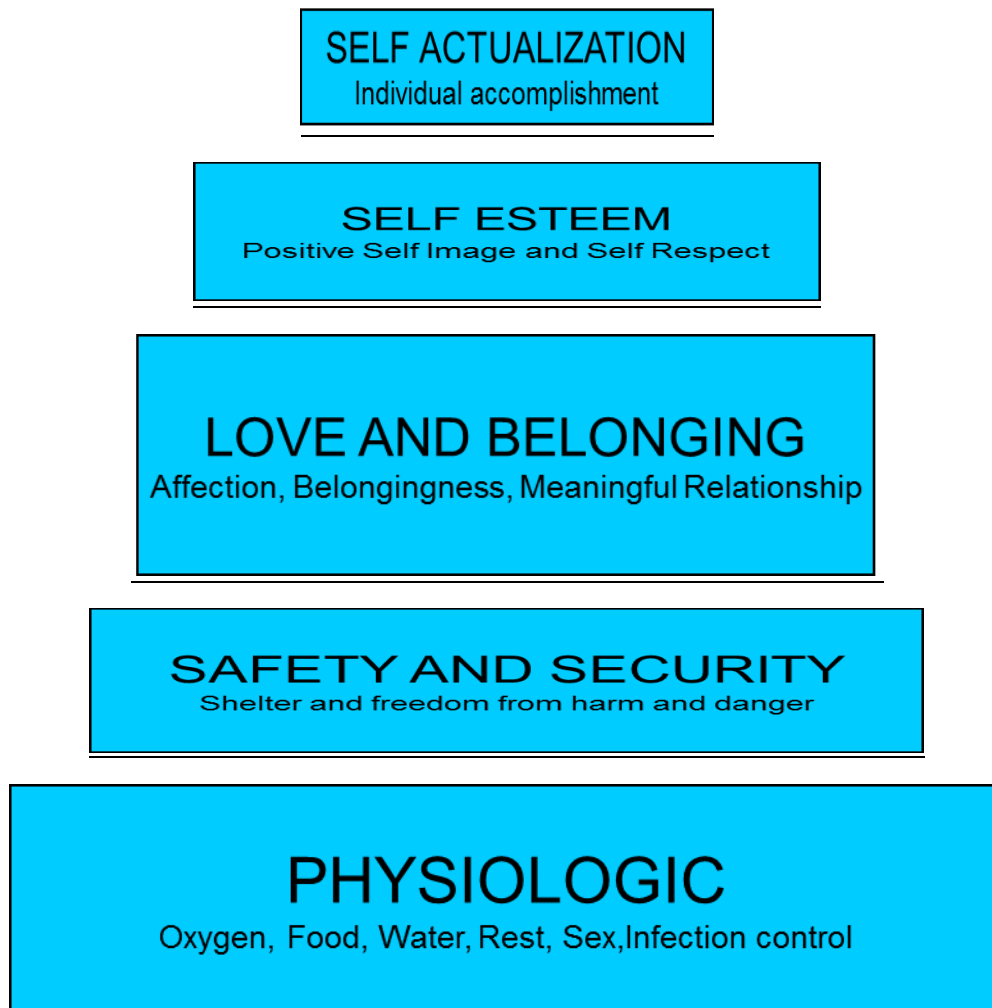
Factors affecting the balance of Healthcare

- ▶ Age
- ▶ Sex
- ▶ Family relationships
- ▶ Cultural influences
- ▶ Economic Status

Healthcare workers must consider all the above factors when providing healthcare to the consumer. The comprehensive approach to health is known as Holistic Health Care

MASLOW HEIRACHY OF NEEDS

- ▶ In 1943, Abraham Maslow described the Theory of Human Needs “Hierarchy of Needs”
- ▶ In order to maintain one’s health in the wellness-illness continuum individuals work towards meeting individual needs starting with basic physiological needs
- ▶ To achieve the highest level, a person must work toward meeting each level
- ▶ Healthcare workers also work hard to give care from a humanist approach by meeting the needs of each individual patient



Components of Healthcare Delivery Systems

- ▶ Providers (Facilities and Healthcare Workers)
- ▶ Payers
- ▶ Clients

Healthcare Providers are Healthcare Facilities where healthcare services are conducted and Healthcare Workers who provide caregiving services

Healthcare facilities are divided into inpatient (non-ambulatory) and outpatient facilities (ambulatory) All this facilities support all three levels of healthcare (primary , secondary and tertiary system).There are variety of healthcare facilities and with a variety of Healthcare profession

TYPES OF HEALTHCARE PROVIDERS AND SERVICES

1.Acute Care – commonly known facility in the healthcare industry with patients having serious condition that require close monitoring.

2.ICU or Intensive Care Unit – care for patients that are critically ill. Each ICU provide specialize care e.g.

- ▶ Neuro Intensive Care Unit
- ▶ Coronary Care Unit
- ▶ Cardiovascular Intensive Care Unit
- ▶ Neonatal Intensive Care Unit
- ▶ Critical Care Unit
- ▶ Pediatric Intensive Care Unit

3. Specialized Facilities – facility that only admit specific type of patient or client e.g.

- ▶ Psychiatric Hospitals
- ▶ Government Hospitals
- ▶ Pediatric Hospitals

4. Home Health Care – provided by an agency or acute care facility that offer services in the home e.g.

- ▶ Wound Care
- ▶ IV Therapy
- ▶ Respiratory Treatment

5. Hospice

- ▶ Care provided to terminally ill patients in a facility or home setting
- ▶ Main focus of Hospice is transition from life to death with emphasis on working collaboratively with patient, family and significant others.

6.Respite

- ▶ Part time care provided for patients having chronic medical condition or mental illness.
- ▶ Allow the primary care provider time off at the same time socialization for the patient.

7. Tele Health

- ▶ New innovation added to the healthcare industry
- ▶ Provide ability for a nurse or physician to interact via telephone or computer audio/video

- ▶ Frequent communication with patient resulting to better compliance
- ▶ Decrease ER visits, unscheduled Physician office visit, and re-hospitalization

8. Extended Care Facilities - provide longer period of care to patient e.g.

- ▶ Nursing Homes
 - Types of Nursing Homes
- ▶ Skilled Nursing Facility (SNF) – 24 hours care provided under supervision of Registered Nurse
- ▶ Intermediate Care Facility (ICF) – 24 hours care provided by nursing assistants under supervision of an LPN/LVN

9. Community Health Services – health care provided to certain community e.g.

- ▶ Neighborhood
- ▶ Small Town
- ▶ Rural County

10. Healthcare in School and Industry

- Provide healthcare services to students particularly with disabilities in the school setting and/or employees in an industrial setting
- Assist in providing care to ill patients and/or emergency
- Provide preventive care such as health teaching, administering immunizations and medications

THE HEALTH CARE TEAM AS PROVIDERS

- **Nurse Practitioner** – A Nurse with additional training in a specialized area such as family practice, maternity, cardio-thoracic or mental health
- **Registered Nurse** – provide direct and indirect nursing care, supervision and leadership in a wide variety of healthcare settings.
- **License Practical Nurse** – provide care in long term care and acute care facilities. Works under the supervision of a Registered Nurse or Physician
- **Certified Nurse Assistant** - – provide basic nursing care of clients in a long term care facility Nurse Practitioner – A Nurse with additional training in a specialized area such as family practice, maternity, cardio-thoracic or mental health

Other caregivers include Technologists and technicians.

- Technologists hold a Baccalaureate degree
- Technicians hold an associate degree, diploma or certificate

Examples of technicians are

- Patient care techs
- Certified Nursing Assistants
- Unit clerks

The majority of healthcare workers must be board certified

Nursing

Professional nursing holds a unique place in the American health care system. As members of the largest health care profession, the nation's 2.9 million nurses work in diverse settings and fields and are frontline providers of health care services. While most nurses work in acute-care settings such as hospitals, nurses' expertise and skills extend well beyond hospital walls. Working independently and with other health care professionals, nurses promote the health of individuals, families, and communities. Millions of Americans turn to nurses for delivery of primary health care services, health care education, and health advice and counseling. Nurses are critical links in maintaining a cutting edge health care system. Nursing continues to be an indispensable service to the American public

While many may think of a nurse as someone who takes care of hospitalized patients, nurses also fill a wide variety of positions in health care in many varied settings, working both collaboratively and independently with other health care professionals. For example, most Americans are familiar with home care nurses who provide a plethora of nursing and health care services to patients in their homes. School nurses have a long history of providing health services to school children from kindergarten through high school. Nurses play a major role in delivering care to those residing in long-term-care facilities such as nursing homes.

Florence Nightingale

Most people think of the nursing profession as beginning with the work of Florence Nightingale, an upper class British woman who captured the public imagination when she led a group of female nurses to the Crimea in October of 1854 to deliver nursing service to British soldiers. Upon her return to England, Nightingale successfully established nurse education programs in a number of British hospitals. These schools were organized around a specific set of ideas about how nurses should be educated, developed by Nightingale often referred to as the "Nightingale Principles." Actually, while Nightingale's work was ground-breaking in that she confirmed that a corps of educated women, informed about health and the ways to promote it, could improve the care of patients based on a set of particular principles, she was not the first to put these principles into action.

The Nursing Program

Today nursing is highly regarded as an excellent career choice for both women and men. The nursing Program is a limited access program. This means there are limited seats and admissions process is extremely competitive. Students entering a nursing are maybe required to pass entrance examination.

Admissions Exams

	Test	Required Scores
1	Nursing Entrance Exam- Students Applying into Associate of Science Degree	75%
2	Basic Computer Skills- All students must pass a Basic Computer Skills Test	80%
3	PN Step - all current practical nurses must take and pass the Step test	60%
4	Nursing TABE Test - Students Applying into Practical Nursing diploma	70%
5	ACT - student with ACT scores of 19 do not need to take an entrance exam	19
6	SAT- student with SAT scores of 1350 do not need to take an entrance exam	1350
1	Nursing Entrance Exam- Students who score a 70% may apply in Practical Nursing Program	75%

Students applying into the Associate of Science Nursing Program who fail to receive a score of 75% after three (3) attempts may apply into the Practical Nursing Program if they score a 70%.

Nursing Entrance Examination

The exam is used to aid adult education programs in deciding which applicants to accept. The nursing entrance examination is divided into three sections. Math, English and Science. The English Section is divided into Two Sections

Section	Number of Questions
English Section A (Reading Comprehension)	30
English Section B (Language)	30
Math	30
Science	30

The prospective student will be allowed three (3) attempts in a twelve-month period.

Tips for Taking NURSING ENTRANCE EXAMINATION

- Be positive and do your best.
- Relax, it's normal to be somewhat nervous before taking a test. Don't worry!
- Be sure you can understand the instructions and understand them.
- Read the directions for each test section carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time well. Each test section is timed. Do not spend too much time on any one test question
- Before answering a question, be sure you know what is being asked. For example, a test question might say, "Which of these is not an even number?" If you read the question too quickly, you may miss the word not and answer incorrectly.
- Do not read into a question something that is not there. There are no trick questions.
- Trust your instincts. If you know a lot about a subject (reading, mathematics or language), the first answer you select probably will be the best. When rechecking, change an answer only when you are sure that your first answer choice was wrong.
- If you are not sure how to answer a question, rule out answer choices that you know are incorrect. Then mark your best guess.
- Remember that the score you will receive on NURSING ENTRANCE EXAMINATION is only one way to measure your **skills**. **NURSING ENTRANCE EXAMINATION will show you the skills you have now and those you need to learn.**

English

The English test measures a test taker's ability to understand, analyze and evaluate written passages. The passages will contain material that will be from a variety of sources and on a number of different topics.

Each of the passages and statements in the English test will be followed by a series of questions covering the content of the passage or statement, in which you will have to answer questions, which will demonstrate how well you understand the passages and are able to draw conclusions about the material.

Reading Comprehension Practice

Questions 1 through 7 refer to the following passage:

In the 16th century, an age of great marine and terrestrial exploration, Ferdinand Magellan led the first expedition to sail around the world. As a young Portuguese noble, he served the king of Portugal, but he became involved in the quagmire of political intrigue at court and lost the king's favor. After he was dismissed from service by the king of Portugal, he offered to serve the future Emperor Charles V of Spain.

A papal decree of 1493 had assigned all land in the New World west of 50 degrees W longitude to Spain and all the land east of that line to Portugal. Magellan offered to prove that the East Indies fell under Spanish authority. On September 20, 1519, Magellan set sail from Spain with five ships. More than a year later, one of these ships was exploring the topography of South America in search of a water route across the continent. This ship sank, but the remaining four ships searched along the southern peninsula of South America. Finally they found the passage they sought near 50 degrees S latitude. Magellan named this passage the Strait of All Saints, but today it is known as the Strait of Magellan.

One ship deserted while in this passage and returned to Spain, so fewer sailors were privileged to gaze at that first panorama of the Pacific Ocean. Those who remained crossed the meridian now known as the International Date Line in the early spring of 1521 after 98 days on the Pacific Ocean. During those long days at sea, many of Magellan's men died of starvation and disease.

Later, Magellan became involved in an insular conflict in the Philippines and was killed in a tribal battle. Only one ship and 17 sailors under the command of the Basque navigator Elcano survived to complete the westward journey to Spain and thus prove once and for all that the world is round, with no precipice at the edge.

1. The 16th century was an age of great _____ exploration.

- A. cosmic
- B. land
- C. mental
- D. common man
- E. None of the above

2. Magellan lost the favor of the king of Portugal when he became involved in a political _____.

- A. entanglement
- B. discussion
- C. negotiation
- D. problem
- E. None of the above

3. The Pope divided New World lands between Spain and Portugal according to their location on one side or the other of an imaginary geographical line 50 degrees west of Greenwich that extends in a _____ direction.

- A. north and south
- B. crosswise
- C. easterly
- D. south east
- E. north and west

4. One of Magellan's ships explored the _____ of South America for a passage across the continent.

- A. coastline
- B. mountain range
- C. physical features
- D. islands
- E. None of the above

5. Four of the ships sought a passage along a southern _____.

- A. coast
- B. inland
- C. body of land with water on three sides
- D. border
- E. Answer not available

6. The passage was found near 50 degrees S of _____.

- A. Greenwich
- B. The equator
- C. Spain
- D. Portugal
- E. Madrid

7. In the spring of 1521, the ships crossed the _____ now called the International Date Line.

- A. imaginary circle passing through the poles
- B. imaginary line parallel to the equator
- C. area
- D. land mass
- E. Answer not available

The following passage refers to questions 8 through 14.

Marie Curie was one of the most accomplished scientists in history. Together with her husband, Pierre, she discovered radium, an element widely used for treating cancer, and studied uranium and other radioactive substances. Pierre and Marie's amicable collaboration later helped to unlock the secrets of the atom.

Marie was born in 1867 in Warsaw, Poland, where her father was a professor of physics. At an early age, she displayed a brilliant mind and a blithe personality. Her great exuberance for learning prompted her to continue with her studies after high school. She became disgruntled, however, when she learned that the university in Warsaw was closed to women. Determined to receive a higher education, she defiantly left Poland and in 1891 entered the Sorbonne, a French university, where she earned her master's degree and doctorate in physics.

Marie was fortunate to have studied at the Sorbonne with some of the greatest scientists of her day, one of whom was Pierre Curie. Marie and Pierre were married in 1895 and spent many productive years working together in the physics laboratory. A short time after they discovered radium, Pierre was killed by a horse-drawn wagon in 1906. Marie was stunned by this horrible misfortune and endured heartbreaking anguish. Despondently she recalled their close relationship and the joy that they had shared in scientific research. The fact that she had two young daughters to raise by herself greatly increased her distress.

Curie's feeling of desolation finally began to fade when she was asked to succeed her husband as a physics professor at the Sorbonne. She was the first woman to be given a professorship at the world-famous university. In 1911 she received the Nobel Prize in chemistry for isolating radium. Although Marie Curie eventually suffered a fatal illness from her long exposure to radium, she never became disillusioned about her work. Regardless of the consequences, she had dedicated herself to science and to revealing the mysteries of the physical world.

8. The Curies' _____ collaboration helped to unlock the secrets of the atom.

- A. friendly
- B. competitive
- C. courteous
- D. industrious
- E. chemistry

9. Marie had a bright mind and a _____ personality.

- A. strong
- B. lighthearted
- C. humorous
- D. strange
- E. envious

10. When she learned that she could not attend the university in Warsaw, she felt _____.

- A. hopeless
- B. annoyed
- C. depressed
- D. worried
- E. None of the above

11. Marie _____ by leaving Poland and traveling to France to enter the Sorbonne.

- A. challenged authority
- B. showed intelligence
- C. behaved
- D. was distressed
- E. Answer not available

12. _____ she remembered their joy together.

- A. Dejectedly
- B. Worried
- C. Tearfully
- D. Happily
- E. Irefully

13. Her _____ began to fade when she returned to the Sorbonne to succeed her husband.

- A. misfortune
- B. anger
- C. wretchedness
- D. disappointment
- E. ambition

14. Even though she became fatally ill from working with radium, Marie Curie was never _____.

- A. troubled
- B. worried
- C. disappointed
- D. sorrowful
- E. disturbed

The following passage refers to questions 15 through 19.

Mount Vesuvius, a volcano located between the ancient Italian cities of Pompeii and Herculaneum, has received much attention because of its frequent and destructive eruptions. The most famous of these eruptions occurred in A.D. 79.

The volcano had been inactive for centuries. There was little warning of the coming eruption, although one account unearthed by archaeologists says that a hard rain and a strong wind had disturbed the celestial calm during the preceding night. Early the next morning, the volcano poured a huge river of molten rock down upon Herculaneum, completely burying the city and filling the harbor with coagulated lava.

Meanwhile, on the other side of the mountain, cinders, stone and ash rained down on Pompeii. Sparks from the burning ash ignited the combustible rooftops quickly. Large portions of the city were destroyed in the conflagration. Fire, however, was not the only cause of destruction. Poisonous sulfuric gases saturated the air. These heavy gases were not buoyant in the atmosphere and therefore sank toward the earth and suffocated people.

Over the years, excavations of Pompeii and Herculaneum have revealed a great deal about the behavior of the volcano. By analyzing data, much as a zoologist dissects an animal specimen, scientists have concluded that the eruption changed large portions of the area's geography. For instance, it turned the Sarno River from its course and raised the level of the beach along the Bay of Naples. Meteorologists studying these events have also concluded that Vesuvius caused a huge tidal wave that affected the world's climate.

In addition to making these investigations, archaeologists have been able to study the skeletons of victims by using distilled water to wash away the volcanic ash. By strengthening the brittle bones with acrylic paint, scientists have been able to examine the skeletons and draw conclusions about the diet and habits of the residents. Finally, the excavations at both Pompeii and Herculaneum have yielded many examples of classical art, such as jewelry made of bronze, which is an alloy of copper and tin. The eruption of Mount Vesuvius and its tragic consequences have provided everyone with a wealth of data about the effects that volcanoes can have on the surrounding area. Today, volcanologists can locate and predict eruptions, saving lives and preventing the destruction of other cities and cultures.

15. Herculaneum and its harbor were buried under _____ lava.

- A. liquid
- B. solid
- C. flowing
- D. gas
- E. Answer not available

16. The poisonous gases were not _____ in the air.

- A. able to float
- B. visible
- C. able to evaporate
- D. invisible
- E. able to condense

17. Scientists analyzed data about Vesuvius in the same way that a zoologist _____ a specimen.

- A. describes in detail
- B. studies by cutting apart
- C. photographs
- D. chart
- E. Answer not available

18. _____ have concluded that the volcanic eruption caused a tidal wave.

- A. Scientists who study oceans
- B. Scientists who study atmospheric conditions
- C. Scientists who study ash
- D. Scientists who study animal behavior
- E. Answer not available in article

19. Scientists have used _____ water to wash away volcanic ash from the skeletons of victims.

- A. bottled
- B. volcanic
- C. purified
- D. sea
- E. fountain

The following passage refers to questions 20-24.

Conflict had existed between Spain and England since the 1570s. England wanted a share of the wealth that Spain had been taking from the lands it had claimed in the Americas.

Elizabeth I, Queen of England, encouraged her staunch admiral of the navy, Sir Francis Drake, to raid Spanish ships and towns. Though these raids were on a small scale, Drake achieved dramatic success, adding gold and silver to England's treasury and diminishing Spain's supremacy.

Religious differences also caused conflict between the two countries. Whereas Spain was Roman Catholic, most of England had become Protestant. King Philip II of Spain wanted to claim the throne and make England a Catholic country again. To satisfy his ambition and also to retaliate against England's theft of his gold and silver, King Philip began to build his fleet of warships, the Spanish Armada, in January 1586.

Philip intended his fleet to be indestructible. In addition to building new warships, he marshaled 130 sailing vessels of all types and recruited more than 19,000 robust soldiers and 8,000 sailors. Although some of his ships lacked guns and others lacked ammunition, Philip was convinced that his Armada could withstand any battle with England.

The martial Armada set sail from Lisbon, Portugal, on May 9, 1588, but bad weather forced it back to port. The voyage resumed on July 22 after the weather became more stable.

The Spanish fleet met the smaller, faster, and more maneuverable English ships in battle off the coast of Plymouth, England, first on July 31 and again on August 2. The two battles left Spain vulnerable, having lost several ships and with its ammunition depleted. On August 7, while the Armada lay at anchor on the French side of the Strait of Dover, England sent eight burning ships into the midst of the Spanish fleet to set it on fire. Blocked on one side, the Spanish ships could only drift away, their crews in panic and disorder. Before the Armada could regroup, the English attacked again on August 8.

Although the Spaniards made a valiant effort to fight back, the fleet suffered extensive damage. During the eight hours of battle, the Armada drifted perilously close to the rocky coastline. At the moment when it seemed that the Spanish ships would be driven onto the English shore, the wind shifted, and the Armada drifted out into the North Sea. The Spaniards recognized the superiority of the English fleet and returned home, defeated.

20. Sir Francis Drake added wealth to the treasury and diminished Spain's _____.

- A. unlimited power
- B. unrestricted growth
- C. territory
- D. treaties
- E. Answer not available in article

21. King Philip recruited many _____ soldiers and sailors.

- A. warlike
- B. strong
- C. accomplished
- D. timid
- E. inexperienced

22. The _____ Armada set sail on May 9, 1588.

- A. complete
- B. warlike
- C. independent
- D. isolated
- E. Answer not available

23. The two battles left the Spanish fleet _____.

- A. open to change
- B. triumphant
- C. open to attack
- D. defeated
- E. discouraged

24. The Armada was _____ on one side.

- A. closed off
- B. damaged
- C. alone
- D. circled
- E. Answer not available in this article

The following passage refers to questions 25-29.

The victory of the small Greek democracy of Athens over the mighty Persian Empire in 490 B.C. is one of the most famous events in history. Darius, king of the Persian Empire, was furious because Athens had interceded for the other Greek city-states in revolt against Persian domination. In anger the king sent an enormous army to defeat Athens. He thought it would take drastic steps to pacify the rebellious part of the empire.

Persia was ruled by one man. In Athens, however, all citizens helped to rule. Ennobled by this participation, Athenians were prepared to die for their city-state. Perhaps this was the secret of the remarkable victory at Marathon, which freed them from Persian rule. On their way to Marathon, the Persians tried to fool some Greek city-states by claiming to have come in peace. The frightened citizens of Delos refused to believe this. Not wanting to abet the conquest of Greece, they fled from their city and did not return until the Persians had left. They were wise, for the Persians next conquered the city of Eritrea and captured its people.

Tiny Athens stood alone against Persia. The Athenian people went to their sanctuaries. There they prayed for deliverance. They asked their gods to expedite their victory. The Athenians refurbished their weapons and moved to the plain of Marathon, where their little band would meet the Persians. At the last moment, soldiers from Plataea reinforced the Athenian troops.

The Athenian army attacked, and Greek citizens fought bravely. The power of the mighty Persians was offset by the love that the Athenians had for their city. Athenians defeated the Persians in both archery and hand combat. Greek soldiers seized Persian ships and burned them, and the Persians fled in terror. Herodotus, a famous historian, reports that 6,400 Persians died, compared to only 192 Athenians.

25. Athens had _____ the other Greek city-states against the Persians.

- A. refused help to
- B. intervened on behalf of
- C. wanted to fight
- D. given orders for all to fight
- E. defeated

26. Darius took drastic steps to _____ the rebellious Athenians.

- A. weaken
- B. destroy
- C. calm
- D. irritate
- E. Answer not available

27. Their participation _____ to the Athenians.

- A. gave comfort
- B. gave honor
- C. gave strength
- D. gave fear
- E. gave hope

28. The people of Delos did not want to _____ the conquest of Greece.

- A. end
- B. encourage
- C. think about
- D. daydream about
- E. Answer not available

29. The Athenians were _____ by some soldiers who arrived from Plataea.

- A. welcomed
- B. strengthened
- C. held
- D. captured
- E. Answer not available

The following passage refers to questions 30-32.

The Trojan War is one of the most famous wars in history. It is well known for the 10-year duration, for the heroism of a number of legendary characters, and for the Trojan horse. What may not be familiar, however, is the story of how the war began.

According to Greek myth, the strife between the Trojans and the Greeks started at the wedding of Peleus, King of Thessaly, and Thetis, a sea nymph. All of the gods and goddesses had been invited to the wedding celebration in Troy except Eris, goddess of discord. She had been omitted from the guest list because her presence always embroiled mortals and immortals alike in conflict.

To take revenge on those who had slighted her, Eris decided to cause a skirmish. Into the middle of the banquet hall, she threw a golden apple marked "for the most beautiful." All of the goddesses began to haggle over who should possess it. The gods and goddesses reached a stalemate when the choice was narrowed to Hera, Athena, and Aphrodite. Someone was needed to settle the controversy by picking a winner. The job eventually fell to Paris, son of King Priam of Troy, who was said to be a good judge of beauty. Paris did not have an easy job. Each goddess, eager to win the golden apple, tried aggressively to bribe him.

"I'll grant you vast kingdoms to rule," promised Hera. "Vast kingdoms are nothing in comparison with my gift," contradicted Athena. "Choose me and I'll see that you win victory and fame in war." Aphrodite outdid her adversaries, however. She won the golden apple by offering Helen, daughter of Zeus and the most beautiful mortal in the land, to Paris. Paris, anxious to claim Helen, set off for Sparta in Greece.

Although Paris learned that Helen was married, he nevertheless accepted the hospitality of her husband, King Menelaus of Sparta. Therefore, Menelaus was outraged for a number of reasons when Paris departed, taking Helen and much of the king's wealth back to Troy. Menelaus collected his loyal forces and set sail for Troy to begin the war to reclaim Helen.

30. Eris was known for _____ both mortals and immortals.

- A. scheming against
- B. creating conflict amongst
- C. feeling hostile toward
- D. ignoring
- E. comforting

31. Each goddess tried _____ to bribe Paris.

- A. boldly
- B. effectively
- C. secretly
- D. carefully
- E. Answer not available

32. Athena _____ Hera, promising Paris victory and fame in war.

- A. disregarded the statement of
- B. defeated
- C. agreed with
- D. restated the statement of
- E. questioned the statement of

Refer to the following passage for questions 33-37.

One of the most intriguing stories of the Russian Revolution concerns the identity of Anastasia, the youngest daughter of Czar Nicholas II. During his reign over Russia, the czar had planned to revoke many of the harsh laws established by previous czars. Some workers and peasants, however, clamored for more rapid social reform. In 1918, a group of these people known as Bolsheviks overthrew the government. On July 17 or 18, they murdered the czar and what was thought to be his entire family.

Although witnesses vouched that all the members of the czar's family had been executed, there were rumors suggesting that Anastasia had survived. Over the years, a number of women claimed to be Grand Duchess Anastasia. Perhaps the most famous claimant was Anastasia Tschaikovsky, who was also known as Anna Anderson.

In 1920, 18 months after the czar's execution, this terrified young woman was rescued from drowning in a Berlin river. She spent two years in a hospital, where she attempted to reclaim her health and shattered mind. The doctors and nurses thought that she resembled Anastasia and questioned her about her background. She

disclaimed any connection with the czar's family. Eight years later, however, she claimed that she was Anastasia. She said that she had been rescued by two Russian soldiers after the czar and the rest of her family had been killed. Two brothers named Tschaikovsky had carried her into Romania. She had married one of the brothers, who had taken her to Berlin and left her there, penniless and without a vocation. Unable to invoke the aid of her mother's family in Germany, she had tried to drown herself.

During the next few years, scores of the czar's relatives, ex-servants, and acquaintances interviewed her. Many of these people said that her looks and mannerisms were evocative of the Anastasia that they had known. Her grandmother and other relatives denied that she was the real Anastasia, however.

Tired of being accused of fraud, Anastasia immigrated to the United States in 1928 and took the name Anna Anderson. She still wished to prove that she was Anastasia, though, and returned to Germany in 1933 to bring suit against her mother's family. There she declaimed to the court, asserting that she was indeed Anastasia and deserved her inheritance.

In 1957, the court decided that it could neither confirm nor deny Anastasia's identity. Although it will probably never be known whether this woman was the Grand Duchess Anastasia, her search to establish her identity has been the subject of numerous books, plays, and movies.

33. Some Russian peasants and workers _____ for social reform.

- A. longed
- B. cried out
- C. begged
- D. hoped
- E. thought much

34. Witnesses _____ that all members of the czar's family had been executed.

- A. gave assurance
- B. thought
- C. hoped
- D. convinced some
- E. Answer not available

35. Tschaikovsky initially _____ any connection with the czar's family.

- A. denied
- B. stopped
- C. noted
- D. justified
- E. Answer not available

36. She was unable to _____ the aid of her relatives.

- A. locate
- B. speak about
- C. call upon
- D. identify
- E. know

37. In court she _____ maintaining that she was Anastasia and deserved her inheritance.

- A. finally appeared
- B. spoke forcefully
- C. gave testimony
- D. gave evidence
- E. Answer not available

Refer to the following passage for questions 38-39.

King Louis XVI and Queen Marie Antoinette ruled France from 1774 to 1789, a time when the country was fighting bankruptcy. The royal couple did not let France's insecure financial situation limit their immoderate spending, however. Even though the minister of finance repeatedly warned the king and queen against wasting money, they continued to spend great fortunes on their personal pleasure. This lavish spending greatly enraged the people of France. They felt that the royal couple bought its luxurious lifestyle at the poor people's expense.

Marie Antoinette, the beautiful but exceedingly impractical queen, seemed uncaring about her subjects' misery. While French citizens begged for lower taxes, the queen embellished her palace with extravagant works of art. She also surrounded herself with artists, writers, and musicians, who encouraged the queen to spend money even more profusely.

While the queen's favorites gluttoned themselves on huge feasts at the royal table, many people in France were starving. The French government taxed the citizens outrageously. These high taxes paid for the entertainments the queen and her court so enjoyed. When the minister of finance tried to stop these royal spendthrifts, the queen replaced him. The intense hatred that the people felt for Louis XVI and Marie Antoinette kept building until it led to the French Revolution. During this time of struggle and violence (1789-1799), thousands of aristocrats, as well as the king and queen themselves, lost their lives at the guillotine. Perhaps if Louis XVI and Marie Antoinette had reined in their extravagant spending, the events that rocked France would not have occurred.

38. The people surrounding the queen encouraged her to spend money _____.

- A. wisely
- B. abundantly
- C. carefully
- D. foolishly
- E. joyfully

39. The minister of finance tried to curb these royal _____.

- A. aristocrats
- B. money wasters
- C. enemies
- D. individuals
- E. spenders

Refer to the following passage for questions 40-45.

Many great inventions are initially greeted with ridicule and disbelief. The invention of the airplane was no exception. Although many people who heard about the first powered flight on December 17, 1903 were excited and impressed, others reacted with peals of laughter. The idea of flying an aircraft was repulsive to some people. Such people called Wilbur and Orville Wright, the inventors of the first flying machine, impulsive fools. Negative reactions, however, did not stop the Wrights. Impelled by their desire to succeed, they continued their experiments in aviation.

Orville and Wilbur Wright had always had a compelling interest in aeronautics and mechanics. As young boys they earned money by making and selling kites and mechanical toys. Later, they designed a newspaper-folding machine, built a printing press, and operated a bicycle-repair shop. In 1896, when they read about the death of Otto Lillenthal, the brothers' interest in flight grew into a compulsion.

Lillenthal, a pioneer in hang-gliding, had controlled his gliders by shifting his body in the desired direction. This idea was repellent to the Wright brothers, however, and they searched for more efficient methods to control the balance of airborne vehicles. In 1900 and 1901, the Wrights tested numerous gliders and developed control techniques. The brothers' inability to obtain enough lift power for the gliders almost led them to abandon their efforts.

After further study, the Wright brothers concluded that the published tables of air pressure on curved surfaces must be wrong. They set up a wind tunnel and began a series of experiments with model wings. Because of their efforts, the old tables were repealed in time and replaced by the first reliable figures for air pressure on curved surfaces. This work, in turn, made it possible for the brothers to design a machine that would fly. In 1903 the Wrights built their first airplane, which cost less than \$1,000. They even designed and built their own source of propulsion—a lightweight gasoline engine. When they started the engine on December 17, the airplane pulsed wildly before taking off. The plane managed to stay aloft for 12 seconds, however, and it flew 120 feet.

By 1905, the Wrights had perfected the first airplane that could turn, circle, and remain airborne for half an hour at a time. Others had flown in balloons and hang gliders, but the Wright brothers were the first to build a full-size machine that could fly under its own power. As the contributors of one of the most outstanding engineering achievements in history, the Wright brothers are accurately called the fathers of aviation.

40. The idea of flying an aircraft was _____ to some people.

- A. boring
- B. distasteful
- C. exciting
- D. needless
- E. Answer not available

41. People thought that the Wright brothers had _____.

- A. acted without thinking
- B. been negatively influenced
- C. been too cautious
- D. been mistaken
- E. acted in a negative way

42. The Wrights' interest in flight grew into a _____.

- A. financial empire
- B. plan
- C. need to act
- D. foolish thought
- E. Answer not available

43. Lilienthal's idea about controlling airborne vehicles was _____ the Wrights.

- A. proven wrong by
- B. opposite to the ideas of
- C. disliked by
- D. accepted by
- E. improved by

44. The old tables were _____ and replaced by the first reliable figures for air pressure on curved surfaces.

- A. destroyed
- B. invalidated
- C. multiplied
- D. approved
- E. not used

45. The Wrights designed and built their own source of _____.

- A. force for moving forward
- B. force for turning around
- C. turning
- D. force for going backward
- E. None of the above

Read the following passage and then answer questions 46-50.

The splintered steps leading to the tenement's entrance were rotted and uneven. They led to an unlocked door which wobbled on its hinges and shrank from its frame. It creaked open to a dank, dark hall which smelled of urine and sweat. The paint was peeling off cracked walls. The faint yellow light hung low in the night. Mr. and Mrs. Gomes lived on the second floor with their three young children. Their four-room apartment was immaculate and tidy. The kitchen floor glistened, and the flowered plates and glasses were neatly stacked in the drainer. In the living room, the sheer curtains were always drawn back, filtering sunlight throughout the room, passing over a color television and several porcelain icons. Besides the freestanding gas heater was a brand name stereo system recently purchased on an "easy pay" credit plan.

The soft pine floors were all warped but recently painted. The wide floorboards, once loose in many places, were now nailed down securely. Clear plastic sheets were tacked over the windows to prevent heat loss. The children, two girls and a boy, shared a large room with one small window that was separated from the kitchen by a curtain. The gas stove "warmed" them at night. Their toys were piled high in wooden crates. The children did not dare turn on the kitchen light for fear that the six-legged, brown-bodied pests would dart out in front of them. The Gomes family had rented this apartment for ten years, ever since they came to this country. They had known no other

home, although they had dreamed of many. Some day they hoped to live in a quiet neighborhood with open yards and spotless sidewalks, where people get into cars each weekday morning and commute to work.

46. You can infer that the story takes place in the

- a. summer
- b. spring
- c. fall
- d. winter

47. In the third paragraph the word icons means

- a. fine china plates
- b. ornate lamps
- c. religious figures
- d. ashtrays

48. You can conclude that the Gomes family members are

- a. native Americans
- b. United States citizens
- c. Chinese
- d. immigrants
- e. second generation Americans

49. What would be the opposite meaning of the word immaculate in the second paragraph?

- a. filthy
- b. girlish
- c. clean
- d. horrible
- e. modern

50. What can you infer about the children's bedroom?

- a. It is well furnished.
- b. It is crowded.
- c. It has its own bathroom.
- d. It is well lighted.
- e. It is pest-free.

Reading Main

Americans have always been interested in their Presidents' wives. Many First Ladies have been remembered because of the ways they have influenced their husbands. Other First Ladies have made the history books on their own.

At least two First Ladies, Bess Truman and Lady Bird Johnson, made it their business to send signals during their husbands' speeches. When Lady Bird Johnson thought her husband was talking too long, she wrote a note and sent it up to the platform. It read, "It's time to stop!" And he did. Once Bess Truman didn't like what her husband was saying on television, so she phoned him and said, "If you can't talk more politely than that in public, you come right home."

Abigail Fillmore and Eliza Johnson actually taught their husbands, Millard Fillmore and Andrew Johnson, the thirteenth and seventeenth Presidents. A schoolteacher, Abigail eventually married her pupil, Millard. When Eliza Johnson married Andrew, he could not read or write, so she taught him herself.

It was First Lady Helen Taft's idea to plant the famous cherry trees in Washington, D. C. Each spring these blossoming trees attract thousands of visitors to the nation's capital. Mrs. Taft also influenced the male members of her family and the White House staff in a strange way: she convinced them to shave off their beards!

Shortly after President Woodrow Wilson suffered a stroke, Edith Wilson unofficially took over most of the duties of the Presidency until the end of her husband's term. Earlier, during World War I, Mrs. Wilson had sheep brought onto the White House lawn to eat the grass. The sheep not only kept the lawn mowed, but provided wool for an auction sponsored by the First Lady. Almost \$100,000 was raised for the Red Cross.

Dolly Madison saw to it that a magnificent painting of George Washington was not destroyed during the War of 1812. As the British marched toward Washington, D. C., she remained behind to rescue the painting, even after the guards had left. The painting is the only object from the original White House that was not burned.

One of the most famous First Ladies was Eleanor Roosevelt, the wife of President Franklin D. Roosevelt. She was active in political and social causes throughout her husband's tenure in office. After his death, she became famous for her humanitarian work in the United Nations. She made life better for thousands of needy people around the world.

51. What is the main idea of this passage?

- A. The Humanitarian work of the First Ladies is critical in American government.
- B. Dolly Madison was the most influential president's wife.
- C. Eleanor Roosevelt transformed the First Lady image.
- D. The First Ladies are important figures in American culture.
- E. The First Ladies are key supporters of the Presidents.

Read the passage below and answer question 52.

Of the many kinds of vegetables grown all over the world, which remains the favorite of young and old alike? The potato, of course.

Perhaps you know them as "taters," "spuds," or "Kennebees," or as "chips," "Idahoese," or even "shoestrings." No matter, a potato by any other name is still a potato- the world's most widely grown vegetable. As a matter of fact, if you are an average potato eater, you will put away at least 100 pounds of them each year.

That's only a tiny portion of the amount grown every year, however. Worldwide, the annual potato harvest is over 6 billion bags. Each bag contains 100 pounds of potatoes, some of them as large as four pounds each. Here in the United States, farmers fill about 400 million bags a year. That may seem like a lot of "taters," but it leaves the United States a distant third among world potato growers. Polish farmers dig up just over 800 million bags a year, while the Russians lead the world with nearly 1.5 billion bags.

The first potatoes were grown by the Incas of South America, more than 400 years ago. Their descendants in Ecuador and Chile continue to grow the vegetable as high as 14,000 feet up in the Andes Mountains. (That's higher than any other food will grow.) Early Spanish and English explorers shipped potatoes to Europe, and they found their way to North America in the early 1600s.

People eat potatoes in many ways-baked, mashed, and roasted, to name just three. However, in the United States most potatoes are devoured in the form of French fries. One fast-food chain alone sells more than \$1 billion worth of fries each year. No wonder, then, that the company pays particular attention to the way its fries are prepared.

Before any fry makes it to the people who eat at these popular restaurants, it must pass many separate tests. Fail any one of these tests and the potato is rejected. To start with, only Russet Burbank potatoes are used. These Idaho potatoes have less water content than other kinds, which can have as much as 80 percent water. Once cut into "shoestrings" shapes, the potatoes are partly fried in a secret blend of oils, sprayed with liquid sugar to brown them, steam dried at high heat, then flash frozen for shipment to individual restaurants.

Before shipping, every shoestring is measured. Forty percent of a batch must be between two and three inches long. Another 40 percent has to be over three inches. What about the 20 percent that are left in the batch? Well, a few short fries in a bag are okay, it seems.

So, now that you realize the enormous size and value of the potato crop, you can understand why most people agree that this part of the food industry is no "small potatoes."

52. What is the main idea of this passage?

- A. Potatoes from Ireland started the Potato Revolution.
- B. The average American eats 50 pounds of potatoes a year.
- C. French fries are made from potatoes.
- D. Potatoes are a key vegetable in America.
- E. The various terms for potatoes have a long history.

Read the passage below and answer question 53.

What does the word "patent" mean to you? Does it strike you as being something rather remote from your interests? If it does, stop and think a moment about some of the commonplace things that you use every day, those objects that you take for granted as part of the world around you. The telephone, radio, television, automobile, and the 1,001 other things (even the humble safety pin) that enrich our lives today once existed only as ideas in the minds of men. If it had not been possible to patent their ideas and thus protect them against copying by others, these inventions might never have been fully developed to serve mankind.

If there were no patent protection there would be little incentive to invent and innovate, for once the details of an invention became known, hordes of imitators who did not share the inventor's risks and expenses might well flood the market with their copies of his product and reap much of the benefit of his efforts. The technological progress that has made America great would wither rapidly under conditions such as these.

The fundamental principles in the United States patent structure came from England. During the glorious reign of Queen Elizabeth I in England, the expanding technology was furthered by the granting of exclusive manufacturing and selling privileges to citizens who had invented new processes or tools—a step that did much to encourage creativity. Later, when critics argued that giving monopoly rights to one person infringed on the rights of others, an important principle was added to the patent structure: The Lord Chief Justice of England stated that society had everything to gain and nothing to lose by granting exclusive privileges to an inventor, because a patent for an invention was granted for something new that society never had before.

Another basic principle was brought into law because certain influential people in England had managed to obtain monopoly control over such age-old products as salt, and had begun charging as much as the people could tolerate. The public outcry became so great that the government was forced to decree that monopoly rights could be awarded only to those who created or introduced something really unique. These principles are the mainstays of the modern patent system in the United States.

In colonial times, patent law was left up to the separate states. The inconsistency, confusion, and unfairness that resulted clearly indicated the need for a uniform patent law, and the men who drew up the Constitution incorporated one. George Washington signed the first patent law on April 10, 1790, and less than four months later the first patent was issued to a man named Samuel Hopkins for a chemical process, an improved method of making potash for use in soapmaking.

In 1936 the Patent Office was established as a separate bureau. From the staff of eight that it maintained during its first year of operation, it has grown into an organization of over 2,500 people handling more than 1,600 patent applications and granting over 1,000 every week.

The Patent Office in Washington, D. C. is the world's largest library of scientific and technical data, and this treasure trove of information is open for public inspection. In addition to more than 3 million US patents, it houses more than 7 million foreign patents and thousands of volumes of technical literature. Abraham Lincoln patented a device to lift steam vessels over river shoals, Mark Twain developed a self-pasting scrapbook, and millionaire Cornelius Vanderbilt invented a shoe-shine kit.

A patent may be granted for any new and useful process, machine, article of manufacture, or composition of matter (a chemical compound or combinations of chemical compounds), or any distinct and new variety of plant, including certain mutants and hybrids.

The patent system has also helped to boost the wages of the American worker to an unprecedented level: he can produce more and earn more with the computer, adding machines, drill press or lathe. Patented inventions also help keep prices down by increasing manufacturing efficiency and by stimulating the competition that is the foundation of our free enterprise system.

The decades of history have disclosed little need for modification of the patent structure. United States patent laws, like the Constitution from which they grew, have stood the test of time well. They encouraged the creative processes, brought untold benefits to society as a whole, and enabled American technology to outstrip that of the rest of the civilized world.

53. What is the main idea of this passage?

- A. The patent system encourages free enterprise.
- B. The Constitution protects the patent system.
- C. The patent system in England has been influential in American patent development.
- D. Patents are important tools for inventors.
- E. Patented inventions protect the inventor, free enterprise, and the creative process.

Read the passage below and answer question 54.

Most people think that it's fine to be "busy as a beaver." Little do they know. Beavers may work hard, but often they don't get very much done.

Beavers are supposed to be great tree cutters. It is true that a beaver can gnaw through a tree very quickly: A six-inch birch takes about 10 minutes. But then what? Often the beaver does not make use of the tree. One expert says that beavers waste one out of every five trees they cut.

For one thing, they do not choose their trees wisely. One bunch of beavers cut down a cottonwood tree more than 100 feet tall. Then they found that they could not move it.

In thick woods, a tree sometimes won't fall down. It gets stuck in the other trees. Of course, the beaver doesn't think to cut down the trees that are in the way. So a good tree goes to waste.

Some people think that beavers can make a tree fall the way they want it to. Not true. (In fact, beavers sometimes get pinned under a falling tree.) When beavers cut a tree near a stream, it usually falls into the water, but they do not plan it that way. The fact is that most trees lean toward the water to start with.

Now what about dam building? Most beaver dams are wonders of engineering. The best ones are strongly built of trees, stones, and mud. They are wide at the bottom and narrow at the top.

Beavers think nothing of building a dam more than 200 feet long. One dam in Montana was more than 2,000 feet long. The largest one ever seen was in New Hampshire: it stretched 4,000 feet, and made a lake large enough to hold 40 beaver homes.

So beavers do build good dams. But they don't always build them in the right places. They just don't plan. They will build a dam across the widest part of the stream. They don't try to find a place where the stream is narrow. So a lot of their hard work is wasted.

Beavers should learn that it's not enough to be busy. You have to know what you're doing, too. For example, there was one Oregon beaver that really was a worker. It decided to fix a leak in a man-made dam. After five days of work it gave up. The leak it was trying to block was the lock that boats go through.

54. What is the main idea of this passage?

- A. Beavers may be hard-working animals, but they don't always choose the most efficient mechanisms.
- B. Beavers are excellent dam builders.
- C. New Hampshire was the site of the largest beaver dam.
- D. Beavers are well-developed tree cutters.
- E. Beavers are poor surveyors of aquatic environments in some cases.

Read the passage below and answer question 55.

The raisin business in America was born by accident. It happened in 1873 in the San Joaquin Valley of California. Many farmers raised grapes in this valley. That year, just before the grape harvest, there was a heat wave. It was one of the worst heat waves ever known. It was so hot that the grapes dried on the vines. When they were picked, California had its first raisin crop.

People were surprised to find how good raisins were. Everybody wanted more. So the San Joaquin farmers went into the raisin business. Today, of course, they do not let the grapes dry on the vines. They treat them with much more care.

In late August the grapes start to ripen. They are tested often for sweetness. The growers wait until the sugar content is twenty-one percent. Then they know the grapes are ripe enough to be picked.

Skilled workers come to the vineyards. They pick the grapes by hand in bunches. The workers fill their flat pans with grapes. They gently empty the pans onto squares of paper. These squares lie between the long rows of vines. They sit in the sun.

Here the grapes stay while the sun does its work. It may take two weeks or longer. The grapes are first dried on one side. When they have reached the right color, they are turned to dry on the other side. The grapes are dried until only fifteen percent of the moisture is left. Then they have turned into raisins.

The raisins are rolled up in the paper on which they have dried. Trucks take them from the fields. They are poured into big boxes called sweatboxes. Each box holds 160 pounds of raisins. Here, any raisins that are too dry take moisture from those that have too much. After a while, they are all just moist enough.

The big boxes are trucked next to the packaging plant. They are emptied onto a conveyor belt that shakes the raisins gently. This knocks them from their stems. A blast of air whisks the stems away. The water bath is next. Then the plump brown raisins have a last inspection. They are again checked for moisture and sugar. Then they go on a belt to packing machines. Here they are poured into packages, which are automatically weighed and sealed. The raisins are now ready for market.

55. What is the main idea of this passage?

- A. The creation of raisins in America was an accident.
- B. The process of raisin development requires multiple steps.
- C. Raisins on the grocery store shelf undergo a brief fermentation process.
- D. Raisins are cleaned thoroughly at the packing plant.
- E. California has been the leader in American raisin development.

Read the passage below and answer question 56.

In 1976, Sichan Siv was crawling through the jungle, trying to escape from Cambodia. By 1989, however, Siv was working in the White House in Washington D. C., as an advisor to the President of the United States. How did this strange journey come about?

Like millions of Cambodians, Siv was a victim of a bloody civil war. One of the sides in this war was the Cambodian government. The other was a group called the Khmer Rouge. When the Khmer Rouge won the war, the situation in Cambodia got worse. Many people were killed, while others were forced into hard labor. Sometimes entire families were murdered.

Siv came from a large family that lived in the capital of Cambodia. After finishing high school, Siv worked for a while with a Cambodian airline company. Later, he taught English. After that, he took a job with CARE, an American group that was helping victims of the war.

Siv had hoped to leave Cambodia before the Khmer Rouge took over the country. Unfortunately, he was delayed. As a result, he and his family were taken from their homes and forced to labor in rice fields. Eventually, Siv managed to escape. He rode an old bicycle for miles, trying to reach Thailand where he would be free and safe. For three weeks, he slept on the ground and tried to hide from the soldiers who were looking for him. Caught at last, he was afraid he would be killed. Instead, he was put into a labor camp, where he worked 18 hours each day without rest. After several months, he escaped again, and this time he made it. The journey, however, was a terrifying one. After three days of staggering on foot through mile after mile of thick bamboo, Siv finally made his way to Thailand.

Because he had worked for an American charity group, Siv quickly found work in a refugee camp. Soon he was on his way to the United States. He arrived in June of 1976 and got a job—first picking apples and then cooking in a fast-food restaurant. Siv, however, wanted more than this: he wanted to work with people who, like himself, had

suffered the hardship of leaving their own countries behind. Siv decided that the best way to prepare for this kind of work was to go to college. He wrote letters to many colleges and universities. They were impressed with his school records from Cambodia, and they were impressed with his bravery. Finally, in 1980, he was able to study at Columbia University in New York City. After finishing his studies at Columbia, Siv took a job with the United Nations. He married an American woman and became a citizen. After several more years, he felt that he was very much a part of his new country.

In 1988, Siv was offered a job in the White House working for President Ronald Reagan's closest advisors. It was a difficult job, and he often had to work long hours. However the long hard work was worth it, because Siv got the opportunity to help refugees in his work.

56. What is the main idea of this passage?

- A. Persistence and courage are global ideas.
- B. Siv covered a large area during his life.
- C. Siv persevered to escape from Cambodia.
- D. Siv overcame numerous challenges to come to America and help others.
- E. Siv persevered to become an American citizen.

Read the following passage and answer question 57.

When you want to hang the American flag over the middle of a street, suspend it vertically with the blue field (called the union) to the north and east-west street. When the flag is displayed with another banner from crossed staffs, the American flag is on the right. Place the staff of the American flag in front of the other staff. Raise the flag quickly and lower it slowly and respectfully. When flying the flag at half-mast, hoist it to the top of the pole for a moment before lowering it to mid-pole. When flying the American flag with banners from states or cities, raise the nation's banner first and lower it last. Never allow the flag to touch the ground.

57. What is the main idea of this passage?

- A. The American flag is the symbol of American freedom.
- B. The American flag has fifty stars.
- C. Placing the American flag inappropriately will draw government intervention.
- D. American flag should be flown differently in certain situations.
- E. The flag should be lowered quickly and respectfully.

Read the following passage and answer question 58.

What if someone told you about a kind of grass that grows as tall as the tallest trees? A grass that can be made as strong as steel? A grass from which houses, furniture, boats, and hundreds of other useful things can be made? A grass that you would even enjoy eating? Would you believe that person? You should, for that grass is bamboo, the "wood" of 1,001 uses.

Bamboo may look like wood, but it is part of the family of plants that includes wheat, oats, and barley. It is a kind of grass. This grass is not just a material for making useful products. Young bamboo is eaten, often mixed with other vegetables, in many Asian foods.

Bamboo grows in many parts of the world. In the United States it grows in an area from Virginia west to Indiana and south to Florida, Louisiana, and Texas. Most bamboo, however, is found in warm, wet climates, especially in Asia and on the islands of the South Pacific Ocean.

In most Asian countries, bamboo is nearly as important as rice. Many Asians live in bamboo houses. They sit on bamboo chairs and sleep on bamboo mats. They fence their land with bamboo and use it to cage their chickens and pigs.

Bamboo is used to build large buildings as well as homes. When it is glued in layers, it becomes as strong as steel. On some islands in the South Pacific, bamboo is even used for water pipes. This extraordinary material has many other uses. It is used to make musical instruments such as flutes and recorders. Paper made from bamboo has been highly prized by artists for thousands of years.

Bamboo is light and strong, and it bends without breaking. It is cheap, floats on water, almost never wears out, and is easy to grow. Nothing else on earth grows quite so fast as bamboo. At times you can even see it grow! Botanists have recorded growths of more than three feet in just 24 hours! Bamboo is hollow and has a strong root system that almost never stops growing and spreading. In fact, only after it flowers, an event that may happen only once every 30 years, will bamboo die.

There are more than 1,000 kinds of bamboo. The smallest is only three inches tall and one-tenth of an inch across. The largest is more than 200 feet in height and seven inches in diameter. No wonder, then, that the lives of nearly half the people on earth would change enormously if there were no longer any bamboo. No wonder, too, that for many people, bamboo is a symbol of happiness and good fortune.

58. What is the main idea of this passage?

- A. Bamboo has at least 2,000 uses.
- B. Bamboo grows at an amazing rate and is found primarily in Asia.
- C. Bamboo is an amazing grass that can be used in multiple ways.
- D. There are at least 1,000 types of bamboo.
- E. Bamboo could be considered a flower in some cases.

Read the following passage and answer question 59.

Every year since 1986, some of the world's most daring runners have gathered in the desert of Morocco. They are there to take part in one of the most difficult races in the world. The Marathon of the Sands, as it is called, covers over 125 miles of desert and mountain wilderness. The runners complete the course in fewer than seven days, and they run with their food, clothing, and sleeping bags on their backs.

The Marathon of the Sands was founded in 1986 by Patrick Bauer. His idea was to give the runners, who come from all over the world, a special kind of adventure. Most of the runners in this race have found that they form deep friendships with the other runners during their days and nights in the desert. Facing terrible heat and complete exhaustion, they learn much about themselves and each other.

For most of the runners, however, the challenge of the race is the main reason for coming. On the first day, for example, they run 15 miles across a desert of sand, rocks, and thorny bushes. Few runners finish the day without blistered and raw feet. Because they are allowed less than nine quarts of water during each day of the race, they also suffer from a lack of water. Most of all, they are exhausted when they arrive at the campsite for the night.

The second day, the runners awaken at 6:00 a.m. Within a few hours, it is 100 degrees Fahrenheit, but the runners do not hesitate. They must cover 18 miles that day. That night, they rest. They must be ready for the next day's run.

On the third day, the runners must climb giant sand dunes-the first they have faced. Dust and sand mix with the runners' sweat. Soon their faces are caked with mud. After 15 miles of these conditions, the runners finally reach their next camp.

The race continues like this for four more days. The fourth and fifth days are the worst. On the fourth day, the runners pass through a level stretch and a beautiful, tree-filled oasis, but then, on this and on the next day, they cross more than 21 miles of rocks and sand dunes. The temperature soars to 125 degrees Fahrenheit, and many runners cannot make it. Helicopters rush fallen runners to medical help. Runners who make it to the end of the fifth day know that the worst is over.

On the sixth day, heat and rocks punish the racers terribly. In the Valley of Dra, the wind picks up and, as the desert heat is thrust against them with great force, they grow more and more exhausted.

The seventh day is the last, with only 12 miles to be covered. The dusty, tired, blistered runners set out at daybreak. Near the finish line, children race along with the runners, for everybody has caught the excitement. The ones who have run the whole marathon know they have accomplished what most people could not even dream of. "During the hard moments," says one contestant who has raced here twice, "I'd think, 'Why am I here?' Then I'd realize I was there to find my limits."

59. What is the main idea of this passage?

- A. The Marathon of the Sands race tests the limits of human endurance.
- B. The runners run at their own paces.
- C. The race causes the strong to stumble and the weak to not finish.
- D. The seventh day is the hardest day of the race.
- E. Every runner runs the race to find their human limits.

Read the following passage and answer question 60.

High in the Andes Mountains in Peru stands the ancient city of Machu Picchu. No one knows why this great city was built, nor is it likely that anyone will ever know. Nevertheless, the deserted city of Machu Picchu is important for what it reveals about the ancient Inca people of South America.

The Incas once ruled a great empire that covered a large part of the South American continent. The empire was more than 500 years old when the first Spanish explorers, looking for gold, went to that continent in the 16th century.

The Incas were an advanced people. They were skillful engineers who paved their roads and built sturdy bridges. They plowed the land in such a way that rains would not wash away valuable soil, and dug ditches to carry water into dry areas for farming.

Even though they did not know about the wheel, the Incas were able to move huge stone blocks-some as heavy as 10 tons-up the sides of mountains to build walls. The blocks were fitted so tightly, without cement of any kind, that it would be impossible to slip a knife blade between them! The walls have stood firm through great storms and earthquakes that have destroyed many modern buildings.

The Incas were great artists, too. Today, Incan dishes and other kinds of pottery are prized for their wonderful designs. Because both gold and silver were in great supply, the Incas created splendid objects from these precious metals.

While it is true that the Incas had no written language, they kept their accounts by using a system of knotted strings of various lengths and colors. The sizes of the knots and the distances between them represented numbers.

At its height, the Incan Empire included as many as 30 million people. The emperor ruled them with an iron hand. He told his subjects where to live, what to plant, how long they should work, and even whom they could marry. Because he owned everything, the emperor gave what he wished when he wished-and in the amount he wished-to his people.

In 1533, Spanish explorers led by Francisco Pizarro murdered the emperor of the Incas. Earlier, the heir to the Incan empire had also been killed. The Incas, who had always been entirely dependent on their emperor, now had no recognized leader. The Spaniards easily conquered the empire and plundered its riches.

Have the Incas disappeared from South America? Not at all. In Peru alone, once the center of that great empire, 80 percent of the 20 million people are descendants of the Inca people. Evidence of the Incan empire can be found in many other places in South America as well. Tourists can even visit Machu Picchu. The remains of this ancient city still stand high in the mountains of Peru, an awesome tribute to this once powerful empire.

60. What is the main idea of this passage?

- A. The Incas once inhabited the ancient city of Machu Picchu.
- B. Peru was the primary country of the Incas.
- C. The Incan Empire can be found in ancient cities and was plundered by the Spanish.
- D. Spanish conquerors destroyed the Incan empire in the 13th century.
- E. Machu Picchu was the capital of the Incan empire.

Answers and Explanations

- 1. B:** "Terrestrial" means land. No choice here offers a synonym for "marine," e.g. nautical/naval/water/seagoing, and no other choices match either marine or terrestrial.
- 2. A:** "Quagmire" means literally a bog or marsh, and figuratively an involved situation difficult to escape; entanglement is a synonym, more specifically similar than the other choices.
- 3. A:** Longitudes are imaginary geographical lines running north and south. Latitudes run east and west. The other choices do not equal either latitude or longitude in direction.
- 4. C:** Topography means the physical features of a land mass. It does not mean coastline (A), mountain range (B), or islands (D).
- 5. C:** A peninsula is a piece of land connected to the mainland by an isthmus and projecting into the ocean such that it is surrounded on three sides by water. A peninsula is not a coast (A); it is not found inland (B); and it is not a border (D).
- 6. B:** The passage was found near 50 degrees S latitude. Latitudes are measured horizontally, in relation to the equator or central imaginary line, equidistant between the North and South Poles. Longitudes are measured vertically. Greenwich (A), the location of zero degrees longitude, adopted as the global standard, is both incorrect and never named in the passage. Spain (C), Portugal (D), and Madrid (E) in Spain are also incorrect.
- 7. A:** Meridians are imaginary geographical circles intersecting the poles. Imaginary lines parallel to the equator (B) are latitudes. The International Date Line is a specific meridian, not an area (C). It is not a land mass (D) as it crosses both water and land.
- 8. A:** "Amicable" means friendly. It does not mean competitive (B), i.e. oppositional, ambitious, or aggressive; courteous (C), i.e. polite; industrious (D), i.e. hard-working; or chemistry (E): their collaboration was in physics, but moreover, the passage specifically describes their collaboration as "amicable."
- 9. B:** "Blithe" means light-hearted. It does not mean strong (A), humorous (B) or funny; strange (D), or envious (E).
- 10. B:** "Disgruntled" means annoyed. It does not mean hopeless (A), depressed (C), or worried (D).
- 11. A:** Marie challenged authority by going to study at the Sorbonne, because Warsaw's university did not admit women. The passage indicates this challenge by describing her "defiantly" leaving Poland for France; i.e., she was defying authority. The passage does not indicate she showed intelligence (B), "behaved" (C), or was distressed (D) or upset by her move.
- 12. A:** A synonym for "despondently" is "dejectedly," meaning sadly, with despair or depression. The passage indicates this by describing Curie's emotional state as one of "heartbreaking anguish" over her husband's sudden accidental death. She is not described in this passage as worried (B) by her memories, or recalling them tearfully (C), happily (D), or irefully (E), i.e. angrily.
- 13. C:** The closest synonym for the "feeling of desolation" (despair) described in the passage is wretchedness. Misfortune (A) or ill fate/luck is not as close. Anger (B) is a separate emotion from desolation. Disappointment (D) is also different from desolation, meaning feeling let-down rather than hopeless. Ambition (E) is drive to succeed or accomplish things. It was not Curie's ambition that faded upon returning to the Sorbonne but her depression.

14. C: "Disillusioned" means disappointed. It does not mean troubled (A), i.e. concerned or disturbed; worried (B) or anxious; sorrowful (D) or sad; or disturbed (E).

15. B: "Coagulated" means solidified. Liquid (A) is an opposite of solid. Flowing (C) assumes a liquid, not solid, state. Gas (D) is another opposite of solid. (Three states of matter, like volcanic material, are liquid, solid, and gaseous.)

16. A: "Buoyant" means able to float. The passage indicates this by indicating that the gases therefore, sank toward earth and suffocated people. Buoyant does not mean visible (B) or possible to see. Able to float/buoyant does not mean able to evaporate (C). Evaporation means turning to vapor, which only liquids can do. Gases are already vapors. Buoyant does not mean invisible (D) or unseen. Able to float does not mean able to condense (E), i.e. turn from vapor to liquid.

17. B: "Dissect" means to cut apart for study. It does not mean to describe in detail (A), to photograph (C), or to chart (D) a specimen.

18. B: Meteorologists are scientists who study atmospheric conditions, particularly weather. Scientists who study oceans (A) are oceanographers, i.e. marine scientists. Scientists who study ash (C) do not exist as members of a separate discipline. Climate scientists and many others concerned with its effects study volcanic ash. Scientists who study animal behavior (D) are ethologists or animal behaviorists and do not study ash.

19. C: Distilled water is purified water. Distilled water is not equivalent to bottled (A), volcanic (B), sea (D), or fountain (E) water.

20. A: "Supremacy" means unlimited power, not unrestricted growth (B). The passage states that Drake diminished Spain's supremacy, but does not specifically mention diminishing its territory (C). Drake's raids enriched England and reduced Spain's power; no mention is made of eliminating any treaties (D).

21. B: "Robust" means strong. It does not mean warlike (A), accomplished (C) or competent, timid (D) or fearful, or inexperienced (E).

22. B: "Martial" means warlike or war-related. It does not mean complete (A), independent (C), or isolated (D).

23. C: "Vulnerable" means open to attack or susceptible to harm. It does not mean open to change (A) or receptive, triumphant (B) or victorious, defeated (D) or beaten-they were vulnerable to attack first and then consequently were defeated-or discouraged (E), i.e. disheartened or dispirited.

24. A: The passage indicates the Armada was "blocked" on one side, i.e. closed off rather than damaged (B) (it was damaged extensively, not on one side); alone (C) or circled (D), i.e. surrounded, neither of which can be done on only one side.

25. B: "Interceded for" means intervened on behalf of, not refused help to (A), wanted to fight (C), given orders for all to fight (D), or defeated (E).

26. C: "Pacify" means to calm or make peaceful. It does not mean to make weaker (A), to destroy (B), or to irritate (D), i.e. annoy or provoke.

27. B: "Ennobled" means gave honor to or made noble. It does not mean gave comfort (A) or solace, gave strength (C), i.e. fortified or reinforced, gave fear (D) or frightened, or gave hope (E) or encouraged.

- 28. B:** To "abet" means to enable, support, or encourage, usually in crime or doing something wrong. It does not mean to end (A), think about (C), or daydream about (D) something.
- 29. B:** "Reinforced" means strengthened, not welcomed (A), held (C), or captured (D).
- 30. B:** The passage states that the presence of Eris, goddess of discord, "always embroiled mortals and immortals alike in conflict." Embroiling them in conflict is creating conflict amongst them. It does not mean scheming against (A) them, feeling hostile toward (C) them, ignoring (D) them, or comforting (E) them.
- 31. A:** "Aggressively" means boldly. It does not mean effectively (B) or successfully, secretly (C), or carefully (D).
- 32. A:** "Contradicted" means Athena disregarded Hera's statement and disputed or countered it. It does not mean she defeated (B) her statement, agreed with (C) it, restated (D) it, or questioned (E) it.
- 33. B:** To "clamor for" means to cry out for (something). It does not mean to long for (A) it, beg (C) for it, hope (D) for it, or think much (E) "for," of, or about it.
- 34. A:** To "vouch" means to give assurance. It does not mean to think (B), hope (C), or convince some (D).
- 35. A:** "Disclaimed" means denied, i.e. refused or declared untrue. It does not mean stopped (B), noted (C), or justified (D), i.e. substantiated or confirmed, the opposite of denied.
- 36. C:** She was unable to invoke, i.e. to call upon, the aid of relatives. To invoke does not mean to locate (A) or find; to speak about (B) or discuss; to identify (D), i.e. recognize; or to know (E).
- 37. B:** "Declaimed" means spoke forcefully. It does not mean finally appeared (A). Though she did also give testimony (C) in court, "declaimed" does not mean to testify; it describes the way she spoke while doing so. "Declaimed" also does not mean she gave evidence (D).
- 38. B:** "Profusely" means abundantly, copiously, or excessively. It does not mean wisely (A) or carefully (B), which are both opposite in meaning to the excessive connotation of profuse spending. Foolishly (D) can be associated with spending profusely, but does not have the same meaning. Profusely does not mean joyfully (E), i.e. gleefully or happily.
- 39. B:** "Spendthrifts" means money wasters. It does not mean aristocrats (A), i.e. nobles or privileged people. It does not mean enemies (C) or adversaries. It does not mean individuals (D) or persons. "Spenders" (E) denotes people who spend, but does not convey the sense of wasteful spending or squandering in the same way that "spendthrifts" does.
- 40. B:** "Repulsive" means distasteful. It does not mean boring (A), exciting (C), or needless (D).
- 41. A:** "Impulsive" means acting on impulse, i.e. acting without thinking. People thinking the Wrights "impulsive fools" does not mean they thought the Wrights had been negatively influenced (B), too cautious (C), mistaken (D), or had acted in a negative way (E).
- 42. C:** A "compulsion" is a need or an urge to act. It is not a financial empire (A), a plan (B), or a foolish thought (D).
- 43. C:** "Repellent" means offensive or hateful; in other words, Lilienthal's idea was disliked by the Wrights. It does not mean his idea was opposite to the idea of (B) the Wrights. It means the opposite of its being accepted by (D) the Wrights. They found his idea unpleasant rather than improving (E) on it.

44. B: "Repealed" means invalidated, i.e. disproven or overturned. It does not mean destroyed (A); multiplied (C), i.e. increased/approved (D), an antonym; or unused (E).

45. A: "Propulsion" is force for propelling or moving forward. It does not mean force for turning around (B), turning (C) (oscillation perhaps), or force for going backward (D) (like repulsion).

46. d. Because "clear plastic sheets were tacked over the windows to keep the heat in." Another clue is that the gas stove "warmed" the children at night.

47. c. One definition of an icon is a religious figure.

48. d. Reread the first sentence of the last paragraph.

49. a. Immaculate means very clean.

50. b. Choice "a" is incorrect because wooden crates are used to store toys. No mention is made of a bathroom, and one small window does not light a large room.

51. D: The passage describes actions of various First Ladies as examples of their importance in American culture. That they are key supporters of the Presidents (E) is not the main idea because the first paragraph states some First Ladies are remembered for influencing their husbands, while others "...have made the history books on their own." Not all First Ladies are described here as doing humanitarian work (A). No one First Lady is singled out as most important [(B), (C)].

52. D: The main idea is the importance of potatoes in America. It never mentions Ireland or any Potato Revolution (A). (B) is both incorrect-the passage states 100 lbs., not 50-and regardless of accuracy, is a detail, not the main idea. Readers already know French fries are made from potatoes (C), a detail the passage assumes. Several various terms for potatoes are mentioned in the second paragraph, but their history (E) is never discussed.

53. E: All three benefits of patents-inventor protection, free enterprise, and the creative process-are given equal importance in the passage. The other four choices each accurately identify individual ideas in the passage, but none incorporates all three parts of the main idea.

54. A: Only this choice identifies the main idea, that beavers are hard-working but not always efficient. Each of the other choices identifies one detail included in the passage, not the main idea.

55. B: The multiple steps required in the process are outlined throughout the passage. The introductory statement that the industry began by accident (A) is a detail, not the main idea. Shelf fermentation (C) is never mentioned. A water bath is mentioned, not thorough cleaning (D), and is a detail, regardless. California is only mentioned as the location of the first raisin crop but never identified as raisin development's leader (E).

56. D: The passage focuses on the many challenges overcome by the subject, Siv, in particular, rather than mentioning any global nature of his persistence and courage (A) or the size of the area he covered (B). His perseverance to escape (C) is true, but only part of the main idea, not mentioning his desire to help others. His attaining American citizenship is mentioned, but his perseverance was not for this (E), but for escaping Cambodia and helping other refugees.

57. D: The passage instructs how to fly the flag in different situations. It never mentions the flag's symbolism (A) or its number of stars (B), or any government intervention (C). It states the flag should be lowered slowly, not quickly (E).

58. C: The many uses of bamboo, and the fact it is a grass, are the main focus. "1,001 uses" is a non-literal colloquial expression meaning a great many; the passage never states factually that bamboo has at least 2,000 (A). Bamboo's growth rate and its location in many parts of the world, especially Asia (B), and the number of types (D), and the fact that it occasionally flowers (E), are details supporting/informing the main idea.

59. A: Testing human endurance limits is illustrated in this description of a punishing marathon. It never mentions runners running at their own paces (B). The race's challenges, and many not finishing (C) are details informing the main point. The seventh/last day is not the hardest (D); the fourth and fifth are identified as worst. (Regardless of accuracy, this is also a detail, not the main idea.) One, not every (E), runner is quoted as competing "to find my limits."

60. C: This choice best summarizes the passage's main points. Choice (D) incorrectly identifies the 13th century instead of the 16th century. The passage never indicates that Machu Picchu was the capital of the Incan empire (E). Answers (A) and (B) are details in support of the main idea.

Language Practice

Comma Practice Test Questions

The following sentences either have existing or require additional commas somewhere in their structures. Choose the option that best reflects proper comma usage in each sentence.

1. For the Thanksgiving reunion, relatives were sitting in the dining room, on the porch, and in the carport.

- A. Thanksgiving, reunion
- B. were, sitting
- C. porch and
- D. No error

2. Lydia seems to be a kind, considerate girl.

- A. seems, to
- B. considerate, girl
- C. kind considerate
- D. No error

3. This fishing pole Nathan, has seen better days.

- A. pole, Nathan,
- B. has, seen
- C. Nathan
- D. No error

4. My cousin has moved to 56 Central Street Narragansett, Rhode Island 02882.

- A. has moved,
- B. Central Street,
- C. 56, Central
- D. No error

5. The badger, a shy animal sometimes makes friends with a coyote.

- A. sometimes, makes
- B. friends, with
- C. a shy animal,
- D. No error

6. After the death of Blackbeard, the famous pirate, piracy disappeared from the coast of the American colonies.

- A. the famous pirate
- B. after the death,
- C. coast, of
- D. No error

7. "Silent Night" was written by two men from the village of Oberndorf Austria.

- A. men, from
- B. "Silent Night,"
- C. Oberndorf, Austria
- D. No error

8. On November 19, 1929 Admiral Richard E. Byrd flew the Floyd Bennett to the base of the Queen Maud Mountains.

- A. base, of
- B. the, Queen
- C. 1929,
- D. No error

9. Oh I forgot to bring the cookies.

- A. Oh,
- B. I, forgot
- C. to, bring
- D. No error

10. "The boy in the kayak," whispered Sue "is the new football captain."

- A. boy, in the
- B. new, football
- C. whispered Sue,
- D. No error

Answers and Explanations

1. D: No error. There is a comma after the initial modifying prepositional phrase and after the first and second modifying prepositional phrases in the series of three. No comma belongs between an adjective and the noun it modifies (A), or between an auxiliary verb and verb (B). Omitting the second comma setting off the first modifying prepositional phrase (C) is wrong.

2. D: No error. A comma belongs between two consecutive adjectives modifying the same noun. A comma between verb and object (A) is incorrect. So is one between an adjective and the noun it modifies (B). Omitting a comma between two consecutive adjective (C) is incorrect.

3. A: The comma after "Nathan" is correct, but there should also be another comma before it. When an address to someone by name is inserted mid-sentence-here between subject and object-it should be set off by commas on both sides. There should not be a comma between auxiliary verb and verb (B). Having no commas to set off the inserted name (C) is incorrect.

4. B: There should be a comma between the street address and the city when stating a full address in sentence form (as well as between the city and state, as there is here). There should not be a comma between the verb and prepositional phrase (A), or between street number and street name (C).

5. C: A modifying phrase between subject and predicate should be set off by commas on both sides. Putting a comma between adverb and verb (A) or between object and preposition (B) is incorrect.

6. D: No error. The phrase modifying the subject is set off by commas both before, and after it. Removing the second comma (A) is incorrect. A comma between a noun and its modifying prepositional phrase [(B), (C)] is incorrect.

7. C: There should always be a comma between a village and country, city and state, state and country, or country and continent. There should not be a comma between the noun and modifying preposition (A), or between the subject and verb (B).

8. C: When a date is used in a modifying prepositional phrase before the subject and verb, it should have a comma after it (before subject-verb). There should not be a comma between a noun and modifying preposition (A) or between an article and the noun it modifies (B).

9. A: A comma should follow an interjection like "Oh" at the beginning of a sentence. (In some sentences, other punctuation like an exclamation point is acceptable.) A comma between subject and verb (B) is incorrect. A comma in the middle of an infinitive (C) is incorrect.

10. C: When a non-quotation clause/phrase is inserted in the middle of a quotation, it should be set off by commas on both sides. There should not be a comma between a noun and its modifying prepositional phrase (A), or between an adjective and the noun phrase it modifies (B).

Grammar Practice Questions

Search for grammatical errors in the underlined sections of the following sentences and select the option that best corrects them. If there is no error, choose option A.

1. Everyone in the bank-including the manager and the tellers, ran to the door when the fire alarm rang.

- A. tellers, ran
- B. tellers: ran
- C. tellers, had run
- D. tellers-ran
- E. tellers' ran"

2. To no ones surprise, Joe didn't have his homework ready.

- A. no ones surprise
- B. noones surprise
- C. no-ones surprise
- D. no ones' surprise
- E. no one's surprise

3. If he would have read "The White Birds," he might have liked William Butler Yeats' poetry.

- A. would have read
- B. could have read
- C. would of read
- D. could of read
- E. had read

4. After the hurricane, uprooted trees were laying all over the ground.

- A. were laying
- B. lying
- C. were lying
- D. were laid
- E. was laid

5. Ralph Waldo Emerson (1803-1882), the great transcendentalist philosopher, wrote in his essay "Self-Reliance" of the need for an individual to develop his capacities.

- A. essay "Self-Reliance"
- B. essay, "Self-Reliance"
- C. essay: Self-Reliance
- D. essay, Self-Reliance
- E. essay; "Self-Reliance"

6. The recently built children's amusement park has been called "a boon to the community" by its supporters and "an eyesore" by its harshest critics.

- A. and "an eyesore" by its harshest
- B. and, "an eyesore," by its harshest
- C. and, an eyesore; by its harshest
- D. and-an eyesore-by its' harshest
- E. and-"an eyesore"-by its' harshest

7. I always have trouble remembering the meaning of these two common verbs, affect (to change" or "to influence") and effect ("to cause" or "to accomplish).

- A. "to accomplish)."
- B. "to accomplish").
- C. "to accomplish).
- D. To accomplish.
- E. "to accomplish.")

8. My class just finished reading-"The Fall of the House of Usher", a short story by Edgar Allan Poe.

- A. reading-"The Fall of the House of Usher",
- B. reading, The Fall of the House of Usher,
- C. reading "The Fall of the House of Usher,"
- D. reading, "The Fall of the house of Usher,"
- E. reading: The Fall of the House of Usher-

9. After it was repaired it ran perfect again.

- A. ran perfect
- B. ran perfectly
- C. could run perfect
- D. could of run perfect
- E. would run perfectly

10. "Are there two E's in beetle," asked Margo?

- A. there two E's in beetle," asked Margo?
- B. their two E's in beetle?" asked Margo.
- C. their two E's in beetle," asked Margo.
- D. there two E's in beetle?" asked Margo.
- E. there two E's in beetle, asked Margo?

11. The circus audience received a well-deserved round of applause for the perfectly timed acrobatic stunt.

- A. audience received a well-deserved
- B. audience gave a well deserved
- C. audience did receive a well deserved
- D. audience gave a well-deserved
- E. audience did get a well-deserved

12. Looking directly at me, Mother said, "These are your options: the choice is yours."

- A. Mother said, "These are your options: the choice is
- B. Mother said-these are your options, the choice is
- C. Mother had said, These are your options; the choice is
- D. Mother had said, "These are your options; the choice is
- E. Mother said, "These are your options; the choice is

13. Porcupine is from Latin *porcus*, "pig," and *spina*, "spine."

- A. *porcus*, "pig," and *spina*, "spine."
- B. *Porcus-pig* and *spina*, "spine."
- C. *Porcus-pig*, and *Spina*, "spine."
- D. *Porcus-Pig*-,*Spina-spine*.
- E. *Porcus*, "pig," and *spina* "spine".

14. Seeing the dolphins, some sharks, a killer whale, and a Moray eel made the visit to the marine park worthwhile.

- A. a killer whale, and a Moray eel made the visit
- B. a killer whale, and a moray eel made the visit
- C. a killer whale and a moray eel makes the visit
- D. a killer whale and a Moray eel makes the visit
- E. a killer whale and a moray eel made the visit

15. Still, the fact that a planet exists outside our solar system encourages hope that other solar systems exist, and in them, perhaps, a planet that supports life.

- A. that a planet exists outside our solar system encourages hope that other solar systems exist, and
- B. that a Planet exists out side our solar system encourages hope that other solar systems exist and
- C. could be that a planet exists outside our solar system encourages hope that other solar systems exist, and
- D. that a planet exist outside our solar systems encourage hope that other solar systems exist, and
- E. that a planet does exists out side our solar system encourages hope that other solar systems exist, and

16. Mail-order shopping can be convenient and timesaving with appropriate precautions, it is safe as well.

- A. can be convenient and timesaving
- B. can be convenient and timesaving;
- C. should be convenient and time saving;
- D. could be convenient and time saving;
- E. can be convenient and time-saving;

17. Among the many fields of science, no matter what turns you on, there are several fields of study.

- A. science, no matter what turns you on,
- B. Science, no matter what turns you on,
- C. Science, no matter which you chose,
- D. Science, no matter which of these you chose-
- E. science, no matter which you choose,

18. The fact that boxing is known to cause head injuries and brain damage should lead us to inform the public and push for a ban on boxing.

- A. should lead us to inform
- B. could lead us to inform
- C. should of led us to inform
- D. will lead us to inform
- E. should have led us to inform,

19. The first part of the test was on chemistry, the second on mathematics, and the third on english.

- A. on mathematics, and the third on english.
- B. on mathematics; and the third on English.
- C. on Mathematics; and the third on English.
- D. on mathematics, and the third on English.
- E. on mathematics: and the third on English.

20. *The Diary of Anne Frank* showed a young girl's courage during two years of hiding.

- A. showed a young girl's courage
- B. shows a young girl's courage
- C. did show a young girls courage
- D. has shown a young girl's courage
- E. showed a young girls courage

21. In August my parents will be married for twenty-five years.

- A. will be married for twenty-five years.
- B. shall have been married for twenty-five years.
- C. will have been married for twenty-five years.
- D. will be married for twenty five years.
- E. will have married for twenty-five years.

Answers and Explanations

- 1. D:** The modifying phrase inserted between subject and predicate should be set off on both sides by dashes, not just one. Non-matching punctuation marks, like a dash before it but a comma after it [sentence, (A), (C)], or a dash before but a colon after it (B), are incorrect and asymmetrical. An apostrophe (E) indicates possession and is incorrect in a non-possessive plural noun. There is no reason for the incorrect, extraneous close-quotation mark after the verb (E) either.
- 2. E:** "No one's is a possessive pronoun and needs the apostrophe." Omitting it [sentence, (A), (B), and (C)] is incorrect. "No one" is spelled as two words, not one (B) or one hyphenated word (C). An apostrophe after the s (D) denotes a possessive plural, not a possessive singular.
- 3. E:** The past unreal conditional should consist of "if" plus the past perfect of "to read" (auxiliary verb "had" with "read"). Adding "would" or "could" to the past perfect [sentence, (A), (B), (C), and (D)] is incorrect. In the "If...then" past unreal conditional construction, "would have" is only used in the second ("then" understood) clause, never in the first "If" clause. Also, "of" [(C), (D)] is a preposition, an incorrect substitute for the auxiliary verb "have."
- 4. C:** The correct past progressive tense of the verb "to lie" is "were lying." "Were laying" (A) is acting on an object, e.g. "Workers were laying uprooted trees on the side of the road." Without the auxiliary verb "were," "lying" (B) is incomplete and does not form a predicate for the subject "trees." "Were laid" (D) means somebody/something laid them there, not that the trees themselves were lying there. "Was laid" is singular, not plural as "trees" are.
- 5. A:** A comma (B), colon (C), or semicolon (E) is incorrect and unnecessary between the noun and its proper name.
- 6. A:** No punctuation other than the quotation marks is required or correct after "and" and around "an eyesore." Commas [(B), (C)], semicolons (C), or dashes [(D), (E)] are incorrect. Omitting quotation marks (D) is incorrect since the sentence is quoting people; and the first phrase has them, so the second also should. The apostrophes [(D), (E)] are incorrect: the irregular possessive pronoun "its" does not have an apostrophe.
- 7. B:** The end quotation mark should come after the word but inside the end parenthesis. Putting it after the period, outside the end parenthesis (A) is incorrect. Omitting the end quotation mark (C) is incorrect. Omitting parentheses and capitalizing the infinitive verb example (D) are both incorrect. Omitting the open parenthesis (E) is incorrect. Both quotation marks and parentheses always come in pairs.
- 8. C:** There should not be any punctuation between the verb and its object, even if the object is a title in quotation marks as it is here. Therefore, a dash (A), comma [(B), (D)], colon (E), or any combination of two [(A), (E)] is incorrect. Additionally, omitting quotation marks around the title [(B), (E)] is incorrect.
- 9. B:** The verb is modified by the adverb "perfectly," not "perfect" [(A), (C), (D)], an adjective for modifying a noun. "After it was repaired" indicates past tense, so for agreement, the verb should also be the past tense "ran." "Could run" (C) and "would run" (E) are not past tense but unreal subjunctive mood. There is no such construction as "could of" (D), which incorrectly substitutes the preposition "of" for the auxiliary verb "have," part of the past perfect tense.
- 10. D:** The question mark comes after the question, inside the quotation marks. A line of dialogue or a quotation normally has a comma [(A), (C), (E)], but inside the end quotation mark when it is a statement. When it is a question it has a question mark, which should NOT go at the end of the sentence [(A), (E)] containing the question, when that sentence is a statement. Also, the adverb "there" is misspelled as the possessive plural third-person pronoun "their" in (B) and (C).

11. D: From the context, we assume the circus acrobats performed the stunt and received the applause that the audience gave. For the audience to receive applause makes no sense in this context [sentence, (A), (C), (E)]. Omitting the hyphen in "well-deserved" [(B), (C)] is also incorrect.

12. E: A comma, not a hyphen (B) introduces dialogue/quotations. A semicolon, not a comma (B) separates two independent clauses. A colon (A) is incorrect, because the first clause does not introduce the second clause and is not explained by it. (C) omits quotation marks. Past perfect (D) is not incorrect in itself, but past tense in the original sentence was not incorrect and required no change.

13. A: A comma after each italicized Latin word and after each English translation, inside the quotation marks surrounding the latter, is correct. Separating any of these terms with dashes is incorrect [(B), (C), (D), and (E)]. A dash followed by a comma is always incorrect, as is separating a pair with a hyphen (D). Both pairs should be separated by commas; (E) omits the comma from the second pair.

14. B: Each item in a series of three or more is separated with a comma. Omitting the last comma before "and" [(C), (D), (E)] is incorrect. The term "moray eel" is not a proper name but a common name for many types of eels and thus is not capitalized [(A), (D)] (unless it begins a sentence). Present verb tense [(C), (D)] is not incorrect, but these choices also include the identified punctuation [(C), (D)] and capitalization (D) errors.

15. A: "A planet" is not a name, hence not capitalized; a comma should separate the independent clause from the following phrase (B); "outside" is one word [(B), (E)]. Adding "could be" (C) changes the meaning and is also ungrammatical, creating two unconnected predicates "...the fact could be...encourages..." requiring ", which" before "encourages" or changing "encourages" to ", encouraging..." "Fact" and "planet" are both singular nouns; "exist" and "encourage" (D) belong with plural nouns. The words "...does exists..." should be "...does exist" (E).

16. E: A semicolon separates independent clauses. Omitting punctuation (A), including that semicolon and the hyphen from "time-saving" [(A), (B)], is incorrect. Spelling "time-saving" as two separate words [(C), (D)] is also incorrect. Substituting "should" (C) or "could" (D) for "can" alters the meaning.

17. E: The word "science" is not capitalized [(B), (C), (D)]. The phrase "what turns you on" is slangy and not preferred. (If it ended the sentence, it would also be incorrect for ending a sentence with a preposition.) "Which you choose" is preferable. "Chose" [(C), (D)] is past tense, disagreeing with the present-tense predicate "are." "Of these" (D) is redundant. The interrupting modifier "no matter..." is enclosed by commas on each side, not a comma and dash (D).

18. A: Substituting "could" (B) or "will" (D) for "should" changes the sentence meaning. "Should of" (C) incorrectly substitutes the preposition "of" for the auxiliary verb "have;" there is no such construction. Even the correct form "should have led" (E) is subjunctive mood, past tense, disagreeing with the present-tense sentence context ("...boxing is known...lead..."); and a comma after "inform" is incorrect.

19. D: English is capitalized because it is a proper name as well as a school subject. Uncapitalized names (A) are incorrect. However, mathematics, like chemistry, is a school subject but not a proper name and hence, not capitalized (C). Semicolons [(B), (C)] only separate independent clauses, or phrases containing internal commas, but not several phrases in a series. A semicolon (E) introduces lists or explanations but never separates phrases in a series.

20. B: Present tense is preferable when referring to an existing book rather than past tense [(A), (C), (E)] or present perfect tense (D). The author wrote it in the past, but the book still exists in the present. The possessive noun "girl's" has an apostrophe, which is incorrectly omitted in (C) and (E).

21. C: "In August" is the future, requiring the future-tense auxiliary verb "will." "Have been married" is present perfect. Adding "will" to "have been married" makes the tense future perfect. Simple future tense "will be married" [(A), (D)] with "for twenty-five years" literally means they will get married in August and will be married for 25 years thereafter. "Will have married" (E) cannot be "for 25 years": being married is a continuous process; marrying is not.

Grammar Practice Questions

1. The word *boycott* derives from the name of Charles C. Boycott, an English land agent in Ireland that was ostracized for refusing to reduce rent.

- A. that was ostracized for refusing
- B. who was ostracized for refusing
- C. which was ostracized for refusing
- D. that had been ostracized for refusing
- E. who had been ostracized for refusing

2. As a result of his method for early music education, Shinichi Suzuki has been known as one of the world's great violin teachers.

- A. has been known as one
- B. had been known as one
- C. is seen as one
- D. is being seen as one
- E. has been one

3. Last night the weather forecaster announced that this is the most rainy season the area has had in the past decade.

- A. this is the most rainy season the
- B. this has been the most rainy season the
- C. this was the most rainy season the
- D. this is noted as the most rainy season the
- E. this is the rainiest season the

4. Although Mandy is younger than her sister, Mandy is the tallest of the two.

- A. is the tallest of the
- B. is the taller of the
- C. has been the taller of the
- D. is the most tall of the
- E. is the more taller of the

5. When Katherine Hepburn's play came to town, all the tickets had sold out far in advance.

- A. had sold out far
- B. have sold out far
- C. were sold out far
- D. had been sold out far
- E. had been sold out for

6. The origins of most sports is unknown.

- A. sports is unknown
- B. sports have been unknown
- C. sports are unknown
- D. sports has been unknown
- E. sports are now unknown

7. Neither of the Smith brothers expect to be drafted by a major league team this year.

- A. expect to be drafted
- B. expects to be drafted
- C. has expected to be drafted
- D. is expecting to be drafted
- E. was expecting to be drafted

8. Has any of the witnesses been sworn in yet?

- A. Has any of the
- B. Is any of the
- C. Will any of the
- D. Are any of the
- E. Have any of the

9. The *Lusitania* sunk on May 7, 1915.

- A. sunk
- B. did sink
- C. was sunk
- D. did sank
- E. sank

10. Whos in the office now?

- A. Whos in
- B. Whose in
- C. Who is in
- D. Who's in
- E. Whose' in

11. There are now many kinds of dictionaries, such as a dictionary of synonyms and antonyms, a biographical dictionary, and a geographical dictionary with pronunciations given.

- A. with pronunciations given
- B. that has pronunciations given
- C. with pronunciations' given
- D. that have pronunciations given
- E. that do have pronunciations given

12. Towering 700 feet above the valley floor, Mount Rushmore National Memorial was an impressive site.

- A. was an impressive site
- B. is a impressive sight
- C. is an impressive sight
- D. was an impressive sight
- E. is an impressive site

13. San Francisco lays southwest of Sacramento.

- A. lays southwest
- B. has laid southwest
- C. is lying southwest
- D. lain southwest
- E. lies southwest

14. Did they know that Labor Day always came on the first Monday in September?

- A. came on
- B. comes on
- C. has come on
- D. had come on
- E. has came on

15. Eating, drinking, and to stay up late at night were among her pleasures.

- A. to stay up late
- B. to remain up late
- C. staying up late
- D. she liked staying up late
- E. trying to stay up late

16. Each night when night came and the temperature fell, my parents lit the fire in the bedroom.

- A. and the temperature fell,
- B. and that the temperature did fall
- C. and that the temperature fell
- D. and because the temperature fell
- E. and when the temperature fell

17. Frances promised to bring the Papago basket that she bought in Arizona.

- A. bought in
- B. had bought in
- C. has bought in
- D. did buy in
- E. purchased in

18. He has lain his racquetball glove on the beach.

- A. has lain
- B. has laid
- C. have lain
- D. have laid
- E. is lying

19. I would have lent you my notes if you would have asked me.

- A. would have asked me
- B. could of asked
- C. could ask
- D. had asked
- E. had of asked

20. Many scientists are still hoping to have found life on another planet.

- A. to have found
- B. to find
- C. two find
- D. to have been found
- E. too have found

21. Because she had an astounding memory, Sue has never forgotten an important equation.

- A. had an
- B. could have had
- C. has
- D. did have
- E. has had

Answers and Explanations

- 1. B:** When referring to a person, use "who," not "that" [(A), (D)] or "which" (C). The past perfect "had been" [(D), (E)] is inappropriate in this context: simple past "was ostracized" refers to the historical event itself. Past perfect would only be used with something identified as leading up to the past event, e.g. "...who had been refusing to reduce rent for years and finally was ostracized."
- 2. C:** Present perfect (A) implies Suzuki is not still known thusly. Past perfect (B) implies he stopped being known thusly in the past. Also, "known" is less accurate than "seen": the former suggests fact; the latter connotes perception/view/opinion, the case here. Present progressive (D) is awkward and suggests the opinion is only current and short-term. "Has been" without "seen" (E) changes the meaning from public opinion to fact-and past, not present, fact.
- 3. E:** "Rainiest" is the superlative form of the adjective "rainy." ("Rainier" is the comparative.) Using "most"/"more" plus the original adjective instead of its superlative/comparative form when it has one is incorrect with one-syllable adjectives and usually awkward with two-syllable adjectives.
- 4. B:** When comparing two things/people, use the comparative (-er/more), not the superlative (-est/most), only used when comparing three or more. "Has been" (C) is only correct when sentence context warrants, e.g. "...has been the taller of the two for three years." Here it is extraneous. "Most tall" (D) is doubly incorrect: once for using superlative, not comparative; and again for using "most"/"more" instead of "-est"/"-er" with a one-syllable adjective. "More taller" (E) is an incorrect double/redundant comparative.
- 5. D:** Though common, using "sold out" in active voice with "tickets" as the subject is undesirable since tickets cannot literally sell themselves, so passive voice is more appropriate. Also, past perfect "had been sold out" is more correct than simple past tense "were sold out" (C) since the selling out preceded when the play came to town (past tense). "For" (E) instead of "far" in advance is the wrong preposition/word choice for the meaning and makes no sense.
- 6. C:** Subject-verb agreement: The subject "origins" is plural, so the verb must agree with "are." The singular "is" (A) or "has been" (D) is incorrect. Present perfect "have been" (B) only applies if the context dictates it, e.g. "have been unknown until recently." Adding "now" (E) changes the meaning, implying they were previously known.
- 7. B:** "Neither" is singular, so "expects" is correct. "Expect" (A) is plural. Present perfect "has expected" (C) is superfluous and awkward, as are present progressive "is expecting" (D) and past progressive "was expecting" (E). These would only apply if followed by (e.g.) "...until now" for (C) and (E) or "...until next year" (D).
- 8. E:** "Any" can be singular or plural; in this context, plural is more appropriate. When asking questions with plural count nouns, use "any" as plural. For singular, "Has any one of the witnesses...?" is better. "Is" (B), "will" (C), and "are" (D) are not correct auxiliary verbs in past perfect with "been."
- 9. E:** The past tense of "sink" is "sank." "Sunk" (A) is part of the present perfect ("has sunk"/"is sunk"/"has been sunk"- passive voice) and past perfect (had sunk/"was sunk" (C)]/"had been sunk"- passive voice) tenses. "Did sink" (B) is awkward and unnecessary. "Did sank" (D) is incorrect: past-tense auxiliary verbs are never used together with past-tense main verbs (doubling).
- 10. D:** An apostrophe is required in "who's," a contraction of "who is." No apostrophe (A) is incorrect. "Whose" (B) is the possessive (i.e. belonging to whom). Its irregular spelling differentiates it from the contraction "who's" (like "its" vs. "it's"). "Whose" is never spelled with a final apostrophe (E). "Who is" (C) is not incorrect, but expanding the contraction to full form avoids correctly identifying the contraction's correct spelling.

- 11. A:** This is the most economical wording of the modifying prepositional phrase. "That has" (B) is unwieldy and superfluous. The plural "pronunciations" is not possessive and thus should not have an apostrophe (C). "Have" [(D), (E)] is plural, disagreeing with the singular subject.
- 12. C:** Present tense is more correct when describing something that currently still exists. Also, from the sentence context, "sight," i.e. something to see, is the desired meaning whereas "site" [(A), (E)] means a location. Past tense [(A), (D)] would only be correct in context, e.g. "...was an impressive sight when we visited it last year." The article "a" (B) is incorrect before a vowel ("an" is correct).
- 13. E:** The present tense of "to lie" is "lies." "Lays" is the present tense of the transitive (taking a direct object) verb "to lay," e.g. "We lay books on this table." "Has laid" (B) should be "has lain," but present perfect makes no sense here: San Francisco's location has not moved. Present progressive "is lying" (C) is similarly misleading regarding a non-temporary location. "Lain" (D) is present perfect/past perfect, not present-and moreover lacks its auxiliary verb (has/had).
- 14. B:** Although the predicate is past-tense ("Did they know...?"), something that is still true, like a national holiday, "always comes on" the same day in present tense. "Always came on" (A) implies it no longer does, as does "has come" (C) and "had come" (D). "Has come" (E) is never used: the present perfect (has) and past perfect (had) both take the form "come."
- 15. C:** The series of gerunds ("-ing"-participial verbals used as nouns) require parallel structure. To agree with "eating" and "drinking," "staying up late" is correct. The infinitive "to stay/remain" [(A)/(B)] disagrees with the gerunds "eating, drinking." Adding "She liked..." (D) incorrectly places the third verbal into an independent clause with another subject and verb, contradicting the sentence structure-and redundant with "were among her pleasures." "Trying to stay up late" (E) changes the meaning.
- 16. A:** A comma between a modifying phrase/clause and the clause it modifies is correct. Inserting "that" [(B), (C)] is incorrect: "the temperature fell," along with "night darkness came," is introduced by the adverb "when." It is not a restrictive relative clause introduced by "that." Past tense "fell" is preferred over the awkward "did fall" (B). "Because" (D) is incorrect: the clause was already introduced by "when." Past-perfect "had fallen" (E) disagrees with past-tense "darkness came" and "my parents lit..."
- 17. B:** Past perfect is correct because Frances promised (past tense) to bring what she had bought before she promised. Present perfect "has bought" (C) disagrees with the past-tense predicate "promised." "Did buy" (D) is just an awkward or archaic version of past tense "bought" (A); "purchased" (E) is simply a past-tense synonym for "bought"-all incorrect here. (Frances did not buy the basket at the same time that she promised to bring it.)
- 18. B:** The correct present-perfect of transitive verb (i.e. it always takes a direct object) "to lay" is "has laid." "Has lain" (A) is intransitive, e.g. "He has lain on this bed before." "Have lain" (C) uses not only the wrong verb/tense, but also a plural auxiliary verb with a singular subject, like "have laid" (D). "Is lying" (E) should be "is laying" with the object "racquetball glove;" but even corrected, changing the tense changes the meaning here.
- 19. D:** In conditional-subjunctive constructions, "if..." introduces the conditional clause/phrase, and the corresponding "then..." subjunctive uses "would have." Using "would have" in the conditional is incorrect. There is no such construction as "could of" (B) or "had of" (E); these incorrectly substitute the preposition "of" for the auxiliary verb "have." "Could ask" (C) is wrong in both tense and meaning.
- 20. B:** "Hoping," like "planning"/"dreaming"/"expecting," etc., is future-oriented and in the present participle ("-ing"), requires the infinitive in modifying verbs, i.e. "hoping to find." Scientists cannot hope "to have found" [(A), (E)] something already that they are "still hoping" to find. "Two" (C) is the spelling of the number 2, and "too" (E) is

the adverb meaning "also," not the preposition "to." "To have been found" errs doubly, using both present-perfect tense and passive voice incorrectly here.

21. C: With present-perfect "has never forgotten," present-tense "has an astounding memory" is correct. "Had" (A) and "did have" (D) are past-tense; and "has had" (E) is present-perfect tense, all implying Sue no longer has an astounding memory, contradicting the statement that she still "has never forgotten." "Could have had" (B) completely changes the meaning and also contradicts "has never forgotten."

Word Usage Practice

Each underlined section corresponds to an answer choice. The first underlined section corresponds to choice A, the second to choice B, and so on. Please select the answer choice that either contains an error or select choice E, which is "No error."

1. Whom did you talk to at the information desk at the airport? No error.

- A. A
- B. B
- C. C
- D. D
- E. E

2. Ellen always got into more trouble than me. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

3. The title of salutatorian goes to whomever has the second highest academic average. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

4. Do you feel good enough to go to the store? No error.

- A. A
- B. B
- C. C
- D. D
- E. E

5. Bolivar, an idol between his contemporaries, has been the inspiration for many modern revolutions. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

6. Birds fly south in the winter threw an instinct not completely understood by scientists. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

7. No animal has yet been discovered that can "see" infrared light with its eyes. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

8. Lying there in the half-dark of my room, I could see my shelf, with my books-some of them prizes I had won in high school. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

9. The man who sat beside Ben and I was running for the city council. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

10. Whom did you say sent this package? No error.

- A. A
- B. B
- C. C
- D. D
- E. E

11. There isn't scarcely room on the front steps to pose the entire class for a picture. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

12. Haven't none of you seen my dog? No error.

- A. A
- B. B
- C. C
- D. D
- E. E

13. I found the expensive vase broken when I first came in the room. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

14. Mrs. Clement, my English teacher, said that I could of improved my reading comprehension score if I had spent more time reading great literature. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

15. If you sign up as a volunteer for the special olympics, you will find that you receive as much as you give. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

16. "Your themes," said Ms. Buchanan, will be due in class on September 7; late papers will lose one full grade." No error.

- A. A
- B. B
- C. C
- D. D
- E. E

17. What should I do when the computer says, "Sorry, try again?" No error.

- A. A
- B. B
- C. C

- D. D
- E. E

18. "Whose in the office now?" asked Mom. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

19. Parking her car at the depot, Ms. Jones decided to take the bus to town. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

20. In 1936, Adolph Hitler refused to congratulate the great Jesse Owens, winner of four gold medals in the Berlin Olympics. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

21. Preserving rare and valuable books is one of the challenges facing the Librarian of Congress. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

22. Everyone is excited about graduation because all had worked so hard for it. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

23. Without saying a word, the major gave a nod of ascent. No error.

- A. A
- B. B
- C. C
- D. D
- E. E

24. Just as they were about to go to bed, Jane told her mother, "Its my turn to wind the clock." No error.

- A. A
- B. B
- C. C
- D. D
- E. E

Answers and Explanations

- 1. E:** This sentence is correct as it is written.
- 2. D:** "Than me" in the comparative is incorrect; it should be "than I." This can be deduced by adding a verb to the pronoun to finish the thought: "...than I am," not "...than me am."
- 3. B:** "...to whomever" would only be correct if it is a direct object in all parts of the sentence, e.g. "...to whomever you want." However, in this sentence it is a subject in the prepositional phrase: "... to whoever has..." and thus should be "whoever" so "who" agrees with "has." "Whoever" as subject takes precedence over "whomever" as object.
- 4. B:** How you feel is expressed by the adverb "well," not by the adjective "good," e.g. "I have good feelings."
- 5. A:** "Between" only refers to two, e.g. "Between you and me;" when modifying more than two, as here since "his contemporaries" refers to many people, "among" is the correct preposition.
- 6. C:** The correct spelling of the preposition meaning via or by means of, as it is used here, is "through." "Threw" is the past tense of the verb "to throw."
- 7. E:** This sentence is correct as it is written.
- 8. E:** This sentence is correct the way that it is written.
- 9. C:** "Ben and I" as an indirect object is incorrect: it should be "Ben and me." The correct personal pronoun can be ascertained by removing the added "Ben and:" We would not write "The man who sat beside I," but "The man who sat beside me..." and this does not change when adding another object (Ben).
- 10. A:** "Whom" is used to indicate an indirect object, e.g. "to whom" or "for whom" did you send this package? But this example asks the question, "Who sent this package?" and further specifies "Who did you say it was?" "Who" agrees with "sent," not with "did you say."
- 11. A:** "Scarcely" means "barely" or "hardly," i.e. it minimizes, indicating very little. Only a positive quantity, like the state of being indicated by "is," can be minimized. A negative, i.e. "is not," cannot be minimized, as nothing exists to be made smaller. Minimizer + negative is akin to a double negative and equally incorrect.
- 12. B:** This is a double negative as written. With the negative "Haven't" goes "any," not "none."
- 13. D:** One comes into a room; one cannot come "in" a room, house, or situation. This is a common usage error. "In" means already there; "into" indicates movement there from someplace else.
- 14. C:** There is no such verb construction as "could of." "Of" is a preposition meaning belonging to or associated with. The subjunctive mood, present perfect tense is "could have." The auxiliary verb "have" indicates the action "improved" here as accomplished in the past (present perfect), and the auxiliary verb "could" indicates the subjunctive mood, expressing possibility as opposed to reality.
- 15. A:** "Special Olympics" is a name, i.e. a proper noun, and hence the initial letters of both words should be capitalized.

16. A: The open-quotation mark is missing before "will be" to show that the dialogue resumes following the non-dialogue insertion of said Ms. Buchanan.

17. D: The close-quotation mark should immediately follow "again" and the question mark should come after it. Punctuation marks such as commas, periods, semicolons, colons, etc. are placed inside of quotation marks when the punctuation is part of the line of dialogue or quotation; however, when the punctuation mark is part of the outer sentence that contains the dialogue or quotation, it is placed outside of the end-quotation mark.

18. A: The contraction of "Who is" is spelled "Who's." The word "Whose," used incorrectly here, is the possessive personal pronoun meaning "belonging to whom," e.g. "Whose coat is this?"

19. E: This sentence is correct as it is written.

20. B: The word "congratulate" is misspelled here with a "d" instead of a "t" as it should be spelled.

21. E: The title Librarian of Congress is capitalized on the U.S. Library of Congress website whether it includes a specific name (e.g. "Librarian of Congress Billington") or not. It is a title similar to President of the United States.* If the sentence read only "the librarian/president," i.e. not a title or referring to a specific individual, "librarian/president" would not be capitalized. (NOTE: This is an exception; so is POTUS.* Normally, when not naming an individual, such terms are lower-case.)

22. C: "Everyone" is a collective noun. To agree with it, the modifying clause should read "because they had worked..." , not "because all had worked...".

23. D: The correct spelling for the intended meaning here is "assent," i.e. agreement. The word spelled "ascent" as it is here means a climb or upward progress, e.g. one's ascent up a mountain or one's ascent to leadership, success, fame, wealth, etc. rather than agreement.

24. C: The correct spelling of the contraction of "it is" has an apostrophe: "It's my turn." "Its" as spelled here is the possessive impersonal pronoun, e.g.: "This coat is missing its buttons."

Sentence Practice

Select the answer choice that identifies the noun in the sentence.

1. It will take all of your energy and will to be able to walk again.

- A. Take
- B. All
- C. Your
- D. Energy

2. The works of many great poets have been placed on reserve.

- A. Many
- B. Great
- C. Placed
- D. Reserve

3. The Brooklyn Bridge was opened in 1883.

- A. Bridge
- B. Was
- C. Opened
- D. In

4. Sparta and Athens were enemies during the Peloponnesian War.

- A. And
- B. Were
- C. During
- D. War

5. Sharks and lampreys are not true fish because their skeletons are made of cartilage rather than bone.

- A. True
- B. Because
- C. Their
- D. Bone

6. Joe, have you met your new boss?

- A. Have
- B. Met
- C. Your
- D. Boss

7. Sue's parents tried living in the north, but they could not adapt to the cold.

- A. North
- B. But

- C. Not
- D. Adapt

8. Mastering basic mathematics is an important goal for younger students.

- A. Mastering
- B. Important
- C. Younger
- D. Students

9. To seize a foreign embassy and its inhabitants is flagrant disregard for diplomatic neutrality.

- A. Seize
- B. Its
- C. Flagrant
- D. Neutrality

10. The Trojans' rash decision to accept the wooden horse led to their destruction.

- A. Their
- B. Led
- C. Accept
- D. Destruction

Answers and Explanations

- 1. D:** Energy is a noun, as is will here. Take (A) is a verb. All (B) is an adverb modifying take. Your (C) is an adjective modifying energy and will.
- 2. D:** Reserve is the only noun of the choices. Many (A) and great (B) are adjectives modifying the noun poets. Placed (C) is a verb.
- 3. A:** Bridge is a proper noun here. Was (B) is the auxiliary verb for the past perfect tense of the verb opened (C). In (D) is a preposition.
- 4. D:** War is a proper noun here. And (A) is a conjunction. Were (B) is a verb. During (C) is a preposition.
- 5. D:** Bone is a noun. True (A) is an adjective modifying the noun fish. Because (B) is a conjunction. Their (C) is a plural possessive third-person pronoun modifying the noun skeletons.
- 6. D:** Boss is a noun. Have (A) is the auxiliary verb for the present perfect tense of the verb met (B). Your (C) is a possessive second-person pronoun modifying the noun boss.
- 7. A:** North is a noun here. But (B) is a conjunction. Not (C) is an adverb modifying the verb adapt (D).
- 8. D:** Students is a plural noun. NOTE: Mastering (A) is a gerund, i.e. a verb form functioning as a noun. But since (D) is already a noun, it is the better choice. Important (B) is an adjective modifying the noun goal. Younger (C) is an adjective modifying the noun students.
- 9. D:** Neutrality is a noun. Seize (A) is a verb. Its (B) is a possessive pronoun modifying the noun inhabitants. Flagrant (C) is an adjective modifying the noun disregard.
- 10. D:** Destruction is a noun. Their (A) is a plural possessive pronoun modifying destruction. Led (B) and accept (C) are verbs.

Math Section

The Mathematics test measures a test taker's ability to solve problems representing some of the key concepts in mathematics. Some problems will only test one concept, while others will involve multiple concepts integrated together in a single problem.

The problems will have few technical terms, aside from basics, such as area, perimeter, integer, and ratio, which are expected to be common mathematical knowledge. All figures shown will be drawn accurately and lie in a single plane, unless noted otherwise

Number Types

Integers, Odd and Even Numbers, Prime Numbers, Digits

- **Integers...** ..., -4, -3, -2, -1, 0, 1, 2, 3, 4, ...
- **Consecutive Integers:** Integers that follow in sequence; for example, 22, 23, 24, 25. Consecutive Integers can be more generally represented by $n, n + 1, n + 2, n + 3, \dots$
- **Odd Numbers...** ..., -9, -7, -5, -3, -1, 1, 3, 5, 7, 9, ...
- **Even Numbers...** ..., -8, -6, -4, -2, 0, 2, 4, 6, 8, ... (Note: zero is an even number)
- **Prime Numbers...** 2, 3, 4, 7, 11, 13, 17, 19, ... (Note 1 is not a prime and 2 is the only even prime)
- **Digits:** 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Addition and Multiplication of Odd and Even Numbers

Addition	Multiplication
even + even = even	even x even = even
odd + odd = even	even x odd = even
even + odd = odd	odd x odd = odd

Percent

Percent means hundredths or number out of 100. For example, 40 percent means $40/100$ or $.40$ or $2/5$.

Percent less than 100

- **Problem 1:** If the sales tax on a \$30 item is \$1.80, what is the sales tax rate?
Solution: $\$1.80 = n/100 \times \30 $n = 6$, so 6% is the sale tax rate

Percent Greater than 100

- **Problem 2:** What number is 250% of 2?
Solution: $n = 250/100 \times 2$ $n = 5$, so 5 is the number

Percent less than 1

- **Problem 3:** 3 is 0.2 percent of what number?

Solution: $3 = 0.2/100 \times n$

$n = 1,500$, so 1,500 is the number

Percent Increase/Decrease

- **Problem 4:** If the price of a computer was decreased from \$1,000 to \$750, by what percent was the price decreased?

Solution: The price decrease is \$250. The percent decrease is the value of n in the equation $250/1000 = n/100$. The value of n is 25, so the price was decreased by 25%.

Notes: $n\%$ increase means $\text{increase/original} = n/100$; $n\%$ decrease means $\text{decrease/original} = n/100$.

Average

An average is a statistic that is used to summarize data. The most common type of average is the *arithmetic mean*. The average (arithmetic mean) of a list of n numbers is equal to the sum of the numbers divided by n . For example, the mean of 2, 3, 5, 7, and 13 is equal to

$$2 + 3 + 5 + 7 + 13 / 5 = 6$$

When the average of a list of n numbers is given, the sum of the numbers can be found. For example if the average of six numbers is 12, the sum of these six numbers is 12×6 , or 72.

The **median** of a list of numbers is the number in the middle when the numbers are ordered from greatest to least or from least to greatest. For example, the median of 3, 8, 2, 6, and 9 is 6 because when the numbers are ordered, 2, 3, 6, 8, 9, the number in the middle is 6. When there is an even number of values, the median is the same as the mean of the two middle numbers. For example, the median of 6,

8, 9, 13, 14, and 16 is

$$9 + 13 / 2 = 11$$

The **mode** of a list of numbers is the number that occurs most often in the list. For example, 7 is the mode of 2, 7, 5, 8, 7, and 12. The numbers 10, 12, 14, 16, and 18 have no mode and the numbers 2, 4, 2, 8, 2, 4, 7, 4, 9, and 11 have two modes, 2 and 4.

Note: The mean, median, and mode can each be considered an average. On the test, the use of the word average refers the arithmetic mean and is indicated by "average (arithmetic mean)." The exception is when a question involves average speed (see problem 2 below). Questions involving the median and mode will have those terms stated as part of the question's text.

Weighted Average

Problem 1: In a group of 10 students, 7 are 13 years old and 3 are 17 years old. What is the average (arithmetic mean) age of these 10 students?

Solution: The solution is not the average of 13 and 17, which is 15. In this case the average is

$$7(13) + 3(17) / 10 = 91 + 51 / 10 = 14.2 \text{ years}$$

The expression “weighted average” comes from the fact that 13 gets a weight factor of 7, whereas 17 gets a weight factor of 3.

Average Speed

Problem 2: Jane traveled for 2 hours at a rate of 70 kilometers per hour and for 5 hours at a rate of 60 kilometers per hour. What was her average speed for the 7-hour time period?

Solution: In this situation, the average speed is:

Total Distance/Total Time

The total distance is $2(70) + 5(60) = 440$ km.

The total time is 7 hours. Thus the average speed was

$440/7 = 62 \frac{6}{7}$ kilometers per hour.

Note: In this example the average speed is not the average of the two separate speeds, which would be 65.

Properties of Signed Numbers

positive x negative = negative

negative x negative = positive negative x positive =

negative positive x positive = positive

Factoring

You may need to apply these types of simple factoring:

$$x^2 + 2x = x(x + 2) \quad x^2 - 1 = (x + 1)(x - 1) \quad x^2 + 2x + 1 = (x + 1)(x + 1) = (x + 1)^2 \quad x^2 - 3x - 4 = (x - 4)(x + 1)$$

Probability

Probability refers to the chance that a specific outcome can occur. It can be found by using the following definition when outcomes are equally likely.

$$\frac{\text{Number of ways that a specific outcome can occur}}{\text{Total number of possible outcomes}}$$

For example, if a jar contains 13 red marbles and 7 green marbles, the probability that a marble selected from the jar at random will be green is

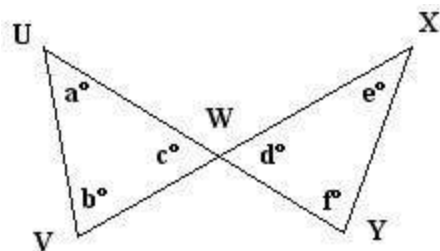
$$7 / 7 + 13 = 7/20 = \text{or } 0.35$$

If a particular outcome can never occur, its probability is 0. If an outcome is certain to occur, its probability is 1. In general, if p is the probability that a specific outcome will occur, values of p fall in the range $0 \leq p \leq 1$. Probability may be expressed as either a decimal or a fraction.

Geometric Figures

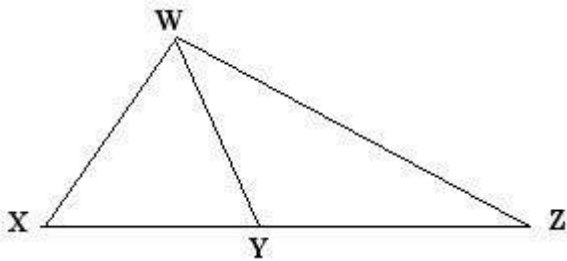
Figures that accompany problems are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a particular problem that the figure is not drawn to scale. In general, even when figure is not drawn to scale, the relative positions of points and angles may be assumed to be in the order shown. Also, line segments that extend through points and appear to lie on the same line may be assumed to be on the same line. The text "Note: Figure not drawn to scale." is included on the test when degree measures may not be accurately shown and specific lengths may not be drawn proportionally. The following examples illustrate the way different figures can be interpreted.

Example 1



Since UV and VX are line segments, angles UWV and XWY are vertical angles. Therefore, you can conclude that $c^\circ = d^\circ$. Even though the figure is drawn to scale, you should NOT make any other assumptions without additional information. For example, you should NOT assume that $VW = WY$ or that the angle at vertex Y is a right angle even though they may look that way in the figure.

Example 2



A question may refer to a triangle such as XWZ above. Although the note indicates that the figure is not drawn to scale, you may assume that:

- (1) XWY and YWZ are triangles.
- (2) Y is between X and Z.
- (3) X, Y, and Z are points on a line.
- (4) The length of XY is less than the length of XZ.
- (5) The measure of angle XWY is less than the measure of angle XWZ.

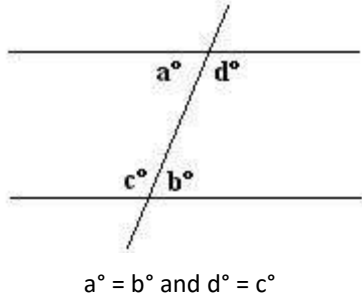
You may *not* assume the following:

- (1) The length of XY is less than the length of YZ.
- (2) The measures of angles WXY and WYX are equal.
- (3) The measure of angle XWY is greater than the measure of angle WYX.
- (4) Angle XWZ is a right angle.

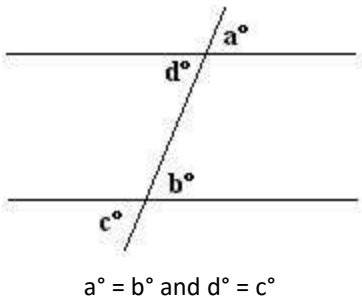
Geometric Skills and Concepts

Properties of Parallel Lines

1. If two parallel lines are cut by a third line, the alternate interior angles are equal.

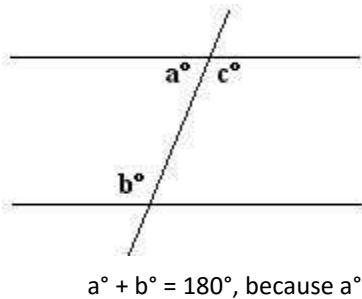


2. If two parallel lines are cut by a third line, the corresponding angles are equal.



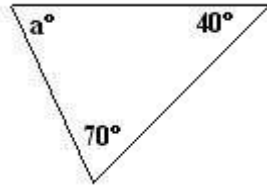
Note: Words like “alternate interior” or “corresponding” are generally not used on the test, but you do need to know which angles involving parallel lines are equal.

3. If two parallel lines are cut by a third line, the sum of the interior angles on the same side of the third line is 180 degrees.



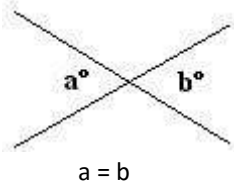
Angle Relationships

1. The sum of the interior angles of a triangle is 180 degrees.

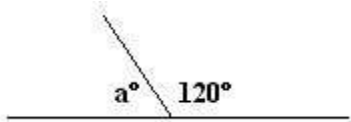


$a^\circ = 70^\circ$ (Because $70^\circ + 40^\circ + a^\circ = 180^\circ$.)

2. When two lines intersect, vertical angles are equal.

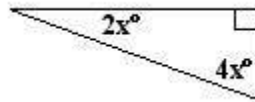


3. A straight angle measures 180 degrees.



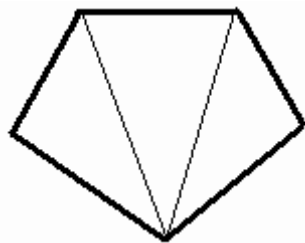
$a^\circ = 60^\circ$ (Because $a^\circ + 120^\circ = 180^\circ$.)

4. The sum of the two acute angles in a right triangle is 90 degrees.



$x = 15$ (Because $2x + 4x = 90$.)

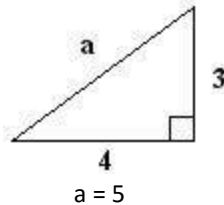
5. The sum of the interior angles of a polygon can be found by drawing all diagonals of the polygon from one vertex and multiplying the number of triangles formed by 180 degrees.



Since the polygon is divided into 3 triangles, the sum of the angles is $3 \times 180^\circ$ or 540° .

Side Relationships

1. Pythagorean Theorem: In any right triangle, $a^2 + b^2 = c^2$, where c is the length of the longest side and a and b are the lengths of the two shorter sides.



(By the Pythagorean Theorem,

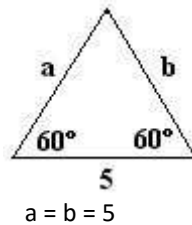
$$a^2 = 3^2 + 4^2$$

$$a^2 = 9 + 16$$

$$a^2 = 25$$

$$a = \text{square root of } 25 = 5$$

2. In any equilateral triangle, all sides are equal and all angles are equal.



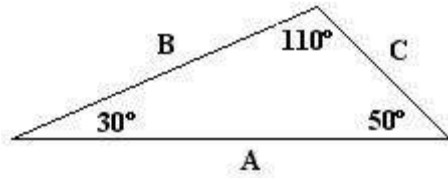
(Because the measure of the unmarked angle is 60° , the measure of all angles of the triangle are equal, and therefore, the lengths of all sides of the triangle are equal.)

3. In an isosceles triangle, the angles opposite equal sides are equal. Also the sides opposite equal angles are equal.



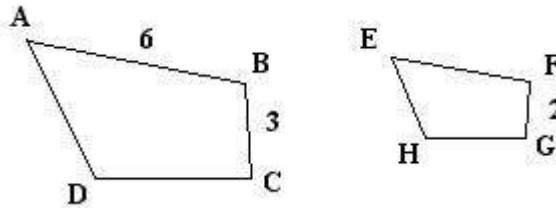
If $A = B$, then $a^\circ = b^\circ$. Also, if $a^\circ = b^\circ$, then $A = B$.

4. In any triangle, the longest side is opposite the largest angle (and the shortest side is opposite the smallest angle.)



$A > B > C$

5. Two polygons are *similar* if the lengths of their corresponding sides are in the same ratio and their corresponding angles are equal.



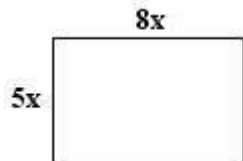
If polygons ABCD and EFGH are similar, and if BC and FG are corresponding sides, then $BC = 3$ and $FG = 2$. Therefore, the ratio is 3:2 and since $AB = 6$, $EF = 4$

Area and Perimeter

Rectangles

Area of a rectangle = length x width = $l \times w$

Perimeter of a rectangle = $2(l + w) = 2l + 2w$



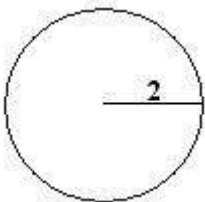
Area = $5x \times 8x = 40x^2$

Perimeter = $2(5x + 8x) = 10x + 16x = 26x$

Circles

Area of a circle = πr^2 (where r is the radius)

Circumference of a circle = $2\pi r = \pi d$ (where d is the diameter)



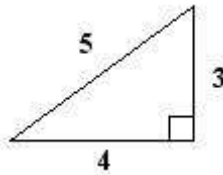
$$\text{Area} = \pi 2^2 = 4\pi$$

$$\text{Circumference} = 2\pi 2 = 4\pi$$

Triangles

$$\text{Area of a triangle} = \frac{1}{2} (\text{base} \times \text{height})$$

$$\text{Perimeter} = \text{Sum of lengths}$$

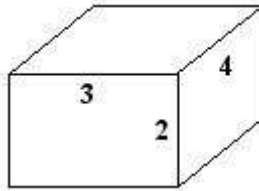


$$\text{Area} = \frac{1}{2} (4 \times 3) = 6$$

$$\text{Perimeter} = 5 + 4 + 3 = 12$$

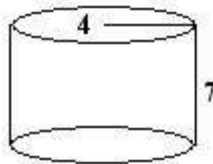
Volume

$$\text{Volume of a rectangular solid or cube} = \text{length} \times \text{width} \times \text{height} = l \times w \times h$$



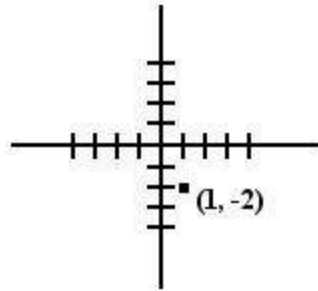
$$\text{Volume} = 3 \times 2 \times 4 = 24$$

$$\text{Volume of a cylinder} = \pi r^2 h \text{ (where } r \text{ is the radius of the base and } h \text{ is the height of the cylinder)}$$



$$\text{Volume} = \pi \times 4^2 \times 7 = \pi \times 16 \times 7 = 112\pi$$

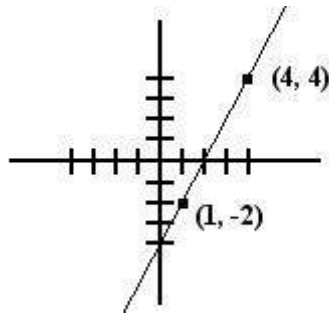
Coordinate Geometry



In questions that involve the x and y axes, x values to the right of the y axis are positive and x values to the left of the y axis are negative. Also, y values above the x axis are positive and y values below the x axis are negative. In an (x,y) ordered pair, the x value is written first, and the y value is written second. For example, in the ordered pair

(1,-2), the x coordinate is 1 and the y coordinate is -2.

Slope of a line = rise/run or vertical distance/horizontal distance.



This line runs through points (1,-2) and (4,4). The slope = $(4 - (-2))/(4 - 1)$ or $6/3 = 2$.

Any line that slopes upward from left to right has a positive slope. Any line that slopes downward from right to left has a negative slope.

Practice Questions

Algebra

1. If Lynn can type a page in p minutes, what piece of the page can she do in 5 minutes?

- A. $5/p$
- B. $p - 5$
- C. $p + 5$

- D. $p/5$
- E. $1 - p + 5$

2. If Sally can paint a house in 4 hours, and John can paint the same house in 6 hour, how long will it take for both of them to paint the house together?

- A. 2 hours and 24 minutes
- B. 3 hours and 12 minutes
- C. 3 hours and 44 minutes
- D. 4 hours and 10 minutes
- E. 4 hours and 33 minutes

3. Employees of a discount appliance store receive an additional 20% off of the lowest price on an item. If an employee purchases a dishwasher during a 15% off sale, how much will he pay if the dishwasher originally cost \$450?

- A. \$280.90
- B. \$287
- C. \$292.50
- D. \$306
- E. \$333.89

4. The sales price of a car is \$12,590, which is 20% off the original price. What is the original price?

- A. \$14,310.40
- B. \$14,990.90
- C. \$15,290.70
- D. \$15,737.50
- E. \$16,935.80

5. Solve the following equation for A : $2A/3 = 8 + 4A$

- A. -2.4
- B. 2.4
- C. 1.3
- D. -1.3
- E. 0

6. If Leah is 6 years older than Sue, and John is 5 years older than Leah, and the total of their ages is 41. Then how old is Sue?

- A. 8
- B. 10
- C. 14
- D. 19
- E. 21

7. Alfred wants to invest \$4,000 at 6% simple interest rate for 5 years. How much interest will he receive?

- A. \$240
- B. \$480

- C. \$720
- D. \$960
- E. \$1,200

8. Jim is able to sell a hand-carved statue for \$670 which was a 35% profit over his cost. How much did the statue originally cost him?

- A. \$496.30
- B. \$512.40
- C. \$555.40
- D. \$574.90
- E. \$588.20

9. The city council has decided to add a 0.3% tax on motel and hotel rooms. If a traveler spends the night in a motel room that costs \$55 before taxes, how much will the city receive in taxes from him?

- A. 10 cents
- B. 11 cents
- C. 15 cents
- D. 17 cents
- E. 21 cents

10. A student receives his grade report from a local community college, but the GPA is smudged. He took the following classes: a 2 hour credit art, a 3 hour credit history, a 4 hour credit science course, a 3 hour credit mathematics course, and a 1 hour science lab. He received a "B" in the art class, an "A" in the history class, a "C" in the science class, a "B" in the mathematics class, and an "A" in the science lab. What was his GPA if the letter grades are based on a 4 point scale? (A=4, B=3, C=2, D=1, F=0)

- A. 2.7
- B. 2.8
- C. 3.0
- D. 3.1
- E. 3.2

11. Simon arrived at work at 8:15 A.M. and left work at 10: 30 P.M. If Simon gets paid by the hour at a rate of \$10 and time and ½ for any hours worked over 8 in a day. How much did Simon get paid?

- A. \$120.25
- B. \$160.75
- C. \$173.75
- D. \$180
- E. \$182.50

12. Grace has 16 jellybeans in her pocket. She has 8 red ones, 4 green ones, and 4 blue ones. What is the minimum number of jellybeans she must take out of her pocket to ensure that she has one of each color?

- A. 4
- B. 8
- C. 12
- D. 13
- E. 16

13. If $r = 5z$ then $15z = 3y$, then $r =$

- A. y
- B. $2y$
- C. $5y$
- D. $10y$
- E. $15y$

14. If 300 jellybeans cost you x dollars. How many jellybeans can you purchase for 50 cents at the same rate?

- A. $150/x$
- B. $150x$
- C. $6x$
- D. $1500/x$
- E. $600x$

15. Lee worked 22 hours this week and made \$132. If she works 15 hours next week at the same pay rate, how much will she make?

- A. \$57
- B. \$90
- C. \$104
- D. \$112
- E. \$122

16. If $8x + 5x + 2x + 4x = 114$, the $5x + 3 =$

- A. 12
- B. 25
- C. 33
- D. 47
- E. 86

17. You need to purchase a textbook for nursing school. The book cost \$80.00, and the sales tax where you are purchasing the book is 8.25%. You have \$100. How much change will you receive back?

- A. \$5.20
- B. \$7.35
- C. \$13.40
- D. \$19.95
- E. \$21.25

18. You purchase a car making a down payment of \$3,000 and 6 monthly payments of \$225. How much have you paid so far for the car?

- A. \$3225
- B. \$4350
- C. \$5375
- D. \$6550
- E. \$6398

19. Your supervisor instructs you to purchase 240 pens and 6 staplers for the nurse's station. Pens are purchased in sets of 6 for \$2.35 per pack. Staplers are sold in sets of 2 for 12.95. How much will purchasing these products cost?

- A. \$132.85
- B. \$145.75
- C. \$162.90
- D. \$225.25
- E. \$226.75

20. If $y = 3$, then $y^3(y^3 - y) =$

- A. 300
- B. 459
- C. 648
- D. 999
- E. 1099

Answers & Explanations

- 1. A:** The following proportion may be written: $1/p = x/5$. Solving for the variable, x , gives $xp = 5$, where $x = 5/p$. So, Lynn can type $5/p$ pages, in 5 minutes.
- 2. A:** Sally can paint $1/4$ of the house in 1 hour. John can paint $1/6$ of the same house in 1 hour. In order to determine how long it will take them to paint the house, when working together, the following equation may be written: $1/4 x + 1/6 x = 1$. Solving for x gives $5/12 x = 1$, where $x = 2.4$ hours, or 2 hours, 24 minutes.
- 3. D:** Sale Price = $\$450 - 0.15(\$450) = \$382.50$, Employee Price = $\$382.50 - 0.2(\$382.50) = \$306$
- 4. D:** $\$12,590 = \text{Original Price} - 0.2(\text{Original Price}) = 0.8(\text{Original Price})$, Original Price = $\$12,590/0.8 = \$15,737.50$
- 5. A:** In order to solve for A , both sides of the equation may first be multiplied by 3. This is written as $3(2A/3) = 3(8+4A)$ or $2A = 24+12A$. Subtraction of $12A$ from both sides of the equation gives $-10A = 24$. Division by -10 gives $A = -2.4$.
- 6. A:** Three equations may initially be written to represent the given information. Since the sum of the three ages is 41, we may write, $l + s + j = 41$, where l represents Leah's age, s represents Sue's age, and j represents John's age. We also know that Leah is 6 years older than Sue, so we may write the equation, $l = s + 6$. Since John is 5 years older than Leah, we may also write the equation, $j = l + 5$. The expression for l , or $s + 6$, may be substituted into the equation, $j = l + 5$, giving $j = s + 6 + 5$, or $j = s + 11$. Now, the expressions for l and j may be substituted into the equation, representing the sum of their ages. Doing so gives: $s + 6 + s + s + 11 = 41$, or $3s = 24$, where $s = 8$. Thus, Sue is 8 years old.
- 7. E:** Simple interest is represented by the formula, $I = Prt$, where P represents the principal amount, r represents the interest rate, and t represents the time. Substituting $\$4,000$ for P , 0.06 for r , and 5 for t gives $I = (4000)(0.06)(5)$, or $I = 1,200$. So, he will receive $\$1,200$ in interest.
- 8. A:** $\$670 = \text{Cost} + 0.35(\text{Cost}) = 1.35(\text{Cost})$, Cost = $\$670/1.35 = \496.30
- 9. D:** The amount of taxes is equal to $\$55 * 0.003$, or $\$0.165$. Rounding to the nearest cent gives 17 cents.
- 10. C:** The GPA may be calculated by writing the expression, $((3*2)+(4*3)+(2*4)+(3*3)+(4*1))/13$, which equals 3, or 3.0.
- 11. C:** From 8:15 A.M. to 4:15 P.M., he gets paid $\$10$ per hour, with the total amount paid represented by the equation, $\$10*8=\80 . From 4:15 P.M. to 10:30 P.M., he gets paid $\$15$ per hour, with the total amount paid represented by the equation, $\$15*6.25=\93.75 . The sum of $\$80$ and $\$93.75$ is $\$173.75$, so he was paid $\$173.75$ for 14.25 hours of work.
- 12. D:** If she removes 13 jellybeans from her pocket, she will have 3 jellybeans left, with each color represented. If she removes only 12 jellybeans, green or blue may not be represented.
- 13. A:** The value of z may be determined by dividing both sides of the equation, $r=5z$, by 5. Doing so gives $r/5=z$. Substituting $r/5$ for the variable, z , in the equation, $15z=3y$, gives $15(r/5)=3y$. Solving for y gives $r = y$.
- 14. A:** 50 cents is half of one dollar, thus the ratio is written as half of 300, or 150, to x . The equation representing this situation is $300/x * 1/2 = 150/x$.

15. B: The following proportion may be used to determine how much Lee will make next week: $22/132=15/x$. Solving for x gives $x = 90$. Thus, she will make \$90 next week, if she works 15 hours.

16. C: The given equation should be solved for x . Doing so gives $x = 6$. Substituting the x -value of 6 into the expression, $5x + 3$, gives $5(6) + 3$, or 33.

17. C: The amount you will pay for the book may be represented by the expression, $80+(80*0.0825)$. Thus, you will pay \$86.60 for the book. The change you will receive is equal to the difference of \$100 and \$86.60, or \$13.40.

18. B: The amount you have paid for the car may be written as $\$3,000 + 6(\$225)$, which equals \$4,350.

19. A: You will need 40 packs of pens and 3 sets of staplers. Thus, the total cost may be represented by the expression, $40(2.35) + 3(12.95)$. The total cost is \$132.85.

20. C: Substituting 3 for y gives $3^3 (3^3-3)$, which equals $27(27 - 3)$, or $27(24)$. Thus, the expression equals 648.

Algebra part 2

1. Simplify the expression $(4^x + 2^{2x}) / (2^x)$

- a. 6
- b. $2+2^x$
- c. $2x2^x$
- d. 2^{x+1}

2. Simplify the expression $(2^{x^2}-5x-12)/(2^{x^2}-4x-16)$.

- a. $(x-6)/2(x-2)$
- b. $(x-6)/2(x+2)$
- c. $(2x+3)/2(x-2)$
- d. $(2x+3)/2(x+2)$

3. Suppose that the function $f(x)$ is a quadratic function with roots at $x=2-3i$ and $x=2+3i$. Find $f(x)$.

- a. $f(x)=x^2-4x-5$
- b. $f(x)=x^2-4x+13$
- c. $f(x)=x^2-6ix-5$
- d. $f(x)=x^2-6ix+13$

4. Solve the inequality for x . Select all that apply.

$$4x^3+10x^2-24x<0$$

- a. $x<-4$
- b. $-4<x<0$
- c. $0<x<3/2$
- d. $x>3/2$

5. A baseball is thrown up in the air from an initial height of 6 feet. Its height above the ground (in feet) t seconds after being thrown is given by the function $h(t)=-16t^2+46t+6$. How long will it take (in seconds) for the baseball to hit the ground?

- a. 2 seconds
- b. $5/2$ seconds
- c. 3 seconds
- d. 4 seconds

6. Solve the equation for x . Select all that apply.

$$\log_2(8x-x^2)=4$$

- a. $x=-8$
- b. $x=0$
- c. $x=4$
- d. $x=8$

7. Calculate the average rate of change of f between $x=1$ and $x=4$.

$$f(x)=x^3+3x+1$$

- a. 6
- b. $20/3$
- c. 24
- d. 72

8. Simplify the expression $(x^3-3x^2+2x-6)/(x^2-9)$.

- a. 1
- b. $(x-3)/(x+3)$
- c. $(x^2+2)/(x-3)$
- d. $(x^2+2)/(x+3)$

9. Suppose that angle ϑ is in Quadrant I and $\cos \vartheta = 12/13$. Find $\tan \vartheta$.

- a. $\tan \vartheta = 1/13$
- b. $\tan \vartheta = 13$
- c. $\tan \vartheta = 5/12$
- d. $\tan \vartheta = 12/5$

10. Which expression is equivalent to $6\sqrt{x}+10x$?

- a. $2(3x^{-1}+5x)$
- b. $2(3x^{1/2}+5x)$
- c. $2x(3x^{-1}+5)$
- d. $2x(3x^{1/2}+5)$

Answers & Explanations

1. D: You can solve this problem either (1) by simplifying the numerator and denominator separately and then simplifying the result or (2) by using the distributive property. For this problem, we will use the first method.

First rewrite 4^x as an exponent of 2 using the property, $(b^x)^y = b^{xy}$.

$$4^x = (2^2)^x = 2^{2x}$$

Then use this to simplify the numerator with the property, $b^x \times b^y = b^{x+y}$.

$$\begin{aligned} \frac{4^x + 2^{2x}}{2^x} &= \frac{2^{2x} + 2^{2x}}{2^x} \\ &= \frac{2 \cdot 2^{2x}}{2^x} \\ &= \frac{2^1 \cdot 2^{2x}}{2^x} \\ &= \frac{2^{2x+1}}{2^x} \end{aligned}$$

Finally, simplify the result using $b^x / b^y = b^{x-y}$

$$\begin{aligned} \frac{2^{2x+1}}{2^x} &= 2^{(2x+1)-x} \\ &= 2^{x+1} \end{aligned}$$

2. D: To simplify the expression, first factor the numerator and the denominator. By the trial-and-error method, the numerator can be factored into two binomials as follows.

$$2x^2 - 5x - 12 = (2x + 3)(x - 4)$$

For the denominator, factor out the common factor, which is 2.

$$\begin{aligned} 2x^2 - 4x - 16 &= 2(x^2 - 2x - 8) \\ &= 2(x-4)(x+2) \end{aligned}$$

Thus, the factored form of the expression is

$$\frac{2x^2 - 5x - 12}{2x^2 - 4x - 16} = \frac{(2x+3)(x-4)}{2(x-4)(x+2)}$$

Notice that there is a common factor, $(x - 4)$, which is in both the numerator and the denominator. Therefore, you

can further simplify the expression by cancelling it out.

$$\frac{(2x+3)(x-4)}{2(x-4)(x+2)} = \frac{2x+3}{2(x+2)}$$

3. B: The roots of a quadratic function $f(x)$ are the values of x for which $f(x)=0$. A quadratic function written in the form $f(x)=(x-a)(x-b)$ has roots at $x=a$ and $x=b$. Therefore, to find $f(x)$, substitute $2-3i$ and $2+3i$ for a and b into this equation and simplify the result. Note that $(2-3i)(2+3i)=4-9i^2=13$.

$$\begin{aligned} f(x) &= (x-a)(x-b) \\ &= [x-(2-3i)][x-(2+3i)] \\ &= x^2 - (2-3i)x - (2+3i)x + (2-3i)(2+3i) \\ &= x^2 - 2x + 3ix - 2x - 3ix + 13 \\ &= x^2 - 4x + 13 \end{aligned}$$

4. A and C: To solve, first factor the polynomial. Notice that the greatest common factor (GCF) of the terms is $2x$. Factor this expression out and then use trial-and-error to factor the resulting trinomial.

$$\begin{aligned} 4x^3 + 10x^2 - 24x &= 2x(2x^2 + 5x - 12) \\ &= 2x(2x-3)(x+4) \end{aligned}$$

Solving for 0, we find that the roots of the polynomial are $x=0$, $x=3/2$, and $x=-4$.

These values divide the number line into four intervals. Choose a test number from each interval and determine whether the product is positive or negative. For this problem, we will use -5 , -1 , 1 , and 2 as test numbers. Substitute these values into the original polynomial.

$$\begin{aligned} x &= -5: \\ 4(-5)^3 + 10(-5)^2 - 24(-5) &= -375 + 250 + 120 = -5 \end{aligned}$$

$$\begin{aligned} x &= -1: \\ 4(-1)^3 + 10(-1)^2 - 24(-1) &= -4 + 10 + 24 = 30 \end{aligned}$$

$$\begin{aligned} x &= 1: \\ 4(1)^3 + 10(1)^2 - 24(1) &= 4 + 10 - 24 = -10 \end{aligned}$$

$$\begin{aligned} x &= 2: \\ 4(2)^3 + 10(2)^2 - 24(2) &= 32 + 40 - 48 = 24 \end{aligned}$$

Thus, the given inequality, $4x^3 + 10x^2 - 24x < 0$, is satisfied by numbers less than -5 and numbers between 0 and $3/2$.

5. D: The baseball will hit the ground when its height is zero. In mathematical notation, this will happen when $h(t)=0$. Therefore, we need to set the given function equal to zero.

$$\begin{aligned} h(t) &= 0 \\ -16t^2 + 46t + 6 &= 0 \end{aligned}$$

Now solve the resulting equation. Factor the left side and use the zero-product property to solve for t .

$$-2(8t^2-23t-3)=0$$

$$-1(8t+1)(t-3)=0$$

$$t=-1/8 \quad t=3$$

The answer only makes sense when t is positive, so we can discard the negative value. Thus, the calculator will hit the ground 3 seconds after it is thrown.

6. C only: The logarithm of a number is the exponent that the base must to be raised to in order to get that number. For example, since $2^3=8$, it is also true that $\log_2 8=3$. Thus, the given equation $\log_2(8x-x^2)=4$ implies that

$$8x-x^2=2^4$$

Simplify this equation and solve for x .

$$8x-x^2=16$$

$$0=x^2-8x+16$$

$$0=(x-4)^2$$

$$x=4$$

Thus, the solution is $x=4$. Check this value on your own by substituting it into the original equation to make sure that the result is a true statement.

7. C: The average rate of change of a function f between $x=a$ and $x=b$ can be computed with the formula

$$\text{Average rate of change} = \frac{f(b)-f(a)}{b-a}$$

To use this formula, first calculate $f(1)$ and $f(4)$.

Then use these values to calculate the average rate of change.

$$\text{Average rate of change} = \frac{f(4)-f(1)}{4-1}$$

8. D: To simplify the expression, first factor the numerator and the denominator. The numerator can be factored by grouping as follows.

$$x^3-3x^2+2x-6 = x^2(x-3)+2(x-3)$$

$$= (x^2+2)(x-3)$$

For the denominator, factor using the difference of squares formula, $a^2-b^2=(a+b)(a-b)$.

$$x^2-9 = (x+3)(x-3)$$

Thus, the factored form of the expression is

$$\frac{(x^3-3x^2+2x-6)}{(x^2-9)} = \frac{(x^2+2)(x-3)}{(x+3)(x-3)}$$

Notice that there is a common factor, $(x-3)$, which is in both the numerator and the denominator. Therefore, you can further simplify the expression by cancelling it out.

$$\frac{(x^2+2)(x-3)}{(x+3)(x-3)} = \frac{(x^2+2)}{(x+3)}$$

9. C: Use a unit circle to model the value of cosine. In a right triangle, the cosine function is $\cos\theta = \text{adjacent}/\text{hypotenuse}$. Using the Pythagorean Theorem, we find that the length of the second leg is

$$\begin{aligned} b &= (c^2 - a^2)^{1/2} \\ &= (1^2 - (12/13)^2)^{1/2} \\ &= (25/169)^{1/2} \\ &= 5/13 \end{aligned}$$

Since the tangent function is $\tan\theta = \text{opposite}/\text{adjacent}$, the value of $\tan\theta$ is $\tan\theta = (5/13)/(12/13) = 5/12$. In Quadrant I, the values of cosine and tangent are both positive. Therefore, $\tan\theta = 5/12$.

10. B: All of the choices involve two transformations of the given expression: factoring out either 2 or $2x$ and changing the radical to an exponent. First factor out the greatest common factor (GCF) of the terms. In this case, the GCF is 2.

$$6x + 10\sqrt{x} = 2(3\sqrt{x} + 5x)$$

In addition, the square root of x is equal to x raised to the $1/2$ power.

$$2(3x + 5\sqrt{x}) = 2(3x^{1/2} + 5x)$$

Basic Operations Practice

1. Edward ascends to the top of a mountain over the course of two days. On Friday, he ascends 482 feet. He ascends another 362 feet on Saturday. How many feet did he ascend in all?

- a. 848 feet
- b. 836 feet
- c. 840 feet
- d. 844 feet

2. Kristen must buy three items that are priced at \$4.58, \$6.22, and \$8.94. What is the best estimate for the total cost of all three items?

- a. \$18
- b. \$16
- c. \$20
- d. \$22

3. A teacher donates to a local charity. Each year, she donates three times the amount donated the previous year. If the teacher donated \$2 the first year, how much did she donate during the fifth year?

- a. \$158
- b. \$164
- c. \$162
- d. \$144

4. Penny drinks 8 glasses of water each day. The number of glasses of water she drinks over a 12-day time span can be determined, using the number sentence: Which number sentence would not show the number of glasses of water she drinks?

- a. $? / 8 = 12$
- b. $12 \times 8 = ?$
- c. $? / 12 = 8$
- d. $12 - 8 = ?$

5. Belinda draws a rectangle with a length of 6 cm. She draws a second rectangle with a length of 11 cm. Belinda continues drawing more rectangles, where for each rectangle drawn, she uses a length that is 5 more centimeters than the length of the previous rectangle. If this pattern continues, what will be the length of the 11th rectangle?

- a. 46 cm
- b. 54 cm
- c. 56 cm
- d. 61 cm

6. Jasper collects 1,082 cans of food. He gives a certain number of cans to the first local charity he finds. He now has 602 cans of food. How many cans of food did he give to the first local charity?

- a. 430
- b. 480
- c. 682
- d. 1,684

7. Amanda creates the base of a picture frame, using 4.55 inches of red fabric and 6.25 inches of blue fabric. How many inches of fabric are used to create the base of the frame?

- a. 10.80 inches
- b. 10.85 inches
- c. 10.75 inches
- d. 10.90 inches

8. Hannah ran 12 laps every day for 8 days. How many laps did she run in all?

- a. 108
- b. 96
- c. 84
- d. 72

9. Three friends sold cupcakes for a fundraiser. Eli sold 84 cupcakes, John sold 46 cupcakes, and Kim sold 72 cupcakes. Which of the following is the best estimate for the number of cupcakes the three friends sold in all?

- a. 180
- b. 200
- c. 210
- d. 190

10. Carlisle charges \$21.95 per hair cut and has completed 30 haircuts this week. Which of the following is the best approximation for the total charges for all haircuts?

- a. \$450
- b. \$600
- c. \$750
- d. \$800

Answers & Explanations

1. D: The total number of feet he ascended can be determined by adding 482 feet and 362 feet. The sum of 482 and 362 is 844. Thus, he ascended 844 feet in all.
2. C: The item priced at \$4.58 can be rounded to \$5. The item priced at \$6.22 can be rounded to \$6. The item priced at \$8.94 can be rounded to \$9. The sum of 5, 6 and 9 is 20. Thus, the best estimate is \$20.
3. C: In order to find the amount donated the following year, you multiply the amount donated the previous year by 3. Thus, the amount donated the second year was \$6 (.). The amount donated the third year was \$18 (.). The amount donated the fourth year was \$54 (The amount donated the fifth year was \$162 (.)).
4. D: If she drinks 8 glasses of water each day, the number of glasses of water she drinks in 12 days can be determined by multiplying 8 by 12. This product is 96; thus she drinks 96 glasses of water in a 12-day time span. The relationship between the number of glasses of water she drinks per day and the total number of glasses of water she drinks in 12 days can be represented by an appropriate multiplication or division number sentence within the following fact family: Subtracting 8 from 12 will not reveal the number of glasses she drinks in a 12-day time span. The number sentence: , is not in this fact family.
5. C: If each rectangle has a length that is 5 cm more than that of the previous rectangle, the lengths of the 3rd rectangle through the 11th rectangle can be found by adding 5 cm to the length of the second triangle and continuing for each next rectangle. So, the lengths of the rectangles will be as follows: 16 cm, 21 cm, 26 cm, 31 cm, 36 cm, 41 cm, 46 cm, 51 cm, and 56 cm.
6. B: In order to find the number of cans of food he gave to the first charity, the number of cans of food he has left needs to be subtracted from the number of cans he collected; .
7. A: The sum of the two decimals is 10.80; the decimals are added just like whole numbers are, while aligning the decimal point.
8. B: She runs laps in all, or 96 laps.
9. B: The number of cupcakes sold can be rounded as follows: 80 cupcakes, 50 cupcakes, and 70 cupcakes, which sum to 200. Therefore, the best estimate for the number of cupcakes sold is 200 cupcakes.
10. B: The amount of money Carlisle charges per hair cut can be rounded to \$20; . Thus, his total charges are approximately \$600.

Exponent Practice

1. 10^4 is not equal to which of the following?

- A. 100,000
- B. 0.1×10^5
- C. $10 \times 10 \times 10 \times 10$
- D. $10^2 \times 10^2$
- E. 10,000

2. Multiply 10^4 by 10^2

- A. 10^8
- B. 10^2
- C. 10^6
- D. 10^{-2}
- E. 10^3

3. Divide x^5 by x^2

- A. x^7
- B. x^4
- C. x^{10}
- D. x^3
- E. $x^{2.5}$

4. Find 8.23×10^9

- A. 0.00000000823
- B. 0.00000823
- C. 8.23
- D. 8230000000
- E. 823000000000

5. 83,000 equals:

- A. 83.0×10^4
- B. 8.3×10^4
- C. 8.3×10^3
- D. 83.0×10^5
- E. 83.0×10^2

6. .00875 equals:

- A. 8.75×10^{-2}
- B. 8.75×10^{-3}
- C. 8.75×10^{-4}
- D. 87.5×10^{-3}
- E. 875×10^{-4}

Answers & Explanations

1. **A:** $10^4=10\cdot 10\cdot 10\cdot 10$, or 10,000.
2. **C:** When multiplying terms with the same base, the exponents should be added. Thus, $10^4 \cdot 10^2=10^6$.
3. **D:** When dividing terms with the same base, the exponents should be subtracted. Thus, $x^5/x^2 =x^3$.
4. **D:** The decimal will be moved to the right 9 places. Thus 7 zeros will be added to the right of 823, giving 8,230,000,000.
5. **B:** Moving the decimal to the right of the digit, 8, gives the equivalent expression, 8.3×10^4 , since there are 4 digits to the right of the 8.
6. **B:** Moving the decimal to the right of the 8 gives 8.75×10^{-3} , since the decimal must be moved 3 places to the right.

Fractions and Square Root Practice

1. Which of the following is listed in order from least to greatest?

- a. $-\frac{3}{4}, -7\frac{4}{5}, -8, 18\%, 0.25, 2.5$
- b. $-8, -7\frac{4}{5}, -\frac{3}{4}, 0.25, 2.5, 18\%$
- c. $18\%, 0.25, -\frac{3}{4}, 2.5, -7\frac{4}{5}, -8$
- d. $-8, -7\frac{4}{5}, -\frac{3}{4}, 18\%, 0.25, 2.5$

2. Which of the following fractions is larger than $2\frac{1}{4}$ but smaller than $2\frac{2}{5}$?

- a. $2\frac{1}{2}$
- b. $2\frac{3}{8}$
- c. $2\frac{6}{11}$
- d. $2\frac{5}{9}$

3. Jason chooses a number that is the square root of four less than two times Amy's number. If Amy's number is 20, what is Jason's number?

- a. 6
- b. 7
- c. 8
- d. 9

4. In a square built with unit squares, which of the following would represent the square root of the square?

- a. The number of unit squares comprising a side
- b. The total number of unit squares within the square
- c. Half of the total number of unit squares within the square
- d. The number of unit squares comprising the perimeter of the square

5. Brianna used five $\frac{3}{4}$ cups of sugar while baking. How many cups of sugar did she use in all?

- a. $3\frac{2}{3}$
- b. $3\frac{3}{4}$
- c. $3\frac{1}{4}$
- d. $3\frac{1}{2}$

6. A publishing company has been given 29 manuscripts to review. If the company divides the work equally amongst 8 editors, which of the following represents the number of manuscript each editor will review?

- a. $3\frac{3}{5}$
- b. $3\frac{5}{8}$
- c. $3\frac{7}{9}$
- d. $3\frac{2}{3}$

7. A lake near Armando's home is reported to be 80% full of water. Which fraction is equivalent to 80% and in simplest form?

- a. $\frac{1}{80}$

- b. $8/10$
- c. $4/5$
- d. $80/1$

8. Alma collected coins. In the bag where she kept only dimes, she had dimes from four different years. She had 20 dimes minted in 1942, 30 minted in 1943, 40 minted in 1944, and 10 minted in 1945. If Alma reached into the bag without looking and took a dime, what is the probability that she took a dime minted in 1945?

- a. $2/5$
- b. $3/10$
- c. $1/5$
- d. $1/10$

9. A recipe calls for $3\frac{3}{4}$ cups of flour. Which fraction below is equivalent to this amount?

- a. $5/2$
- b. $15/4$
- c. $3/2$
- d. $9/4$

10. If $\frac{1}{x} = \frac{1}{9}$, then x could be equal to

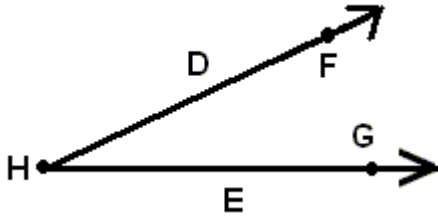
- a. 9
- b. 5
- c. 3
- d. -4
- e. -7

Answers & Explanations

1. D: The smallest negative integers are those that have the largest absolute value. Therefore, the negative integers, written in order from least to greatest, are $-8, -7\frac{4}{5}, -3\frac{1}{4}$. The percent, 18%, can be written as the decimal, 0.18; 0.18 is less than 0.25. The decimal, 2.5, is the greatest rational number given. Thus, the values, $-8, -7\frac{4}{5}, -3\frac{1}{4}, 18\%, 0.25, 2.5$, are written in order from least to greatest.
2. B: The fraction, $2\frac{1}{4}$, can be written as the decimal, 2.25. The fraction, $2\frac{2}{5}$, can be written as the decimal, 2.40. The fraction, $2\frac{3}{8}$, can be written as the decimal, 2.375; 2.375 is larger than 2.25 but smaller than 2.40.
3. A: Jason's number can be determined by writing the following expression: $\sqrt{2x-4}$, where x represents Amy's number. Substitution of 20 for x gives $\sqrt{2(20)-4}$, which simplifies to $\sqrt{36}$, or 6. Thus, Jason's number is 6. Jason's number can also be determined by working backwards. If Jason's number is the square root of 4 less than 2 times Amy's number, Amy's number should first be multiplied by 2 with 4 subtracted from that product and the square root taken of the resulting difference.
4. A: The square root of a square is equal to the length of one of the sides, or the number of unit squares comprising a side. For example, a square representing 7 squared will have 7 unit squares on each side; $7^2=49$, and 7 is the square root of 49. The square will contain 49 unit squares, with 7 unit squares comprising each side.
5. B: In order to determine the total number of cups of sugar used while baking, the product of 5 and $\frac{3}{4}$ should be calculated: $5\frac{3}{4}=15\frac{3}{4}$, which can be simplified to $3\frac{3}{4}$. Thus, she used $3\frac{3}{4}$ cups in all.
6. B: In order to determine the number of manuscripts each editor will review, the total number of manuscripts should be divided by the number of editors; $29\frac{5}{8}$ can be written as $\frac{237}{8}$, which simplifies to the mixed fraction $29\frac{5}{8}$. Notice that the quotient is 3 with a remainder of 5.
7. C: The 80% means 80 out of 100, which can be written as $\frac{80}{100}$. This fraction can be written in lowest terms by dividing both the numerator and denominator by the greatest common factor of 20, to get the fraction, $\frac{4}{5}$.
8. D: By adding all of the dimes, we find that there are a total of 100 dimes in the bag. 10 of them were minted in 1945. The probability, then, of choosing a dime minted in 1945 is 10 out of 100, which is equivalent to the fraction $\frac{1}{10}$.
9. B: $15\frac{3}{4}$. The value of 3 is equivalent to $\frac{12}{4}$. Therefore, $3\frac{3}{4}=\frac{12}{4}+\frac{3}{4}=\frac{15}{4}$. Another way of finding this is sometimes called the "C" method. $3\frac{3}{4}$ equals $(4\times 3+3)/4=15/4$.
10. E: . When you take the square root of a number, the answer is the positive and negative values of the root. Therefore, $x=\pm 7$. Only -7 is an answer choice.

Geometry Practice

1. Which of the following letters represents the vertex in the following picture?



- A. D and E
- B. E and H
- C. F and G
- D. G only
- E. H only

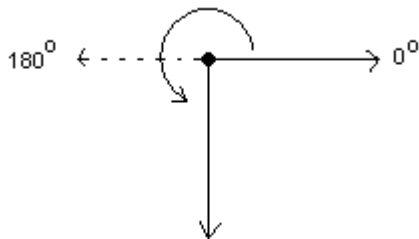
2. If a circle has the diameter of 8, what is the circumference?

- A. 6.28
- B. 12.56
- C. 25.13
- D. 50.24
- E. 100.48

3. What is the area of the triangle below?

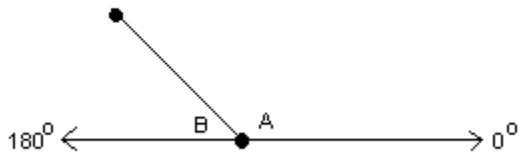
- A. 22 cm²
- B. 33 cm²
- C. 44 cm²
- D. 50 cm²
- E. 66 cm²

4. What is the measure of the solid line angle depicted by the following figure?



- A. 90 degrees
- B. 180 degrees
- C. 225 degrees
- D. 270 degrees
- E. 0 degrees

5. What is the measure of angle B in the following figure if angle A measures 135° ?



- A. 40°
- B. 45°
- C. 50°
- D. 135°
- E. 225°

Answers & Explanations

- E:** The vertex is the point, formed by the two rays of an angle. Thus, H is the vertex of the angle.
- C:** $C = \pi d$. Substituting 8 for d gives $C = 8\pi$, where C is approximately 25.13.
- B:** The area of a triangle may be found by using the formula, $A = 1/2bh$, where b represents the base and h represents the height. Thus, the area may be written as $A = 1/2(11)(6)$, or $A = 33$. The area of the triangle is 33 cm².
- D:** The sum of the angles, formed by the perpendicular rays is 360°, thus the curved arrow represents an angle measure that is equal to the difference of 360° and 90°, or 270°.
- B:** Since angles A and B are supplementary, the measure of angle B is equal to the difference of 180° and 135°, or 45°.

Averages and Rounding Practice Questions

1. The average of six numbers is 4. If the average of two of those numbers is 2, what is the average of the other four numbers?

- 5
- 6
- 7
- 8
- 9

2. Kate got a 56 on her first math test. On her second math test, she raised her grade by 12%. What was her grade?

- 62.7
- 67.2
- 68.0
- 72.3

3. A skyscraper is 548 meters high. The building's owners decide to increase its height by 3%. How high would the skyscraper be after the increase?

- 551 meters
- 555 meters
- 562 meters
- 564 meters

4. Janet makes homemade dolls. Currently, she produces 23 dolls per month. If she increased her production by 18%, how many dolls would Janet produce each month?

- 27
- 32
- 38
- 40

5. A class contains an equal number of boys and girls. The average height of the boys is 62 inches. The average height of the all the students is 60 inches. What is the average height of the girls in the class?

- a. 57 inches
- b. 58 inches
- c. 59 inches
- d. 60 inches

6. Elijah drove 45 miles to his job in an hour and ten minutes in the morning. On the way home in the evening, however, traffic was much heavier and the same trip took an hour and a half. What was his average speed in miles per hour for the round trip?

- a. 30
- b. 45
- c. $33 \frac{3}{4}$
- d. $32 \frac{1}{2}$

7. If Joey and Katrina hike an average of 3 miles per hour, about how long will it take them if they take the Beaverton Falls trail and follow it through the Copper Creek trail?

- a. 3 hours
- b. 3 hours
- c. 4 hours
- d. 4 hours

8. A pasta salad was chilled in the refrigerator at 35° F overnight for 9 hours. The temperature of the pasta dish dropped from 86° F to 38° F. What was the average rate of cooling per hour?

- a.
- b.
- c.
- d.

9. Rachel spent \$24.15 on vegetables. She bought 2 lbs of onions, 3 lbs of carrots, and 1 1/2 lbs of mushrooms. If the onions cost \$3.69 per lb, and the carrots cost \$ 4.29 per lb, what is the price per lb of mushrooms?

- a. \$2.60
- b. \$2.25
- c. \$2.80
- d. \$3.10
- e. \$2.75

10. A roast was cooked at 325 °F in the oven for 4 hours. The internal temperature rose from 32 °F to 145 °F. What was the average rise in temperature per hour?

- a. 20.2°F/hr
- b. 28.25°F/hr
- c. 32.03°F/hr
- d. 37°F/hr

Answers & Explanations

1. A: A set of six numbers with an average of 4 must have a collective sum of 24. The two numbers that average 2 will add up to 4, so the remaining numbers must add up to 20. The average of these four numbers can be calculated: $20/4 = 5$.

2. A: First, calculate 12% of 56.
 $56 \times 0.12 = 6.72$
Then, add this value (the increase) to the original value of 56.
 $56 + 6.72 = 62.72$
Rounding off, we get 62.7

3. D: Explanation: First, calculate 3% of 548 meters.
 $548 \text{ meters} \times 0.03 = 16.44 \text{ meters}$.
Then, add it to the original height.
 $548 \text{ meters} + 16.44 \text{ meters} = 564.44 \text{ meters}$
Rounding off, we get 564 meters.

4. A: Explanation: First, calculate 18% of 23.
 $23 \times 0.18 = 4.14$
Then, add this value (the increase) to the original value of 23.
 $23 + 4.14 = 27.14$
Rounding off, we get 27.

5. B: The average, or arithmetic mean, is computed by totaling all the measurements and dividing by the number of measurements. Let TB represent the sum of the heights of the boys in the class, and TG the sum of the heights of the girls. If N is the number of students in the class, there are $N/2$ boys and $N/2$ girls. The average height of the boys is then $TB / (N/2)$. Similarly, the average height of the girls is $TG / (N/2)$. The average height of all the students is equal to $(TB + TG) / N$. Therefore, $TB / (N/2)$ and the average height for the girls is $2 \times 29 = 58$.

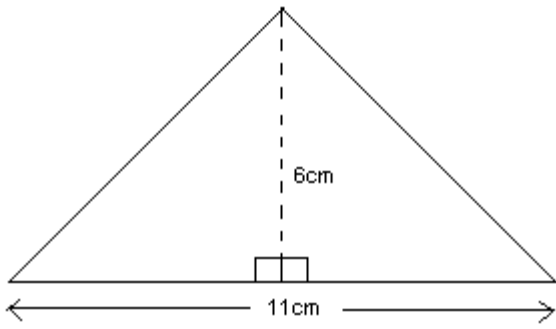
6. C: To determine this, first determine the total distance of the round trip. This is twice the 45 miles of the one-way trip to work in the morning, or 90 miles. Then, to determine the total amount of time Elijah spent on the round trip, first convert his travel times into minutes. One hour and ten minutes equals 70 minutes, and an hour and a half equals 90 minutes. So, Elijah's total travel time was $70 + 90 = 160$ minutes. Elijah's average speed can now be determined in miles per minute:
miles per minute
Finally, to convert this average speed to miles per hour, multiply by 60, since there are 60 minutes in an hour:
Average speed (mph) = $60 \times 0.5625 = 33.75$ miles per hour

7. C: The total distance they will hike is $2.6 \text{ miles} + 9.5 \text{ miles} = 12.1 \text{ miles}$. If they hike 3 miles per hour, it will take them hours to hike 12.1 miles.

8. B: The average rate of cooling is: hrs; = 5.33°F per hour.

9. A: Begin by determining the total cost of the onions and carrots, since these prices are given. This will equal $(2 \times \$3.69) + (3 \times \$4.29) = \$20.25$. Next, this sum is subtracted from the total cost of the vegetables to determine the cost of the mushrooms: $\$24.15 - \$20.25 = \$3.90$. Finally, the cost of the mushrooms is divided by the quantity (lbs) to determine the cost per pound:
Cost per lb =

10. B: $145^\circ\text{F} - 32^\circ\text{F} = 113^\circ\text{F}$, $113^\circ\text{F} / 4\text{hrs} = 28.25^\circ\text{F} / \text{hr}$



Science Section

- Anatomy and Physiology

The Human Body

1. The human body consists of over two hundred and six bones, seven hundred muscles and about twenty five miles of blood vessels. It is always striving to maintain its internal environment. The process of maintaining a constant steady state is called **Homeostasis**. In order to understand the human body, it is important to understand basic anatomy and physiology

2. Define the terms *anatomy* and *physiology*.

Anatomy is the study of the structure of an organism and the relationship of its parts. Physiology is the study of the functions of living organisms and their parts.

3. List and discuss in order of increasing complexity the levels of organization of the body.

Levels of organization of the body include (1) chemical level (atoms and molecules), (2) cells (smallest "living" units), (3) tissues (groups of cells acting together), (4) organs (groups of tissues acting together), and (5) systems (groups of organs acting together).

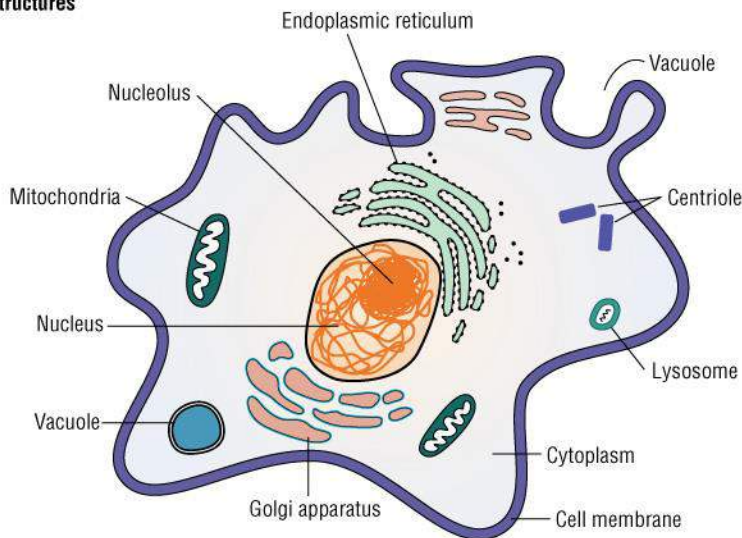
Atom – smallest unit of an element with that's element's chemical characteristics. Comprised of protons, neutrons, and electrons

When two or more Atoms unite through their electron structure, they form a molecule

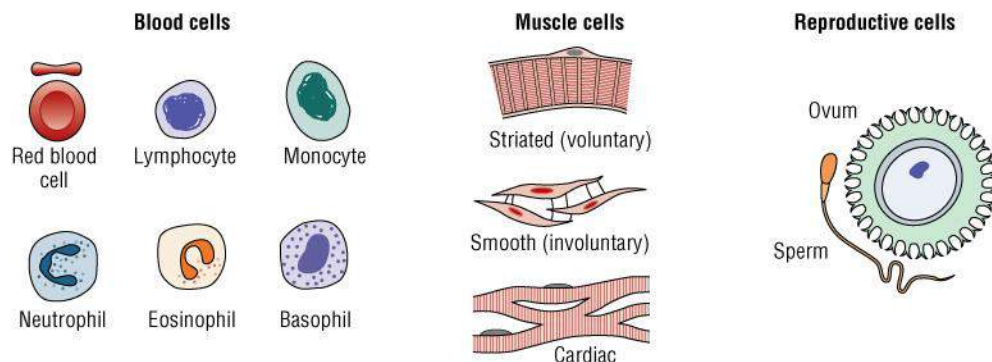
Cell: This is the basic structural unit of life. The study of cells is called **Cytology**.

Cells are considered the smallest living units and a very complex

Basic cell structures



Human cells



Discovery of Cells

- Robert Hooke (1665): observed a thin slice of cork (dead plant cells) with a microscope. He described what he observed as “little boxes” (cells).
- Anton van Leeuwenhoek (1675): was the first person to observe living cells
- All Cells are microscopic but differ widely in size and shape and internal organization.

The Cell Theory

- Who developed the cell theory?
- Matthias Schleiden (1838): concluded that all plants are composed of cells
- Theodor Schwann (1839): concluded that all animals are composed of cells
- Rudolph Virchow (1855): determined that cells come only from other cells

Tissues: Similar Cells come together and form tissue. Tissues are more complex cells. Tissue are similar cells that work together to perform a function. The study of tissue is called **Histology**. There are four basic tissue types and they are the following: Connective, Epithelial, Muscle, Nervous tissue.

Organs are more complex than tissue. An Organ is a **group of several different kinds of tissue**

Each organ in the body is composed of various combinations of body tissues. (For example, the stomach is made of epithelial tissues and muscle tissue)

Each organ in the body is composed of various combinations of body tissues. (For example, the stomach is made of epithelial tissues and muscle tissue)

Connective tissue: This tissue supports and connects all body parts. Includes adipose (fat issue), cartilage, bone and blood. Important forms of connective tissue are areolar connective tissue and adipose (fat) tissue, fibrous connective tissue, bone, cartilage, blood, and hematopoietic tissue

Epithelial tissue: (also know as Epithelium) This tissue protects and covers the body and lines the body organs. Epithelial tissue consist of closely packed flat cells. Functions include, Protection, Absorption and Secretion

Muscle tissue: This tissue contracts to produce movement. There are three types of muscle tissue: Skeletal (voluntary) muscle, cardiac muscle tissue, Smooth muscle.

Nervous tissue: This tissue provides communication throughout the body. The main nervous tissues are the brain, spinal cord and nerves

When several kinds of tissue are united to perform a more complex function than any tissue alone, they are called **ORGANS**.



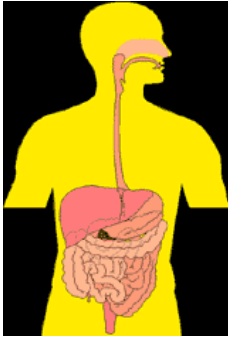

ORGANS working together and for the same general purpose make up an **organ systems or body system**, which maintain the whole body.

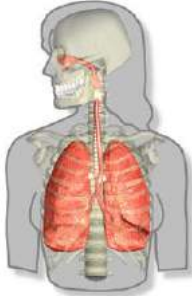
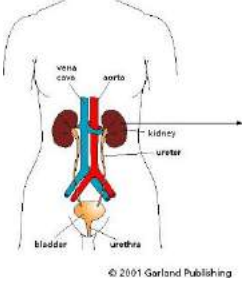
Body Systems perform more complex function than any one organ can perform.

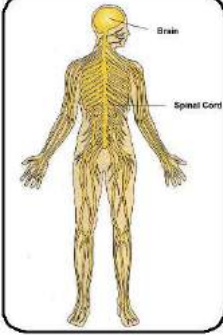
- Study of the anatomy and physiology of the body generally centers on study of the body systems.
- A system is defined as a group of organs working together to perform related functions.
- Many medical specialties concentrate on one body system, ie, neurology is the study of the nervous system.
- Usually the organs in a system are anatomically connected, but in some cases, as with the endocrine system, the tissues are widely distributed

The table below shows body systems

HUMAN BODY SYSTEM CHART

SYSTEM		FUNCTIONS	ORGANS/Major STRUCTURES
Skeletal		<p><u>Functions:</u></p> <ol style="list-style-type: none"> 1. Supports and protects the body 2. Protect organs 3. Makes blood cells 4. Gives the body the shape 5. Helps body to move 	<p><u>Bones</u> <u>Ligaments:</u> connects bones to bones <u>Cartilage:</u> provides cushion between the bones <u>Red Marrow:</u> makes blood</p>
Muscular		<p><u>Function:</u> Help the body move</p> <p><u>Two Types of Muscles:</u></p> <ol style="list-style-type: none"> 1. <u>Voluntary Muscles:</u> muscles you CAN control (Skeletal Muscles) 2. <u>Involuntary Muscles:</u> muscles you CANNOT control (smooth and cardiac muscles) 	<p><u>Heart, diaphragm, biceps/triceps</u> <u>Tendon:</u> connects muscle to bones <u>Skeletal Muscles:</u> attached to the bones and helps us move <u>Smooth Muscles:</u> make up most of the organs of our body <u>Cardiac Muscles:</u> make up the heart</p>
Digestive		<p><u>Function:</u> Breaks down food to make energy for the body</p> <p><u>*Direction of food movement:</u> Mouth esophagus stomach Sm. Intestine lg. Intestine rectum anus</p> <p><u>*Peristalsis:</u> muscle movement that moves food through the D.S</p>	<p><u>Mouth</u> <u>Esophagus:</u> Long tube that connects the mouth to the stomach. <u>Stomach, Liver, Pancreas</u> <u>Small Intestine:</u> where most digestion takes place. <u>Large Intestine:</u> Takes water from the undigested materials <u>Rectum, Anus</u></p>
Circulatory		<p><u>Function:</u> Carries O₂, CO₂, food, waste disease fighting cells, & hormones through the body</p> <p><u>*Direction of blood flow:</u></p> <p>Heart</p> <p>Veins</p> <p>Arteries</p>	<p><u>Heart:</u> main organ of CS that pumps blood to all parts of the body <u>Artery:</u> thickest blood vessel that carry blood high in oxygen AWAY from the heart. <u>Capillary:</u> thinnest blood vessel that connects arteries & vein and where the actual exchange of materials take place.</p>

		<p>Capillaries</p>	<p><u>Vein</u>: blood vessel that carry blood high in carbon dioxide TOWARD the heart. <u>Blood</u>: carries food and oxygen to the body and take away waste from cells <u>White Blood Cells</u>: fight disease</p>
<p>Respiratory</p>		<p><u>Function</u>: take in oxygen and take out carbon dioxide and some water out of the body</p> <p><u>*Direction of air movement</u>: nose trachea bronchi (into the lungs) bronchioles alveoli</p>	<p><u>Nose</u> <u>Trachea</u>: large tube that carries air to the bronchi <u>Larynx</u> <u>Bronchi</u>: tube that connects the trachea and lungs <u>Lungs</u>: main organ of the RS <u>Alveoli</u>: A tiny air sac where air exchange takes place <u>Diaphragm</u>: strong muscle below the lungs that helps in breathing</p>
<p>Excretory</p>		<p><u>*Function</u>: take out waste from the body</p> <p><u>Direction of urine movement</u>: Body kidney ureter Urinary bladder urethra</p> <p><u>*Urine</u> is made of waste, extra water, and salt</p> <p><u>*Perspiration (sweat)</u>: liquid waste that leaves the body through the skin and helps control the body temperature</p>	<p><u>Kidney</u>: main organ of the ES where urine is made <u>Urteter</u>: a tube that carries urine from the kidney to the urinary bladder <u>Urinary bladder</u> <u>Urethra</u>: a tube that carries urine out of the body <u>Liver, Skin</u></p> <p><u>!!!How do your lungs, kidneys, & skin remove (take away) waste from your body???</u> Lungs: breathe out CO₂ Kidney: make urine Skin: perspiration (sweat)</p>

<p>Nervous</p>	 <p>The diagram shows a human figure from the front, with the brain highlighted in yellow at the top of the head. A line points from the label 'Brain' to the brain. The spinal cord is highlighted in yellow along the back of the neck and down the length of the spine. A line points from the label 'Spinal Cord' to the spinal cord. The rest of the body is shown in a light tan color.</p>	<p><u>Function:</u> controls ALL the activities of the body: it's the "boss"</p> <p><u>Two parts of nervous system:</u></p> <p><u>1. Central Nervous system (CNS):</u> made up of brain and spinal cord, controls all activities of the body.</p> <p><u>2. Peripheral Nervous System (PNS):</u> made up of all the nerves outside of CNS, and carries messages between CNS to the all parts of the body</p>	<p><u>Brain:</u> control center of our body functions</p> <p><u>Spinal cord:</u> connects brain with the rest of the body</p> <p><u>Nerves:</u> nerve cells</p>
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Types of Anatomical Studies

Descriptive or Systemic Anatomy - the method of studying the body by systems, such as auditory and respiratory systems

Regional Anatomy - the study of the body by regions, such as the thorax and abdomen

Applied or Clinical Anatomy - emphasizes structure and function as they relate to diagnosis and treatment

Surface Anatomy - the visualization of structures that lie beneath the skin. It is an essential part of the study of regional anatomy and the primary means by which clinicians use anatomical knowledge in treating patients

Developmental Anatomy – the study of anatomy from conception to adulthood

Comparative Anatomy – study of anatomy across the animal kingdom, animal models, etc.

Pathological Anatomy – study of abnormal structures or systems

Anatomical terminology is used to define the body accurately. Anatomical terminology is used to define the human body in anatomical position. Let's now look at the terminology

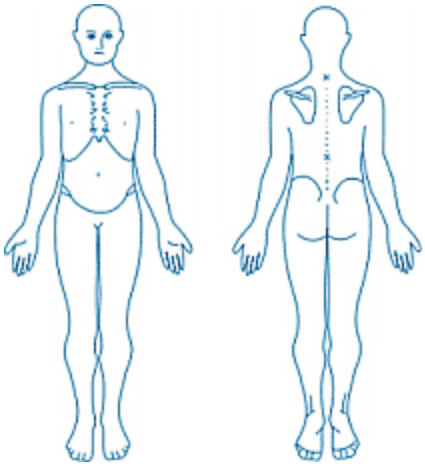
When describing the human body healthcare personnel refer to the body and body parts as if the patient where in **anatomic position**.

Anatomic Position: An individual in the Anatomic Position is standing erect, with arms to their side, palms forward, and facing forward.

4. Define the *anatomical position*.

In the anatomical position, the body is in an erect or standing posture with arms at the sides and palms turned forward. The head and feet also point forward. **The illustration below shows a person standing in anatomical position**

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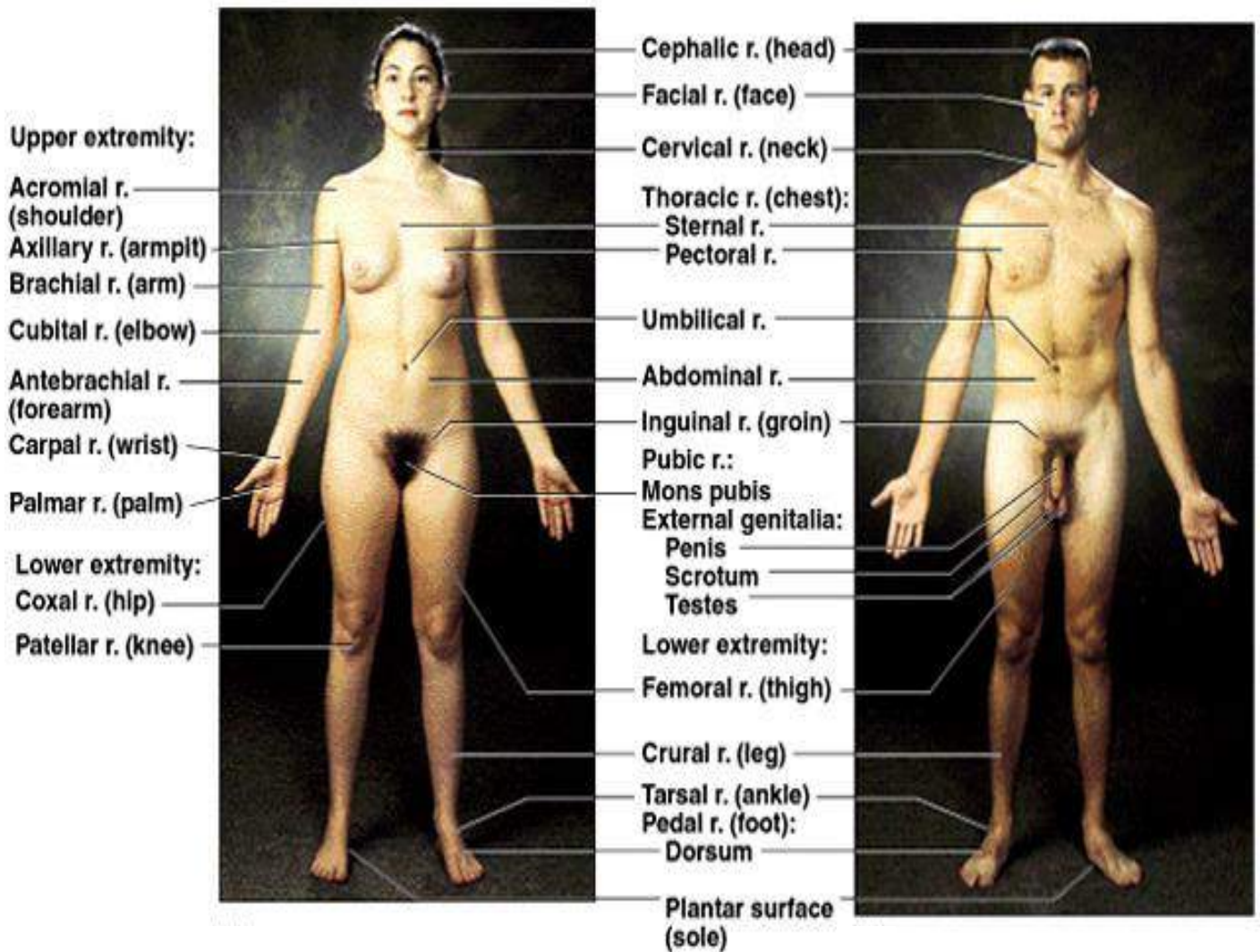


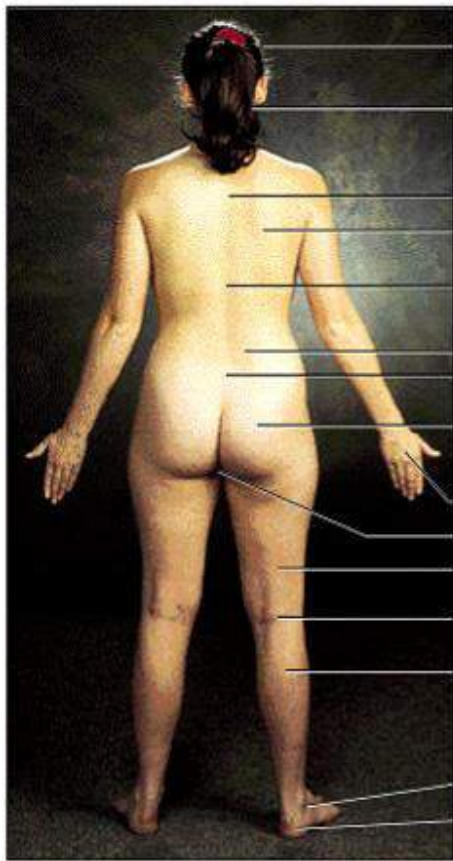
- Person stands erect
- Feet flat on floor
- Arms at sides
- Palms, eyes & face facing forward
- Standard frame of reference for anatomical descriptions & dissection

5. List and define the principal directional terms and sections (planes) used in describing the body and the relationship of body parts to one another.

a. Directional terms

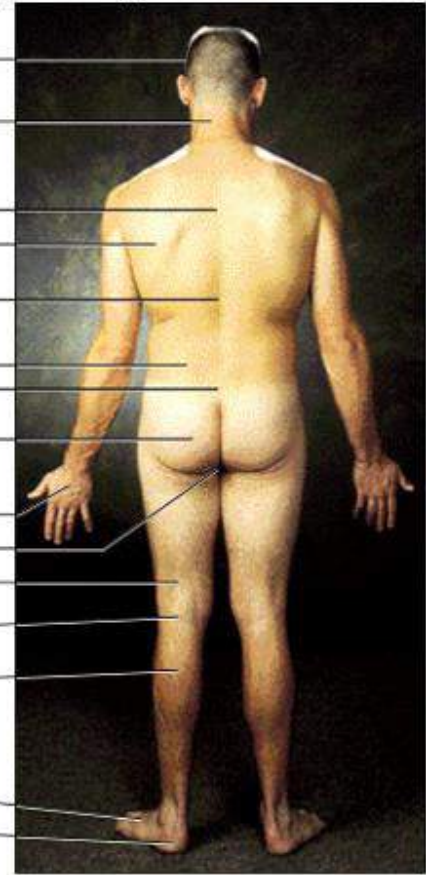
- (1) Superior—toward the head, upper, above
Inferior—toward the feet, lower, below
- (2) Anterior—front, in front of (same as ventral in humans)
Posterior—back, in back of (same as dorsal in humans)
- (3) Medial—toward the midline of the body
Lateral—away from the midline or toward the side of the body
- (4) Proximal—toward or nearest the trunk of the body, or nearest the point of origin of one of its parts
Distal—away from or farthest from the trunk of the body, or farthest from a point of origin of one of its parts
- (5) Superficial—nearer the body surface
Deep—farther away from the body surface





(c)

- Cranial r.
- Nuchal r.
(back of neck)
- Interscapular r.
- Scapular r.
- Vertebral r.
- Lumbar r.
- Sacral r.
- Gluteal r.
(buttock)
- Dorsum of hand
- Perineal r.
- Femoral r.
- Popliteal r.
- Crural r.
- Tarsal r.
- Calcaneal r.
(heel)



(d)

b. **Body planes**

This term is used to describe how the body organs and the body are divided into two sections. A plane of the body is simply referring to sections of the body

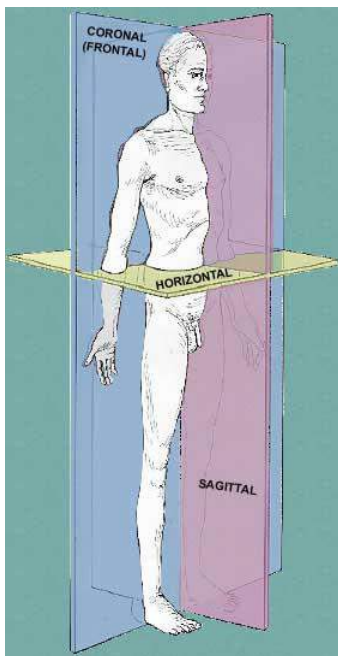
Frontal plane: Also known as the Coronal plane. This divides the body or the organ vertically into a front and rear part.

Horizontal Plane: Also known as the Transverse plane. This divides the organs of the body and the body into top and the bottom parts.

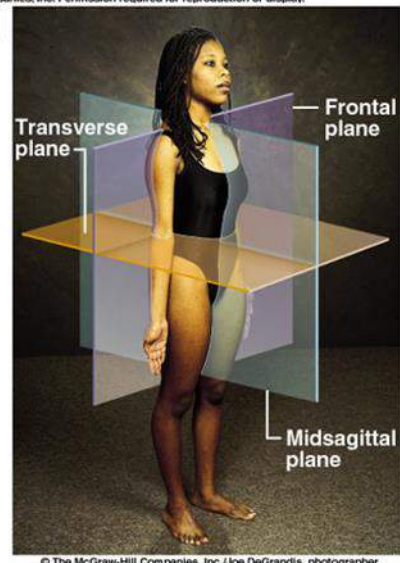
Sagittal planes: Divides the body organs and the body vertically into right and left parts. Mid-sagittal is the term used if the body parts or organs right and left are equal.

Parasagittal plane is the term used if the body parts are divided unequally from left to right. The diagram below illustrates human body planes:

The diagram below illustrates human body planes:



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**Anatomical
Planes**



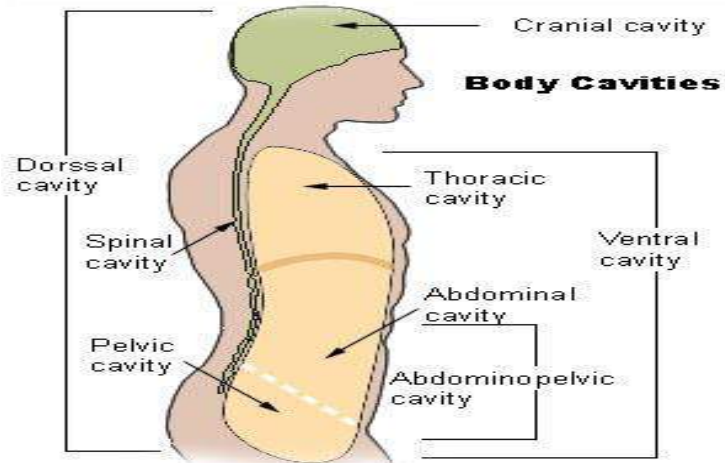
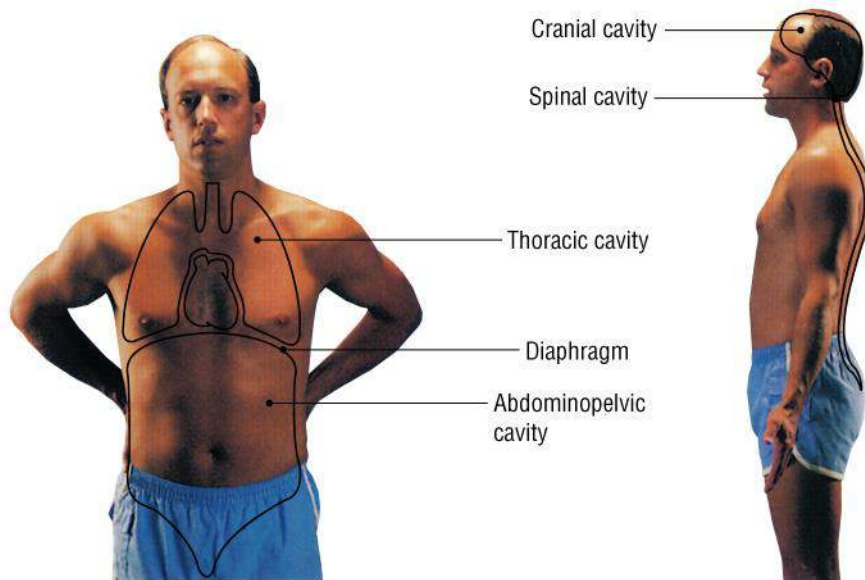
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Planes are imaginary flat surfaces passing through the body sections are anatomical views if body is cut on a plane

6. **Body cavities.** The List the major cavities of the body and the subdivisions found in each. In the human body, various organs are housed in large, hollow spaces called body cavities. The body cavities are divided into two major groups, dorsal and ventral.

- a. Ventral body cavity
 - (1) Thoracic cavity
 - (a) Mediastinum
 - (b) Pleural cavities (right and left)
 - (2) Abdominopelvic cavity
 - (a) Abdominal cavity
 - (b) Pelvic cavity
- b. Dorsal body cavity
 - (1) Cranial cavity
 - (2) Spinal cavity

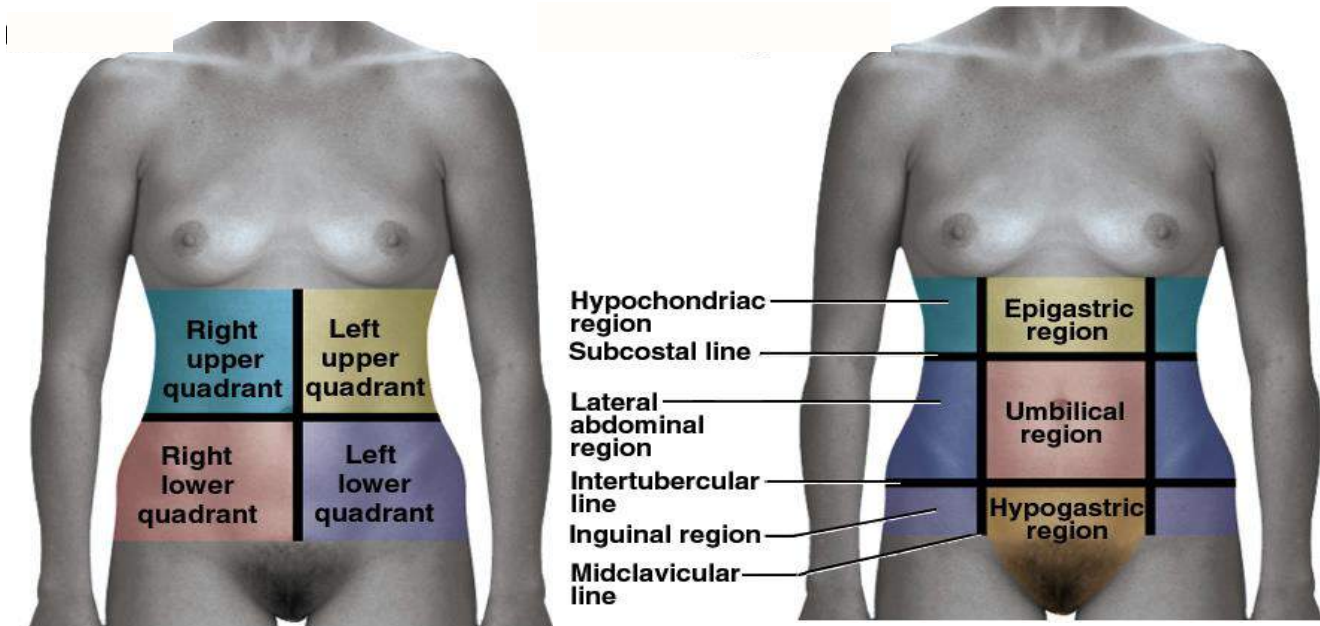
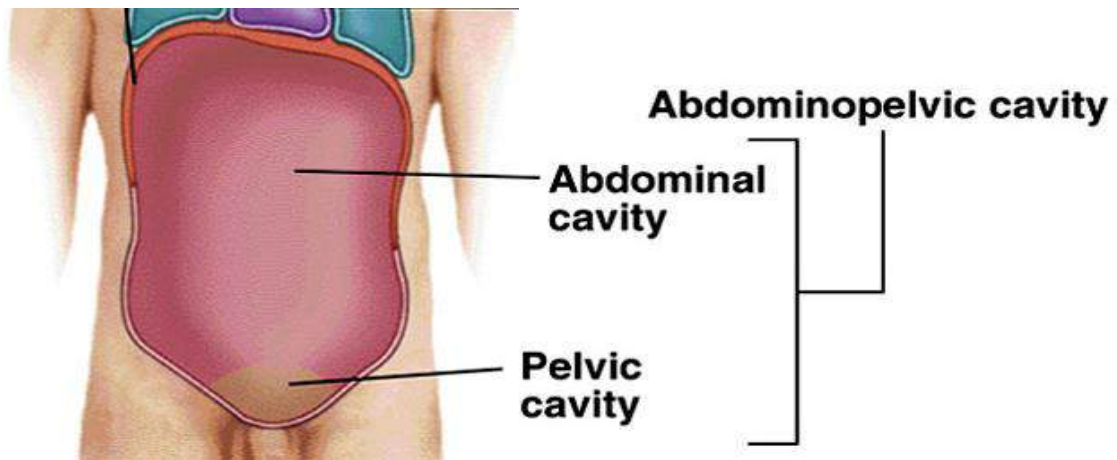
The diagram below illustrates human body cavities



7. **Abdominal Cavity** List the nine abdominopelvic regions and the four abdominopelvic quadrants.
- The nine abdominopelvic regions include (1) right hypochondriac, (2) epigastric, (3) left hypochondriac, (4) right lumbar, (5) umbilical, (6) left lumbar, (7) right iliac, (8) hypogastric, and (9) left iliac regions.
 - The four abdominopelvic quadrants include (1) right upper or superior, (2) right lower or inferior, (3) left upper or superior, and (4) left lower or inferior.

There are two systems of dividing the abdominal cavity. The simplest is dividing into four quadrants.

The Abdomen is divided into FOUR quadrants. By using 2 imaginary lines that intersect at the navel you divide the abdomen into right upper (RUQ) and lower (RLQ), and left upper (LUQ) and lower (LLQ) quadrants



- **RUQ:**

- *** Gallbladder**

- head of Pancreas
- Liver
- Pylorus
- Duodenum
- R adrenal gland
- portion of R kidney
- Hepatic flexure of colon
- portions of ascending and transverse colon

LUQ:

- *** Spleen**

- *** body of Pancreas**

- L lobe of liver
- stomach
- L adrenal gland
- portion of L kidney
- Splenic flexure of colon

RLQ:

- *** Appendix**
 - lower pole of R kidney
 - Cecum and appendix
 - portion of ascending colon
 - Bladder (if distended)
 - Ovary and salpinx
 - Uterus (if enlarged)
 - R ureter*

LLQ:

- - lower pole of L kidney
 - Sigmoid colon
 - portion of descending colon
 - bladder (if distended)
 - Ovary and Salpinx
 - Uterus (if enlarged)
 - L ureter

8. Discuss and contrast the axial and the appendicular subdivisions of the body. Identify a number of specific anatomical regions in each area.
 - a. The axial portion of the body consists of the head, neck, and trunk. It is composed of thoracic, abdominal, and pelvic regions.
 - b. The appendicular portion of the body consists of the upper and lower extremities.
 - (1) Upper extremities are composed of arm, forearm, wrist, and hand regions.
 - (2) Lower extremities are composed of thigh, leg, ankle, and foot regions.
9. Explain the meaning of the term *homeostasis* and give an example of a typical homeostatic mechanism.
 - a. Homeostasis is relative constancy of the internal environment. It requires that chemical composition, volume, and other characteristics of blood and other body fluids remain constant within a narrow limit.
 - b. Example: Constant circulation of blood in the body allows for continuous removal of carbon dioxide produced by body cells.

Practice Questions and Review

Have the students answer these questions prior to covering this chapter to understand where they stand in relation to the content.

- 1) The term used to describe the position of the body lying face upward is _____.
- 2) The plane of the body that runs lengthwise from front to back is the _____.
- 3) The body cavity that contains the trachea, heart, and blood vessels is _____.
- 4) The area of the body around the navel is called _____.
- 5) What is the basic type of control system in the body?
 - a) homeostasis
 - b) feedback loop
 - c) control center
 - d) hypothesis
- 6) What is a systematic approach to discovery called?
 - a) scientific method
 - b) experimentation
 - c) heory
 - d) experimental controls
- 7) What is the anatomical direction term that means nearer the surface?
 - a) proximal
 - b) distal
 - c) superficial
 - d) deep
- 8) What is the body cavity that contains the lower colon, rectum, urinary bladder, and reproductive organs?
 - a) cranial cavity
 - b) pleural cavity
 - c) abdominal cavity
 - d) pelvic cavity
- 9) What is the term for the body region of the upper cheek?
 - a) zygomatic
 - b) volar
 - c) popliteal
 - d) olecranal
- 10) What term refers to a degeneration process?
 - a) effector loop
 - b) negative feedback loop
 - c) homeostasis
 - d) atrophy

Answers

- 1) supine
- 2) sagittal
- 3) mediastinum
- 4) umbilical
- 5) b
- 6) a
- 7) c
- 8) d
- 9) a
- 10) d

Other Practice Questions

Question: What is the anatomical position? Why is the term used? What are other positions besides anatomical position?

Answer: To assume anatomical position, the body is in an erect, or standing, posture with the arms at the sides and the palms forward. The head and feet also point forward. Discussions about the body, the way it moves, its posture, or the relationship of one area to another assume that the body as a whole is in anatomical position. Other positions are supine and prone. In the supine position, the body is lying face upward, and in the prone position, the body is lying face downward.

Question: What are the two major body cavities? What are the subdivisions of these two major cavities?

Answer: The two major body cavities are the ventral and dorsal body cavities. The ventral body cavity is divided into the thoracic cavity, which is further subdivided into the mediastinum and pleural cavities, and the abdominopelvic cavity, which is further subdivided into the abdominal and pelvic cavities. The dorsal body cavity is divided into the cranial and spinal cavities.

1. Define anatomy and physiology.

Answer: Anatomy is the study of the structure of an organism and the relationships of its parts. Physiology is the study of body function.

2. Describe the process used to form scientific theories.

Answer: The scientific method is a the systematic approach to discovery. A tentative explanation (hypothesis) is developed from observation. This hypothesis is tested through a process of experimentation. If accepted, the hypothesis is tentatively accepted as true. A hypothesis that has gained a high level of confidence is called a theory or law.

3. List and explain the levels of organization in a living thing.

Answer: (1) The chemical level of organization (see Appendix A) consists of atoms and molecules. The existence of life depends on the proper levels and proportions of many chemical substances in cells of the body and other living things. (2) Cells are the smallest structural units. (3) Tissues are an organization of many similar cells that act together to perform a common function. (4) Organs are a group of several different kinds of tissues acting together to perform a special function. (5) Systems are an organization of various kinds of organs arranged to perform complex functions of the body.

4. Describe the anatomical position.

Answer: Standing erect with the arms at the sides and palms turned forward.

5. Name and explain the three planes or sections of the body.

Answer: (1) Sagittal plane—a sagittal cut or section is a lengthwise plane running front to back. It divides the body or any of its parts into right and left sides. The sagittal plane divides the body into two equal halves. This unique type of sagittal plane is called a midsagittal plane. (2) Frontal plane (coronal)—divides a structure into anterior and posterior sections. (3) Transverse plane—a horizontal plane that divides a structure into upper and lower sections.

6. List two organs of the mediastinum, two organs of the abdominal cavity, and two organs of the pelvic cavity.

Answer: (1) Mediastinum—heart, trachea; (2) abdominal cavity—liver, stomach; (3) pelvic cavity—uterus, urinary bladder.

7. From the upper left to the lower right, list the nine regions of the abdominopelvic cavity.

Answer: (1) left hypochondriac; (2) left lumbar; (3) left iliac; (4) epigastric; (5) umbilical; (6) hypogastric; (7) right hypochondriac; (8) right lumbar; (9) right iliac.

8. Name the two subdivisions of the dorsal cavity. What structures does each contain?

Answer: (1) The cranial cavity contains the brain. (2) The spinal cavity contains the spinal cord.

9. Explain the difference between the terms lower extremity, thigh, and leg.

Answer: Lower extremity refers to any of the lower limbs, including the hip, thigh, leg, ankle, and foot.

The thigh lies between the hip joint and the knee, and the leg is between the knee and the ankle.

10. List the four conditions in the cell that must be kept in homeostatic balance.

Answer: Temperature, salt content, acid level (pH), fluid volume and pressure, oxygen concentration, and other vital conditions must remain within acceptable limits.

11. List the three parts of a negative feedback loop and give the function of each.

Answer: The (a) sensor detects changes and feeds information to the (b) control center, which responds by initiating certain changes that are then sent to the (c) effector, which influences the controlled condition. Example: When you ride a bike, your eyes are the sensors, your brain is the control center, and your muscles are the effectors.

1. Define and contrast the terms *organ* and *organ system*.

An *organ* is a structure made up of two or more kinds of tissues, organized in such a way that together these tissues perform a more complex function than can any one tissue alone.

An *organ system* is a group of organs arranged in such a way that together they perform a more complex function than can any one organ alone.
2. List the 11 major organ systems of the body.

The 11 major organ systems of the body are (1) integumentary, (2) skeletal, (3) muscular, (4) nervous, (5) endocrine, (6) cardiovascular (circulatory), (7) lymphatic, (8) respiratory, (9) digestive, (10) urinary, and (11) reproductive systems.
3. Identify and locate the major organs of each major organ system.
 - Integumentary system—skin, hair, nails, sense receptors, sweat glands, oil glands
 - Skeletal system—bones, joints
 - Muscular system—muscles
 - Nervous system—brain, spinal cord, nerves
 - Endocrine system—pituitary gland, pineal gland, hypothalamus, thyroid gland, parathyroids, thymus, adrenals, pancreas, ovaries, testes
 - Circulatory system—heart, blood vessels (arteries, veins, capillaries)
 - Lymphatic system—lymph nodes, lymphatic vessels, tonsils, thymus, spleen
 - Respiratory system—nose, pharynx, larynx, trachea, bronchi, lungs
 - Digestive system—mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum, anal canal, teeth, salivary glands, tongue, liver, gallbladder, pancreas, appendix
 - Urinary system—kidneys, ureters, bladder, urethra
 - Reproductive system—(male) testes, vas deferens, urethra, prostate, penis, scrotum; (female) ovaries, uterus, uterine tubes, vagina, vulva, mammary glands
4. Briefly describe the major functions of each major organ system.
 - The integumentary system supports and protects, regulates body temperature, synthesizes chemicals, and acts as a sense organ.
 - The skeletal system supports and protects, makes movement possible (with joints), stores minerals, and forms blood cells.
 - The muscular system makes body movement possible, maintains posture, and produces heat.
 - The nervous system allows a person to communicate with the environment, recognize sensory stimuli, and integrate and control the body.
 - The endocrine system secretes hormones into the blood that communicate, integrate, and control other body mechanisms such as growth, metabolism, reproduction, and fluid and electrolyte balance.
 - The circulatory system transports substances through the body, regulates body temperature, and assists with immunity.
 - The lymphatic system is a subdivision of the circulatory system. It does not contain blood, but rather lymph, which is formed from the fluid surrounding body cells and diffused into lymph vessels. The major functions of the lymphatic system are the movement of fluid and immunity. It has a critical role in the defense of the body against disease.
 - The respiratory system exchanges oxygen from the air for the waste product carbon dioxide, filters irritants from the inspired air, warms and moistens inspired air, and assists with the regulation of acid-base balance.
 - The digestive system breaks down food by mechanical and chemical means, absorbs nutrients, and excretes solid waste.
 - The urinary system cleans waste products from blood and forms urine. It also maintains electrolyte balance, water balance, and acid-base balance. In males, the urethra has both urinary and reproductive functions.
 - The reproductive system produces sex cells, facilitates the transfer of sex cells for fertilization to occur, permits development and birth of offspring, nourishes offspring, and produces sex hormones.

5. Identify and discuss the major subdivisions of the reproductive system.

Male reproductive system

- Consists of testes, vas deferens, prostate, penis, and scrotum.
- Primary functions are to produce sperm cells and transport them to the female reproductive tract.

Female reproductive system

- Consists of ovaries, uterus, uterine (fallopian) tubes, vagina, vulva, and mammary glands.
- Primary functions are to produce egg cells, receive sperm, permit fertilization, transfer fertilized ovum to uterus, allow for development of embryo and fetus, facilitate birth, and nourish offspring.

Practice Questions

1. Which body system serves to clean the blood of waste products?
 - A. digestive
 - B. endocrine
 - C. circulatory
 - D. urinary
2. Ovaries and testes are considered components of which system?
 - A. reproductive system
 - B. endocrine system
 - C. both A and B
 - D. none of the above
3. Which of the following organs is classified as an accessory organ of the digestive system?
 - A. mouth
 - B. esophagus
 - C. tongue
 - D. anal canal
4. Factors in the environment such as heat, light, pressure, and temperature that can be recognized by the nervous system are called
 - A. effectors.
 - B. stimuli.
 - C. receptors.
 - D. nerve impulses.
5. Which body system stores the mineral calcium?
 - A. circulatory
 - B. digestive
 - C. lymphatic
 - D. skeletal
6. What is undigested material in the gastrointestinal tract called?
 - A. feces
 - B. urine
 - C. lymph
 - D. blood
7. Which body system produces heat and maintains body posture?
 - A. endocrine
 - B. muscular
 - C. circulatory
 - D. skeletal
8. Which of the following is *not* a function of the integumentary system?
 - A. integration
 - B. temperature regulation
 - C. ability to serve as a sense organ
 - D. protection
9. Which of the following is *not* a component of the digestive system?
 - A. spleen
 - B. liver
 - C. pancreas
 - D. gallbladder

10. When a group of tissues starts working together to perform a common function, what level of organization is achieved?
- systematic
 - tissue
 - organ
 - cellular

Matching

Select the most appropriate answer in Column B to each item in Column A. Write the letter in the blank provided. (Only one answer for each is correct.)

Column A

- _____ 11. Sweat glands
- _____ 12. Heart
- _____ 13. Spleen
- _____ 14. Vas deferens
- _____ 15. Bladder
- _____ 16. Gallbladder
- _____ 17. Uterine tubes
- _____ 18. Trachea
- _____ 19. Spinal cord
- _____ 20. Adrenals

Column B

- A. Endocrine
- B. Urinary
- C. Integumentary
- D. Circulatory
- E. Respiratory
- F. Digestive
- G. Male reproductive
- H. Lymphatic
- I. Female reproductive
- J. Nervous

Completion

Complete the following statements using the terms listed below.

- | | |
|--------------|---------------|
| A. Male | G. Systems |
| B. Joints | H. Endocrine |
| C. Tendons | I. Urethra |
| D. Lymphatic | J. Vulva |
| E. Female | K. Nervous |
| F. Digestive | L. Organelles |
- The external genitalia of the female are referred to collectively as _____.
 - Movement of bones in the skeletal system is made easier because of the existence of connections between bones called _____.
 - Organs arranged in such a way that together they can perform a more complex function than can any one organ alone are called _____.
 - The pituitary, pineal, thyroid, and parathyroid glands are components of the _____ system.
 - Urine passes from the bladder to the outside of the body through a tube called the _____.
 - Muscles are attached to bones by structures called _____.
 - Communication, integration, and control are the primary functions of two body systems called _____ and _____.
 - The _____ system removes excess fluids from the tissue spaces surrounding cells, transports fats from the digestive system back to the blood, and helps develop immunity.

29. The urethra carries out both a reproductive and a urinary function in the _____ sex.
30. The body system that functions to remove solid waste from the body is called the _____ system.

Multiple Choice

As you review the systems and organs of the body, you begin to understand the direct correlation between where the organs lie and the physical symptoms often experienced.

Mr. Griffith, age 54, has come to the hospital to have his gallbladder removed. He asks what the gallbladder does and where it is located.

31. What would you tell Mr. Griffith about the gallbladder?
- A. The gallbladder will be removed from the thoracic cavity, which is located in the chest.
 - B. The gallbladder is an accessory organ of the digestive system and will be removed from the abdominal cavity.
 - C. The gallbladder is the organ that holds urine and is located in the pelvic cavity.
 - D. The gallbladder is a vital organ, necessary for life. It will be treated but not surgically removed.
32. Which of the following statements about the gallbladder is true?
- A. It is part of the gastrointestinal system.
 - B. It lies superior to the heart.
 - C. It is designated as a primary organ.
 - D. It is an essential organ for the production of insulin.
33. Mr. Griffith is experiencing some difficulty breathing. You know from your studies that the lungs are part of what system?
- A. lymphatic
 - B. circulatory
 - C. respiratory
 - D. endocrine
34. Mr. Griffith mentions that he recently was exposed to poison ivy while fishing. He shows you his arms, which are red and itching. After notifying the appropriate staff member, you remember that the skin is part of which system?
- A. endocrine
 - B. lymphatic
 - C. nervous
 - D. integumentary

ANSWERS

Multiple Choice

1. D
2. C
3. C
4. B
5. D
6. A
7. B
8. A
9. A
10. C

Matching

11. C
12. D
13. H
14. G
15. B
16. F
17. I
18. E
19. J
20. A

Completion

21. J
22. B
23. G
24. H
25. I
26. C
27. H, K
28. D
29. A
30. F

Multiple Choice

31. B
32. A
33. C
34. D

Review Questions

1. Define **organ** and **organ system**.

Answer: An **organ** is a structure made up of two or more kinds of tissues, organized in such a way that the tissues can perform complex functions. An **organ system** is a group of organs arranged in such a way that together they can perform a more complex function than can any one organ alone.

2. Give examples of the stimuli to which the skin organs can respond.

Answer: The body can respond to pain, pressure, touch, and temperature change.

3. How is the skin able to assist in the body's ability to regulate temperature?

Answer: Body temperature can be regulated by sweating.

4. What is the function of tendons?

Answer: Tendons are bands or cords of fibrous connective tissue that attach a muscle to a bone or other structure, which aids in movement and stability.

5. What are some of the differences between the lymphatic and cardiovascular systems?

Answer: The **cardiovascular system** consists of the heart, which acts as a pump; arteries; veins; and capillaries, all of which are part of a closed system that supplies blood to the body.

The **lymphatic system** is composed of lymph, nodes, lymphatic vessels, and specialized organs such as the tonsils, thymus, and spleen. The lymph vessels are filled with lymph fluid, which contains lymphocytes, protein, and some fatty molecules. Unlike blood, lymph does not circulate repeatedly through a closed circuit. Lymph flows through the lymphatic vessels, entering the circulatory system through the large ducts, including the thoracic duct.

6. Name the organs that help rid the body of waste. What type of waste does each organ remove?

Answer: Digestive system—The primary organs and the secondary organs of the digestive system work together to insure proper utilization of nutrients. **Primary organs**—mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum, and anal canal. **Accessory organs**—teeth, salivary glands, tongue, liver, gallbladder, pancreas, and appendix. Food that enters the gastrointestinal tract is digested, its nutrients are absorbed, and the undigested residue is eliminated from the body as waste material called feces. The **kidneys** continually clean and filter the blood. The waste product the kidneys produce is urine, which flows out of the kidneys through the **ureters** into the **urinary bladder**, where it is stored before finally leaving the body through the **urethra**. **Lungs** rid the body of carbon dioxide. **Skin** eliminates water and some salts in sweat.

7. Besides bone, what other types of tissues are included in the skeletal system?

Answer: The skeletal system includes related tissues such as cartilage and ligaments, which provide a framework for support and protection.

8. List the 11 organ systems -**Answer:** (1) Integumentary; (2) skeletal; (3) muscular; (4) nervous; (5) endocrine; (6) cardiovascular; (7) lymphatic; (8) respiratory; (9) digestive; (10) urinary; (11) reproductive.

9. Most of the organ systems have more than one function. List two functions for the following systems: integumentary system, skeletal system, muscular system, lymphatic system, respiratory system, and urinary system.

Answer: (1) **Integumentary** system functions—protection and regulation of body temperature. (2) **Skeletal** system functions—support and movement. (3) **Muscular** system functions—movement and maintenance of body posture. (4) **Lymphatic** system functions—transportation and immunity. (5) **Respiratory** system functions—exchange of waste gas (carbon dioxide) for oxygen in the lungs and filtration of irritants from inspired air. (6) **Urinary** system functions—cleaning blood of waste products, excreting urine, and maintaining acid-base balance.

10. What is unique about the reproductive system? **Answer:** The unique function of the reproductive system ensures the survival not only of the individual, but also of the human race. This takes place as a result of hormone production that aids and enables the development of sexual characteristics, resulting in a normal reproductive system

Completion

To understand the importance of the 11 systems of the body, it is vital that you be able to identify the organs within each system. In the spaces provided, write the names of the organs corresponding to each system.

1. Integumentary	2. Skeletal	4. Respiratory
a.	a.	a.
b.	b.	b.
c.		c.
d.		d.
e.	3. Muscular	e.
f.	a.	f.
5. Digestive: Primary organs	6. Digestive: Accessory organs	7. Nervous
a.	a.	a.
b.	b.	b.
c.	c.	c.
d.	d.	
e.	e.	
f.	f.	8. Cardiovascular
g.	g.	a.
h.		b.
9. Reproductive: Male	10. Reproductive: Female	11. Endocrine

Gonads	Gonads	a.
a.	a.	b.
Genital ducts	Mammary glands	c.
b.	b.	d.
c.	Accessory organs	e.
Accessory organs	c.	f.
d.	d.	g.
Genitalia	e.	h.
e.	Genitalia	i.
f.	f.	j.
12. Lymphatic	13. Urinary	
a.	a.	
b.	b.	
c.	c.	
d.	d.	
e.		

Completion

1. Integumentary	2. Skeletal	4. Respiratory
a. Skin	a. Bones	a. Nose
b. Hair	b. Joints	b. Pharynx
c. Nails		c. Larynx
d. Sense receptors		d. Trachea
e. Sweat glands	3. Muscular	e. Bronchi
f. Oil glands	a. Muscles	f. Lungs
5. Digestive: Primary Organs	6. Digestive: Accessory Organs	7. Nervous
a. Mouth	a. Teeth	a. Brain
b. Pharynx	b. Salivary glands	b. Spinal cord
c. Esophagus	c. Tongue	c. Nerves
d. Stomach	d. Liver	
e. Small intestine	e. Gall bladder	
f. Large intestine	f. Pancreas	8. Cardiovascular
g. Rectum	g. Appendix	a. Heart
h. Anal canal		b. Blood vessels
9. Reproductive: Male	10. Reproductive: Female	11. Endocrine
Gonads	Gonads	a. Pituitary gland
a. Testes	a. Ovaries	b. Pineal gland
Genital ducts	Mammary glands	c. Hypothalamus
b. Ductus (vas) deferens	b. Breasts	d. Thyroid gland
c. Urethra	Accessory organs	e. Parathyroid
Accessory organs	c. Uterus	f. Thymus
d. Prostate	d. Fallopian tubes	g. Adrenals
Genitalia	e. Vagina	h. Pancreas (islet tissue)
e. Penis	f. Vulva	i. Ovaries (female)
f. Scrotum		j. Testes (male)
12. Lymphatic	13. Urinary	
a. Lymph nodes	a. Kidneys	
b. Lymph vessels	b. Ureters	
c. Thymus	c. Thymus	
d. Spleen	d. Urethra	
e. Tonsils		

