Answers to Mini-Quizzes and Labs

Answers to Chapter 1 Mini-Quizzes

Mini-Quiz 1-1

1. machine
2. a. procedure-oriented
3. b. object-oriented
4. compiler

Mini-Quiz 1-2

1. sequence, selection, repetition
2. sequence
3. algorithm
4. repetition
5. repetition
6. selection

Answers to Chapter 1 Labs

LAB 1-1 Stop and Analyze

1. sequence and repetition
2. 2100, 315, and 1785
3. Change the first line to repeat for (the first 10 customers buying a TV).
4. Change the second line to enter the original price of the TV and the discount rate. Then, replace 15% in the third line with the discount rate.

LAB 1-2 Plan and Create

```
repeat (10 times)
    enter the salesperson's name and sales
    if (the sales are greater than 10,000)
        calculate the bonus by multiplying the sales by 10%
    else
        calculate the bonus by multiplying the sales by 5%
    end if
    display the salesperson's name and bonus
end repeat
```

LAB 1-3 Modify

You can use either of the following algorithms. The modifications are shaded in each.

Algorithm 1

```
repeat for (each customer buying a TV)
    enter the original price of the TV
    if (the customer is a store employee)
        calculate the discount by multiplying the original price by 25%
    else
        calculate the discount by multiplying the original price by 15%
    end if
    calculate the total due by subtracting the discount from the original price
    print a bill showing the original price, discount, and total due
end repeat
```

Algorithm 2

```
repeat for (each customer buying a TV)
        enter the original price of the TV
        if (the customer is not a store employee)
                calculate the discount by multiplying the original price by 15%
        else
                calculate the discount by multiplying the original price by 25%
        end if
        calculate the total due by subtracting the discount from the original price
        print a bill showing the original price, discount, and total due
end repeat
```

LAB 1-4 What's Missing?

The missing instruction is shaded.

```
repeat (3 times)
        walk forward one complete step
end repeat
if (Ginger is on the bench)
        gently shove Ginger off the bench
end if
repeat (2 times)
        turn left 90 degrees
end repeat
sit down on the bench
```

Answers to Chapter 2 Mini-Quizzes

Mini-Quiz 2-1

1. Output: raise
   new salary
   Input: current salary
   raise percentage

2. Output: average score
   Input: midterm score
   final score

3. Output: 10% tip
   15% tip
   20% tip
   Input: customer bill

4. Output: yearly savings
   Input: amount saved per day
   number of days in the year

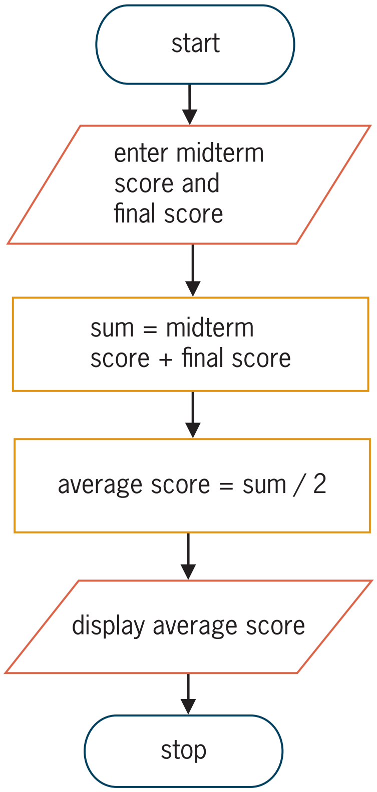
Mini-Quiz 2-2

1. input/output
2. rectangular
3.

Input	Processing	Output
current salary raise percentage	Processing items: none Algorithm: 1. enter the current salary and raise percentage 2. calculate the raise by multiplying the current salary by the raise percentage 3. calculate the new salary by adding the raise to the current salary 4. display the raise and new salary	raise new salary

4.

Input	Processing	Output
midterm score final score	Processing items: sum Algorithm:	average score


start
enter midterm score and final score
sum = midterm score + final score
average score = sum / 2
display average score
stop

Mini-Quiz 2-3

1.

current salary	raise percentage	raise	new salary
~~32600~~	~~.05~~	~~1630~~	~~34230~~
54700	.02	1094	55794

2.

midterm score	final score	sum	average score
~~75~~	~~83~~	~~158~~	~~79~~
98	93	191	95.5

Answers to Chapter 2 Labs

LAB 2-1 Stop and Analyze

1.

quantity sold	item cost	item selling price	price and cost difference	profit
~~100~~	~~5~~	~~8~~	~~3~~	~~300~~
650	2.50	3.75	1.25	812.50

The algorithm will display 300 using the first set of input values. It will display 812.50 using the second set of input values.

2.

Input	**Processing**	**Output**
quantity sold item cost item selling price	Processing items: none	price and cost difference profit

Algorithm:

1. enter the quantity sold, item cost, and item selling price
2. calculate the price and cost difference by subtracting the item cost from the item selling price
3. calculate the profit by multiplying the price and cost difference by the quantity sold
4. display the price and cost difference and profit

3.

Input	**Processing**	**Output**
quantity sold item cost item selling price	Processing items: none	profit

Algorithm:

1. enter the quantity sold, item cost, and item selling price
2. calculate the profit by subtracting the item cost from the item selling price, and then multiplying the result by the quantity sold
3. display the profit

quantity sold	item cost	item selling price	profit

LAB 2-2 Plan and Create

No answer required.

LAB 2-3 Modify

Input	**Processing**	**Output**
number of doughnuts ordered number of muffins ordered doughnut price muffin price	Processing items: doughnut cost muffin cost	total number of items ordered total cost

Algorithm:

1. enter the number of doughnuts ordered, number of muffins ordered, doughnut price, and muffin price
2. calculate the total number of items ordered by adding together the number of doughnuts ordered and number of muffins ordered
3. calculate the doughnut cost by multiplying the number of doughnuts ordered by the doughnut price
4 calculate the muffin cost by multiplying the number of muffins ordered by the muffin price
5. calculate the total cost by adding the doughnut cost to the muffin cost
6. display the total number of items ordered and total cost

number of doughnuts ordered	number of muffins ordered	doughnut price	muffin price
~~4~~	~~2~~	~~0.50~~	~~0.55~~
0	12	0.60	0.70

doughnut cost	muffin cost	total number of items ordered	total cost
~~2~~	~~1.10~~	~~6~~	~~3.10~~
0	8.40	12	8.40

LAB 2-4 What's Missing?

Input	Processing	Output
shortbread sold	Processing items:	shortbread contribution
pecan sandies sold	total sold	pecan sandies contribution
chocolate mint sold		chocolate mint contribution

Algorithm:

1. enter shortbread sold, pecan sandies sold, and chocolate mint sold
2. calculate the total sold by adding together shortbread sold, pecan sandies sold, and chocolate mint sold
3. calculate shortbread contribution by dividing shortbread sold by total sold, and then multiplying the result by 100
4. calculate pecan sandies contribution by dividing pecan sandies sold by total sold, and then multiplying the result by 100
5. calculate chocolate mint contribution by dividing chocolate mint sold by total sold, and then multiplying the result by 100
6. display shortbread contribution, pecan sandies contribution, and chocolate mint contribution

LAB 2-5 Desk-Check

restaurant bill	sales tax	bill before sales tax	10% tip	15% tip	20% tip
~~102.50~~	~~5.80~~	~~96.70~~	~~9.67~~	~~14.51~~	~~19.34~~
56.78	2.18	54.60	5.46	8.19	10.92

LAB 2-6 Debug

first number	second number	third number	sum	average
33	56	70	159	53

Answers to Chapter 3 Mini-Quizzes

Mini-Quiz 3-1

1. one
2. a. `salesTax`
3. d. `TAX_RATE`
4. variables and named constants

Mini-Quiz 3-2

1. a. True
2. b. 11011
3. 72, 01001000
4. d. both a and c

Mini-Quiz 3-3

1. a. '$'
2. d. all of the above
3. 3
4. `int population = 0;`
5. `const double INTEREST_RATE = 0.05;`
6. $5

Answers to Chapter 3 Labs

LAB 3-1 Stop and Analyze

1. The problem requires five memory locations.
2. The problem requires one named constant for the item cost. A named constant is appropriate because the item cost will always be $5.45. The remaining four input, processing, and output items require variables. Variables were chosen for these items so that their values can vary during runtime.

3.
```
int quantitySold = 0;
const double ITEM_COST = 5.45;
double sellingPrice = 0.0;
double difference = 0.0;
double profit = 0.0;
```

LAB 3-2 Plan and Create

No answer required.

LAB 3-3 Modify

The modifications made to Figures 3-18 and 3-21 are shaded.

Input
commission rate
sales amount

Processing
Processing items: none

Algorithm:
```
1. enter the commission rate and sales amount
2. calculate the commission by multiplying the
   sales amount by the commission rate
3. display the commission
```

Output
commission

IPO chart information	C++ instructions
Input	
commission rate	`double CommRate = 0.0;`
sales amount	`double sales = 0.0;`
Processing	
none	
Output	
commission	`double commission = 0.0;`

LAB 3-4 What's Missing?

The missing statement is shaded.

IPO chart information	C++ instructions
Input	
height	`double height = 0.0;`
radius	`double radius = 0.0;`
pi (3.14)	`const double PI = 3.14;`

Processing	
none	
Output	
volume	`double volume = 0.0;`

LAB 3-5 Desk-Check

Algorithm:

1. enter the height and radius
2. calculate the volume by multiplying the radius by itself, and then multiplying the result by pi, and then multiplying that result by the height
3. display the volume

height	radius	pi	volume
~~9~~	~~6~~	~~3.14~~	~~1017.36~~
17	15	3.14	12010.50

LAB 3-6 Debug

The modifications made to Figure 3-23 are shaded in the C++ instructions column.

IPO chart information	**C++ instructions**
Input	
first number	`double first = 0.0;`
second number	`double second = 0.0;`
third number	`double third = 0.0;`
Processing	
sum	`double sum = 0.0;`
Output	
average	`double average = 0.0;`

Answers to Chapter 4 Mini-Quizzes

Mini-Quiz 4-1

1. a. `cin >> population;`
2. d. `cout << quantity;`
3. d. all of the above
4. `<<`

Mini-Quiz 4-2

1. `totalDue = 2.5 * quantity;`
2. `totalDue = 2.5 * static_cast<double>(quantity);`
3. The expression will evaluate to 5.5. It should evaluate to 6. The expression evaluates incorrectly because dividing the integer 9 by the integer 2 results in the integer 4 rather than in the `double` number 4.5. Adding 1.5 to 4 results in the incorrect answer of 5.5.
4. You can use any of the following expressions. You can also use the `static_cast` operator to type cast at least one of the integers in the expression.

   ```
   9.0 / 2.0 + 1.5
   9.0 / 2 + 1.5
   9 / 2.0 + 1.5
   ```
5. `ordered -= 7;`

Mini-Quiz 4-3

1. syntax
2. source
3. braces

Answers to Chapter 4 Labs

LAB 4-1 Stop and Analyze

1.
   1. The `quantity` integer (10) is *implicitly* promoted to the `double` number 10.0.
   2. The result of Step 1 (10.0) is multiplied by the `double` number stored in the `itemCost` variable (5.35), giving 53.5.
   3. The integer 5 is *implicitly* promoted to the `double` number 5.0
   4. The result of Step 2 (53.5) is added to the result of Step 3 (5.0), giving 58.5.
   5. The result of Step 4 (58.5) is assigned to the `amountDue` variable. The value is correct.
2.
   1. The `total` integer (30) is divided by the integer 3, giving 10.
   2. The result of Step 1 (10) is assigned to the `total` variable. The value is correct.

3.

1. The integer 2 is implicitly promoted to the `double` number 2.0.
2. The result of Step 1 (2.0) is divided into the `double` number stored in the `store2Sales` variable (8325.72), giving 4162.86.
3. The result of Step 2 (4162.86) is added to the `double` number stored in the `store1Sales` variable (5678.43), giving 9841.29.
4. The result of Step 3 is assigned to the `avgSales` variable. The value is not correct. To fix the assignment statement, include parentheses around the addition operation, like this: `avgSales = (store1Sales + store2Sales) / 2;`

4.

1. The `midterm` integer (74) is added to the `final` integer (93), giving 167.
2. The result of Step 1 (167) is divided by 2, giving 83.
3. The result of Step 2 is assigned to the `average` variable. The value is not correct. Two ways you can fix the statement are shown here:

```
average = (midterm + final) / 2.0;
average = static_cast<double>(midterm + final) / 2;
```

LAB 4-2 Plan and Create

No answer required.

LAB 4-3 Modify

The modifications made to the Lab4-2.cpp file are shaded.

```
//Lab4-3.cpp - displays a salesperson's commission
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
  //declare variables
   double commRate   = 0.0;
   double sales      = 0.0;
   double commission = 0.0;

   //enter input items
   cout << "Sales amount: ";
```

```
    cin >> sales;
    cout << "Commission rate (in decimal form): ";
    cin >> commRate;

    //calculate and display the commission
    commission = sales * commRate;
    cout << "Commission: $"
         << commission << endl;

    return 0;
} //end of main function
```

LAB 4-4 What's Missing?

```
//Lab4-4.cpp - displays the volume of a cylinder
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
      const double PI = 3.14;
      double height   = 0.0;
      double radius   = 0.0;
      double volume   = 0.0;

      cout << "Height: ";
      cin >> height;
      cout << "Radius: ";
      cin >> radius;

      volume = PI * radius * radius * height;
      cout << "Volume: " << volume << endl;

      return 0;
} //end of main function
```

LAB 4-5 Desk-Check

num	result1	result2	result3
75	~~0~~	~~0~~	~~0.0~~
	1	37	37.5

LAB 4-6 Debug

To debug the program, you need to convert at least one of the items on the right side of the assignment operator to the `double` data type. For example, you can use any of the following:

```
area = base * height / 2.0;
area = static_cast<double>(base) * height / 2;
area = base * static_cast<double>(height) / 2;
area = static_cast<double>(base) * static_
cast<double>(height) / 2.0;
```

Answers to Chapter 5 Mini-Quizzes

Mini-Quiz 5-1

1. *end if*
2. b. False
3. a. diamond
4. b. single-alternative
5. a. dual-alternative

Mini-Quiz 5-2

1. a. braces
2. d. `if (age == 21)`
3. b. `if (price >= 12.75)`
4. c. `!=`
5. b. `>=`

Mini-Quiz 5-3

1. false
2. true
3. false
4. b. `if (age >= 30 && age <= 40)`
5. a. `if (code == 'R' || code == 'r')`

Mini-Quiz 5-4

1. d. `cout << fixed << setprecision(2);`
2. c. `letter = tolower(letter);`
3. d. 34.650000

Answers to Chapter 5 Labs

LAB 5-1 Stop and Analyze

1. The 0.2 rate will be assigned to the `rate` variable when the user enters either code 1 or code 3. The 0.15 rate will be assigned to the `rate` variable when the user enters one of the following codes: 2, 4, and 5.
2. The directive on Line 5 is necessary because the program uses the `setprecision` stream manipulator.
3. The literal constants on Line 19 are enclosed in single quotation marks because the `code` variable's data type is `char`.
4.
```
if (code != '1' && code != '3')
    rate = 0.15;
else
   rate = 0.2;
//end if
```
5. You can also write the statement on Line 26 as follows:
```
sales = sales * (1 + rate);
sales *= (1 + rate);
sales += (sales * rate);
```
6. To omit the `rate` variable from the program, you would need to remove the `double rate = 0.0;` and `sales = sales + sales * rate;` statements. You would also need to change the `rate = 0.2;` statement to `sales = sales + sales * 0.2;`, and change the `rate = 0.15;` statement to `sales = sales + sales * 0.15;`.

LAB 5-2 Plan and Create

No answer required.

LAB 5-3 Modify

The changes made to the original program are shaded in the following partial program.

```
int main()
{
    const double MEMBER_DISCOUNT_RATE = 0.1;
    const double NONMEMBER_DISCOUNT_RATE = 0.05;
    const double SHIP_CHG1 = 0.99;
    const double SHIP_CHG2 = 4.99;
    double amtOwed = 0.0;
    char member = ' ';
    double discount = 0.0;

    //enter input items
    cout << "Amount owed before any discount and shipping: ";
    cin >> amtOwed;
    cout << "Premier Club member (Y/N)? ";
    cin >> member;

    //subtract discount
    if (toupper(member) == 'Y')
        discount = amtOwed * MEMBER_DISCOUNT_RATE;
    else
        discount = amtOwed * NONMEMBER_DISCOUNT_RATE;
    //end if
    amtOwed -= discount;
```

LAB 5-4 What's Missing?

```
//Lab5-4.cpp - displays the total due for tickets
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

int main()
{
    const int TICKET_PRICE = 75;
    int tickets = 0;
    int total = 0;
    cout << "Number of tickets you want to purchase (the maximum
    is 10): ";
    cin >> tickets;
    if (tickets > 0 && tickets < 11)
    {
        total = tickets * TICKET_PRICE;
        cout << fixed << setprecision(0);
        cout << "Price: $" << total << endl;
    }
    else
        cout << "Invalid number of tickets." << endl;
    //end if

    return 0;
}    //end of main function
```

LAB 5-5 Desk-Check

quantity
~~0~~
~~5~~
~~0~~
0

When the user enters the number 0, the condition in the first `if` statement evaluates to true and the statement's true path displays the message "The quantity must be greater than 0." Although the correct message already appears on the screen, the computer still evaluates the second `if` statement's condition, which determines whether the quantity is greater than 0. The second evaluation is unnecessary and makes the code inefficient. You can fix the code by replacing the first `//end if` comment and the second `if` clause with an `else` clause.

LAB 5-6 Debug

To debug the program, change `if (code = '2')` to `if (code == '2')`.

Answers to Chapter 6 Mini-Quizzes

Mini-Quiz 6-1

1. c. in either an outer selection structure's false path or its true path

2.

```
1. shoot the basketball
2. if (the basketball did not go through the hoop)
        say "Missed it!"
        if (the basketball hit the rim)
            say "So close"
        end if
   else
        say "I did it!"
        if (Maleek was behind the 3-point line)
           say "3 points for me"
        else
            say "2 points for me"
        end if
   end if
```

3.

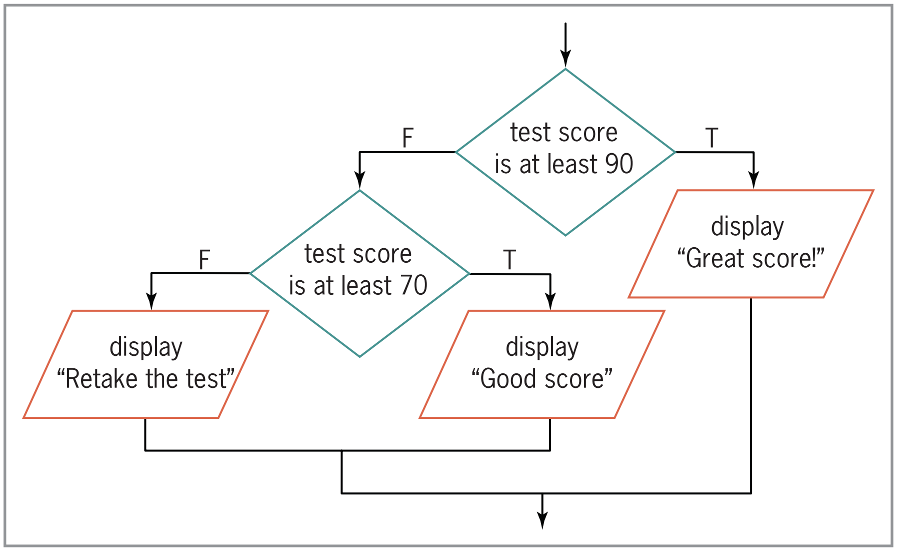
```
ask the store clerk whether the store accepts your credit card
if (the store accepts your credit card)
    pay for your items using your credit card
else
    ask the store clerk whether the store accepts your debit card
```

```
        if (the store accepts your debit card)
                pay for your items using your debit card
        else
                pay for your items using cash
        end if
end if
```

Mini-Quiz 6-2

1.
```
if (the test score is at least 90)
    display "Great score!"
else
    if (the test score is at least 70)
        display "Good score"
    else
        display "Retake the test"
    end if
end if
```

2.



3.
```
if (score >= 90)
     cout << "Great score!" << endl;
else
     if (score >= 70)
            cout << "Good score" << endl;
     else
            cout << "Retake the test" << endl;
     //end if
 //end if
```

4. a. membership status, day of the week

Mini-Quiz 6-3

1. Using a compound condition rather than a nested selection structure
   Reversing the decisions in the outer and nested selection structures
   Using an unnecessary nested selection structure
   Including an unnecessary comparison in a condition

2. Algorithm A in Figure 6-19 is inefficient because the nested selection structure is unnecessary. If the first selection structure's condition evaluates to false, it means that the basketball did *not* go through the hoop. Therefore, there is no need for a nested selection structure that determines whether the basketball did not go through the hoop.

3. Algorithm B in Figure 6-19 will not give you the same results as the algorithm shown in Figure 6-2. Algorithm B has Maleek saying "I did it!" and "3 points for me" even when the basketball does not go through the hoop.

4. Algorithm C in Figure 6-19 will give you the same results as the algorithm shown in Figure 6-2.

Mini-Quiz 6-4

1.
```
if (score >= 90)
  cout << "Great score!" << endl;
else if (score >= 70)
  cout << "Good score" << endl;
else if (score >= 0)
  cout << "Retake the test" << endl;
else
  cout << "Invalid test score" << endl;
//end if
```

2. b. `case 'B':`

3. `break`

Answers to Chapter 6 Labs

LAB 6-1 Stop and Analyze

1. The program will display the number 11.46 when the ID is the number 11.

2.
```
if (id == 1)
  price = 50.55;
else
   if (id == 2 || id == 9)
       price = 12.35;
   else
       if (id == 5 || id == 7 || id ==11)
           price = 11.46;
      else
```

```
            price = -1
        //end if
    //end if
//end if
```

3.
```
if (id == 1)
   price = 50.55;
else if (id == 2 || id == 9)
   price = 12.35;
else if (id == 5 || id == 7 || id == 11)
   price = 11.46;
else
   price = -1;
//end if
```

4.
```
switch (id)
{
case 1:
   price = 50.55;
   break;
case 2:
case 9:
   price = 12.35;
   break;
case 5:
case 7:
case 11:
   price = 11.46;
   break;
default:
   price = -1;
}  //end switch
```

5.
```
switch (id)
{
case 1:
   price = 50.55;
   cout << price << endl;
   break;
case 2:
case 9:
   price = 12.35;
   cout << price << endl;
   break;
case 5:
case 7:
case 11:
   price = 11.46;
   cout << price << endl;
   break;
default:
   cout << "Invalid ID" << endl;
}  //end switch
```

LAB 6-2 Plan and Create

No answer required.

LAB 6-3 Modify

```
//Lab6-3.cpp - displays the price of a pizza
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

int main()
{
     char size = ' ';
     char coupon = ' ';
     double price = 0.0;

     cout << "M(edium) or L(arge) pizza? ";
     cin >> size;
     size = toupper(size);

     if (size != 'M' && size != 'L')
          cout << "Please enter either M or L." << endl;
     else
     {
          if (size == 'M')
               price = 9.99;
          else
               //large pizza
               price = 12.99;
          //end if
          cout << "$2 coupon (Y/N)? ";
          cin >> coupon;
          if (toupper(coupon) == 'Y')
               price -= 2;
          //end if
          cout << fixed << setprecision(2);
          cout << "Price: $" << price << endl;
     } //end if

     return 0;
}   //end of main function
```

LAB 6-4 What's Missing?

```
//Lab6-4.cpp - displays the price of a ticket
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int age = 0;
    int price = 0;

    cout << "Age (years): ";
    cin >> age;

    if (age < 0)
        cout << "Invalid age" << endl;
    else
    {
        if (age > 64)
            price = 6;
        else if (age > 3)
            price = 9;
        else
            price = 0;
        //end if
        cout << "Price: $" << price << endl;
    }  //end if
    return 0;
}   //end of main function
```

LAB 6-5 Desk-Check

number
~~0~~
~~2~~
~~4~~
~~0~~
~~5~~
~~10~~
~~0~~
~~100~~
50

LAB 6-6 Debug

The modifications are shaded in the code.

```
//Lab6-6.cpp -displays the salary associated with a code
//Valid codes   Salary
//1             $45,000
//2, 5          $33,000
//3, 4          $25,000
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int code = 0;

    cout << "Enter the code (1 through 5): ";
    cin >> code;

    //display salary
    if (code == 1)
        cout << "$45,000" << endl;
    else if (code == 2 || code == 5)
        cout << "$33,000" << endl;
    else if (code == 3 || code == 4)
        cout << "$25,000" << endl;
    else
        cout << "Entry error" << endl;
    //end if
    return 0;
}   //end of main function
```

Answers to Chapter 7 Mini-Quizzes

Mini-Quiz 7-1

1.
```
1. print the first page
2. repeat while (there is another page to print)
        print the next page
   end repeat
   say "Done printing"
```

2.

```
1. print the first page
2. repeat while (there is another page to print)
          if (the next page is not page 3)
                print the next page
          end if
   end repeat
   say "Done printing"
```

3.

```
1. shoot the basketball
2. repeat while (the basketball did not go through the hoop)
        say "Missed it!"
        shoot the basketball
    end repeat
3. say "I did it!"
```

Mini-Quiz 7-2

1. `while (ordered > 100)`
2. `while (quantity >= 0)`
3. `while (inStock > reorder)`
4. `while (toupper(letter) == 'Y')` [You can also use `while (tolower(letter) == 'y')` or `while (letter == 'Y' || letter == 'y')`.]
5. a. –9

Mini-Quiz 7-3

1. b. counter
2. `quantity += 10;` (or `quantity = quantity + 10;`)
3. `total -= 5;` (or `total = total - 5;` or `total += -5;` or `total = total + -5;`)
4. `totalPurchases += purchases;` (or `totalPurchases = totalPurchases + purchases;`)

Mini-Quiz 7-4

1.
```
while (evenNum < 9)
{
    cout << evenNum << endl;
    evenNum += 2;      (or evenNum = evenNum + 2;)
}  //end while
```

2. a. `for (int x = 10; x <= 100; x = x + 10)`

3. d. 110

4. `for (int x = 25; x > 0; x = x - 5)` (You can also use `x -= 5`, `x += -5`, or `x = x + -5` as the *update* argument.)

5. 0

6. `for (int num = 2; num < 9; num += 2)` (You can also use `num = num + 2` as the *update* argument.)

Answers to Chapter 7 Labs

LAB 7-1 Stop and Analyze

1. The program's counter and accumulator variables are named `day` and `totalTexts`, respectively.

2. The `for` clause's *condition* argument can also be phrased as `day <= 7`.

3. The `for` statement's counter variable is declared at the beginning of the program because it needs to be used after the `for` loop ends. More specifically, it needs to be used by the statement on Line 24, which calculates the average number of text messages.

4. The average number of text messages is 74.

day	dailyTexts	totalTexts	average
~~0~~	~~0~~	~~0~~	~~0.0~~
~~1~~	~~76~~	~~76~~	74.0
~~2~~	~~80~~	~~156~~	
~~3~~	~~100~~	~~256~~	
~~4~~	~~43~~	~~299~~	
~~5~~	~~68~~	~~367~~	
~~6~~	~~70~~	~~437~~	
~~7~~	79	516	
8			

5. The program displays 74.

6. The build or compile operation was not successful because the compiler does not recognize the `day` variable used in Line 24. When the `for` loop ended, that variable was removed from the computer's internal memory.

8. The program does not work correctly because it prompts the user to enter the number of text messages for days from 0 through 7, rather than from 1 through 7. To fix the program change the `day` variable's declaration statement to `int day = 1;`.

LAB 7-2 Plan and Create

No answer required.

LAB 7-3 Modify

```
//Lab7-3.cpp - calculates the average number of text
//messages sent each day for 7 days
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

int main()
{
     int day = 1;
     int totalTexts = 0;
     int dailyTexts = 0;
     double average = 0.0;

     while (day < 8)
     {
           cout << "How many text messages did you send on day "
                 << day << "? ";
           cin >> dailyTexts;
           totalTexts += dailyTexts;
           day += 1;
     } //end while

     average = static_cast<double>(totalTexts) / (day - 1);
     cout << fixed << setprecision(0);
     cout << endl << "You sent approximately "
                << average << " text messages per day." << endl;
    return 0;
}   //end of main function
```

LAB 7-4 What's Missing?

```
//Lab7-4.cpp - displays the average electric bill
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

int main()
{
        double bill = 0.0;
        double totalBills = 0.0;
        double avgBill = 0.0;
        int months = 0;

        cout << "Bill for month 1: ";
        cin >> bill;
        while (bill >= 0.0)
        {
                totalBills += bill;
                months += 1;
                cout << "Bill for month " << months + 1 << ": ";
                cin >> bill;
        }  //end while

        if (months > 0)
        {
                avgBill = totalBills / months;
                cout << fixed << setprecision(2);
                cout << "Average electric bill for " << months
                        << " months: $" << avgBill << endl;
        }
        else
                cout << "No bill amount entered." << endl;
        //end if
        return 0;
}       //end of main function
```

LAB 7-5 Desk-Check

The original code contains an error because it will not display the number 12. To correct the code, change the for statement's condition to `number <= 12`.

First desk-check:	Corrected desk-check:
number	number
~~2~~	~~2~~
~~4~~	~~4~~
~~6~~	~~6~~
~~8~~	~~8~~
~~10~~	~~10~~
12	~~12~~
	14

LAB 7-6 Debug

To debug the program, enter a `cin >> price;` statement below the `cout << "Next price: ";` statement.

Answers to Chapter 8 Mini-Quizzes

Mini-Quiz 8-1

1. The condition will be evaluated four times. The algorithm will display the numbers 5, 8, and 9, followed by the word Done.
2. The condition will be evaluated once. The algorithm will display the word Done.
3. The condition will be evaluated three times. The algorithm will display the numbers 5, 8, and 9, followed by the word Done.
4. The condition will be evaluated once. The algorithm will display the number 0 followed by the word Done.

Mini-Quiz 8-2

1. a. `do`
2. d. semicolon
3. `} while (ordered <= inventory);`
4. `} while (toupper(letter) == 'Y');`

Mini-Quiz 8-3

1. b. False
2. b. nested, outer
3. a. outer, nested

Answers to Chapter 8 Labs

LAB 8-1 Stop and Analyze

1. The program contains three loops. Two of the loops are nested.
2. Desk-check:

maxRows	row	space	asterisk
~~0~~	~~0~~	~~0~~	~~0~~
3	~~1~~	~~1~~	~~1~~
	~~2~~	~~2~~	~~0~~
	3	~~3~~	~~1~~
		~~0~~	~~2~~
		~~1~~	~~0~~
		~~2~~	~~1~~
		~~0~~	~~2~~
		1	3

The program will display the following pattern of asterisks:

```
  *
 * *
* * *
```

3. The program displays the pattern of asterisks shown above.
4. The program displays the following pattern of asterisks:

```
         *
        * *
       * * *
      * * * *
     * * * * *
    * * * * * *
   * * * * * * *
  * * * * * * * *
 * * * * * * * * *
* * * * * * * * * *
```

5.

```
//Lab8-1.cpp
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int maxRows = 0;
    int row = 0;

    cout << "Maximum number of rows: ";
    cin >> maxRows;

    while (row < maxRows)
    {
        for (int space = 0; space < maxRows - row; space += 1)
            cout << " ";
        //end for
        for (int asterisk = 0; asterisk <= row; asterisk += 1)
            cout << "* ";
        //end for

        cout << endl;
        row += 1;
    }  //end while
    return 0;
}    //end of main function
```

LAB 8-2 Plan and Create

No answer required.

LAB 8-3 Modify

```
//Lab8-3.cpp - displays a person's total
//earnings before retirement at age 65,
//using annual raise rates of 3%, 4%, and 5%
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

int main()
{
    int age = 0;
    int currentSalary = 0;
    int yearsToRetire = 0;
    double newSalary = 0.0;
    double total = 0.0;
    double rate = 0.0;

    cout << fixed << setprecision(0);

    cout << "Current age in years (1 to 64): ";
    cin >> age;

    if (age < 1 || age > 64)
        cout << "Please enter an age from 1 to 64." << endl;
    else
    {
        cout << "Current salary as a whole number: ";
        cin >> currentSalary;
        cout << endl;

        yearsToRetire = 65 - age;
        rate = 0.03;
        do
        {
            newSalary = currentSalary;  //year 1 salary
            total = currentSalary;      //year 1 salary
            for (int year = 2; year <= yearsToRetire; year += 1)
            {
                newSalary *= (1 + rate);
                total += newSalary;
            } //end for
            cout << "Total with a " << rate * 100
                << "% annual raise: $" << total << endl;
            rate += 0.01;
        } while (rate < 0.06);
    }  //end if
    return 0;
}    //end of main function
```

LAB 8-4 What's Missing?

```
//Lab8-4.cpp - displays a pattern of numbers
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int maxRows = 0;
    cout << "How many rows? ";
    cin >> maxRows;

    for (int row = 1; row <= maxRows; row += 1)
    {
        for (int col = 1; col <= row; col += 1)
            cout << col;
        //end for
        cout << endl;
    } //end for
    return 0;
}    //end of main function
```

LAB 8-5 Desk-Check

Desk-check:

sumX	sumY	x	y
~~0~~	~~0~~	~~2~~	~~1~~
~~2~~	~~1~~	~~4~~	~~3~~
~~6~~	~~4~~	~~6~~	~~5~~
12	~~5~~	8	~~1~~
	~~8~~		~~3~~
	~~9~~		~~5~~
	12		~~1~~
			~~3~~
			5

The program will display the following:

```
sumX value: 12
sumY value: 12
```

When the outer loop ends, the `x` variable contains the number 8. When the nested loop ends, the `y` variable contains the number 5.

LAB 8-6 Debug

To debug the program, cut the `month += 1;` statement from the nested loop and paste it below the `cout << endl;` statement in the outer loop. Also, change the `totalSales += totalSales + sales;` statement to either `totalSales = totalSales + sales;` or `totalSales += sales;`.

Answers to Chapter 9 Mini-Quizzes

Mini-Quiz 9-1

1. b. `sqrt(16.0)`
2. c. `25 + rand() % (50 - 25 + 1)`
3. d. none of the above
4. a. `#include <ctime>`

Mini-Quiz 9-2

1. d. all of the above
2. a. `double getArea()`
3. `double getGrossPay(int hours, double rate)`
4. `return gross;`

Mini-Quiz 9-3

1. b. `area = getArea();`
2. c. `double getArea();`
3. `cout << getArea();`
4. `double getGrossPay(int hours, double rate);` or `double getGrossPay (int, double);`
5. `weekGross = getGrossPay(40, payRate);`

Answers to Chapter 9 Labs

LAB 9-1 Stop and Analyze

1. The statements on Lines 9 and 10 are function prototypes, and they are necessary because the `getArea` and `getDiameter` functions are defined below the `main` function.
2. The statement on Line 9 could also be written as follows: `double getArea(double);`.
3. Without the outer selection structure, the program will display the following: Diameter: 20.
4. The scope of the `choice` and `radius` variables is the `main` function (Lines 17 through 36). The lifetime is the same as the `main` function's lifetime, which means that the variables will be removed from the computer's memory when the `main` function ends.
5. The scope of the `rad` variable used in the `getArea` function is the function itself (Lines 40 through 45). Its lifetime is the same as the `getArea` function's lifetime, which means it will be removed from the computer's memory when the function ends.
6. The scope of the `PI` constant and the `area` variable is the `getArea` function (Lines 43 through 45). Their lifetime is the same as the `getArea` function's lifetime, which means they will be removed from the computer's memory when the function ends.
7. The scope of the `rad` variable used in the `getDiameter` function is the function itself (Lines 48 through 50). Its lifetime is the same as the `getDiameter` function's lifetime, which means it will be removed from the computer's memory when the function ends.

9.
```
//Lab9-1.cpp - circle calculations
//Created/revised by <your name> on <current date>

#include <iostream>
#include <cmath>
using namespace std;

//function prototypes
double getArea(double rad);
double getDiameter(double rad);
double getCircumference(double rad);
```

```
int main()
{
    int choice = 0;
    double radius = 0.0;

    cout << "1   Circle area" << endl;
    cout << "2   Circle diameter" << endl;
    cout << "3   Circle circumference" << endl;
    cout << "Enter your choice (1, 2, or 3): ";
    cin >> choice;

    if (choice < 1 || choice > 3)
        cout << "Invalid choice" << endl;
    else
    {
        cout << "Radius: ";
        cin >> radius;
        if (choice == 1)
            cout << "Area: " << getArea(radius);
        else if (choice == 2)
            cout << "Diameter: " << getDiameter(radius);
        else
            cout << "Circumference: " << getCircumference(radius);
        //end if
        cout << endl;
    }  //end if
    return 0;
}   //end of main function

    //*****function definitions*****
double getArea(double rad)
{
    const double PI = 3.141593;
    double area = 0.0;
    area = PI * pow(rad, 2);
    return area;
}  //end getArea function

double getDiameter(double rad)
{
    return 2 * rad;
}  //end getDiameter function

double getCircumference(double rad)
{
    const double PI = 3.141593;
    double circumference = 0.0;
    circumference = 2 * PI * rad;
    return circumference;
}  //end getCircumference function
```

LAB 9-2 Plan and Create

No answer required.

LAB 9-3 Modify

```
//Lab9-3.cpp - displays two monthly car payments
//Created/revised by <your name> on <current date>

#include <iostream>
#include <cmath>
#include <iomanip>
using namespace std;

//function prototype
double getPayment(int, double, int);

int main()
{
    int carPrice = 0;
    int rebate = 0;
    double creditRate = 0.0;
    double dealerRate = 0.0;
    int term = 0;
    double creditPayment = 0.0;
    double dealerPayment = 0.0;
    char another = 'Y';

    while (another == 'Y')
    {
        cout << "Car price (after any trade-in): ";
        cin >> carPrice;
        cout << "Rebate: ";
        cin >> rebate;
        cout << "Credit union rate: ";
        cin >> creditRate;
        cout << "Dealer rate: ";
        cin >> dealerRate;
        cout << "Term in years: ";
        cin >> term;

        if (creditRate >= 1)
            creditRate /= 100;
        //end if
        if (dealerRate >= 1)
            dealerRate /= 100;
        //end if
        //call function to calculate payments
        creditPayment = getPayment(carPrice - rebate,
            creditRate / 12, term * 12);
        dealerPayment = getPayment(carPrice,
            dealerRate / 12, term * 12);

        //display payments
        cout << fixed << setprecision(2) << endl;
        cout << "Credit union payment: $"
            << creditPayment << endl;
        cout << "Dealer payment: $"
            << dealerPayment << endl;

        if (creditPayment < dealerPayment)
            cout << "Take the rebate and finance through the credit union.";
        else if (creditPayment > dealerPayment)
            cout << "Don't take the rebate. Finance through the dealer.";
        else
            cout << "You can finance through the dealer or the credit union.";
        //end if
        cout << endl;

        cout << "Calculate another set of payments (Y/N)?";
        cin >> another;
        another = toupper(another);
    } //end while

    return 0;
}    //end of main function

//*****function definitions*****
double getPayment(int prin,
                  double monthRate,
                  int months)
{
    //calculates and returns a monthly payment
    double monthPay = 0.0;
    monthPay = prin * monthRate /
        (1 - pow(monthRate + 1, -months));
    return monthPay;
}    //end of getPayment function
```

LAB 9-4 What’s Missing?

```
//Lab9-4.cpp - displays total due
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

double getSalesTax(double subTotal);

int main()
{
    int quantity = 0;
    double itemPrice = 0.0;
    double totalBeforeTax = 0.0;
    double totalDue = 0.0;

    cout << "Quantity: ";
    cin >> quantity;
    cout << "Item price: ";
    cin >> itemPrice;

    totalBeforeTax = quantity * itemPrice;
    totalDue = totalBeforeTax + getSalesTax(totalBeforeTax);

    cout << fixed << setprecision(2) << endl;
    cout << "Total due: $" << totalDue << endl;
    return 0;
} //end of main function

//*****function definitions*****
double getSalesTax(double subtotal)
{
    const double TAX_RATE = 0.1;
    double tax = 0.0;
    tax = subtotal * TAX_RATE;
    return tax;
} //end of getSalesTax function
```

LAB 9-5 Desk-Check

Desk-check:

currentTotal	number	x	current	num
~~0~~	~~0~~	~~1~~	~~100~~	~~4~~
~~100~~	~~4~~	~~2~~	~~116~~	~~-3~~
~~116~~	~~-3~~	~~3~~	~~116~~	~~10~~
~~110~~	~~10~~	~~4~~	~~110~~	~~9~~
~~210~~	~~9~~	~~5~~	~~110~~	-5
~~291~~	-5	6	~~210~~	
281			~~210~~	
			~~291~~	
			~~291~~	
			281	

The code will display 281 as the current total.

LAB 9-6 Debug

To debug the program, change the statement that calls the `getDepreciation` function to `depreciation = getDepreciation(cost, salvage, lifeYears);`.

Answers to Chapter 10 Mini-Quizzes

Mini-Quiz 10-1

1. `void`
2. `displayTaxes(federalTax, localTax);`
3. `void displayTaxes(double fedTax, double stateTax)`
4. b. False

Mini-Quiz 10-2

1. `void calcTaxes(double pay, double &fedTax, double &stateTax)`
2. `calcTaxes(gross, federal, state);`
3. `void calcTaxes(double pay, double &fedTax, double &stateTax);` or `void calcTaxes(double, double &, double &)`
4. b. False

Answers to Chapter 10 Labs

LAB 10-1 Stop and Analyze

1. Lines 10 and 52 indicate whether the variables are passed *by value* or *by reference* to the **getArea** function.

2. The **radius** variable is passed *by value* because the receiving functions need to know its value but do not need to change its contents. The **circleArea** and **circleDiameter** variables are passed *by reference* because the receiving functions need to store values (either the area or the diameter) inside the variables.

3. The **displayChoices** function is a void function because it does not need to return a value after completing its task.

4. The **getArea** and **getDiameter** functions use the variables that are passed *by reference* to send information back to the **main** function.

5.
```
//Lab10-1.cpp - circle calculations
//Created/revised by <your name> on <current date>

#include <iostream>
#include <cmath>
using namespace std;

//function prototypes
void displayChoices();
double getArea(double rad);
void getDiameter(double rad, double &diameter);

int main()
{
    int choice = 0;
    double radius = 0.0;
    double circleArea = 0.0;
    double circleDiameter = 0.0;

    displayChoices();
    cout << "Enter your choice (1 or 2): ";
    cin >> choice;

    if (choice < 1 || choice > 2)
        cout << "Invalid choice" << endl;
    else
    {
        cout << "Radius: ";
        cin >> radius;
        if (choice == 1)
        {
            circleArea = getArea(radius);
            cout << "Area: " << circleArea;
        }
        else
        {
            getDiameter(radius, circleDiameter);
            cout << "Diameter: " << circleDiameter;
        } //end if
        cout << endl;
    }  //end if
    return 0;
}   //end of main function

    //*****function definitions*****
void displayChoices()
{
    cout << "1   Circle area" << endl;
    cout << "2   Circle diameter" << endl;
}  //end displayChoices

double getArea(double rad)
{
    const double PI = 3.141593;
    double area = 0.0;

    area = PI * pow(rad, 2);
    return area;
}  //end getArea function

void getDiameter(double rad, double &diameter)
{
    diameter = 2 * rad;
}  //end getDiameter function
```

LAB 10-2 Plan and Create

No answer required.

LAB 10-3 Modify

```
//Lab10-3.cpp - displays total owed
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;
```

```
        //function prototypes
        void displayOptions();
        double getRegular(int windows, double price);
        double getBoGo(int windows, double price);

        int main()
        {
            int option = 0;
            int numOrdered = 0;
            double winPrice = 0.0;
            double totalOwed = 0.0;

            cout << fixed << setprecision(2);

            displayOptions();
            cout << "Pricing option? ";
            cin >> option;

            if (option == 1 || option == 2)
            {
                cout << "Number of windows: ";
                cin >> numOrdered;
                cout << "Price per window: ";
                cin >> winPrice;

                if (option == 1)
                    totalOwed = getRegular(numOrdered, winPrice);
                else
                    totalOwed = getBoGo(numOrdered, winPrice);
                //end if

                cout << "Total owed-----> $" << totalOwed << endl << endl;
            }
            else
                cout << "Invalid option" << endl;
            //end if

            return 0;
}   //end of main function

//*****function definitions*****
void displayOptions()
{
    cout << "Pricing options:" << endl;
    cout << "1   Regular pricing" << endl;
    cout << "2   BOGO pricing" << endl;
}  //end displayOptions
```

```
double getRegular(int windows, double price)
{
    double total = 0.0;
    total = windows * price;
    return total;
}  //end getRegular function

double getBoGo(int windows, double price)
{
    double total = 0.0;
    total = (windows / 2 + windows % 2) * price;
    return total;
}  //end getBoGo function
```

LAB 10-4 What's Missing?

```
//Lab10-4.cpp - displays the raise and new salary
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

//function prototypes
void getRaise(double current, double rate, double &increase);
void getNewPay(double current, double increase, double &newPay);

int main()
{
    double currentSalary = 0.0;
    double raiseRate = 0.0;
    double raise = 0.0;
    double newSalary = 0.0;

    cout << "Current salary: ";
    cin >> currentSalary;
    cout << "Raise rate (in decimal form): ";
    cin >> raiseRate;

    //get the raise and new salary
    getRaise(currentSalary, raiseRate, raise);
    getNewPay(currentSalary, raise, newSalary);

    //display the raise and new salary
    cout << fixed << setprecision(2);
    cout << "Raise: $" << raise << endl;
    cout << "New salary: $" << newSalary << endl;
    return 0;
}     //end of main function
```

```
//*****function definitions*****
void getRaise(double current, double rate, double &increase)
{
    increase = current * rate;
}    //end of getRaise function

void getNewPay(double current, double increase, double &newPay)
{
    newPay = current + increase;
}  //end of getNewPay function
```

LAB 10-5 Desk-Check

The names in black indicate variables that belong to the `main` function. The names in red indicate variables that belong to the `getSquare` function. The names in blue indicate variables that belong to the `getCube` function. The program will display "The sum is: 50".

~~cubeAnswer~~ ~~sqAnswer~~ sum	number	num	num
~~0~~	~~1~~	~~1~~	~~1~~
~~1~~	~~2~~	~~2~~	~~2~~
~~2~~	~~3~~	3	3
~~6~~	4		
~~14~~			
~~23~~			
50			

LAB 10-6 Debug

To debug the program, change the function prototype to either `void assignGrade(int pointsEarned, char &letter);` or `void assignGrade(int, char &);` and change the function header to `void assignGrade(int pointsEarned, char &letter)`. Also change the function call to `assignGrade(totalPoints, grade);`.

Answers to Chapter 11 Mini-Quizzes

Mini-Quiz 11-1

1. a. `int quantities[20] = {0};`
2. `quantities[0]`
3. `quantities[19]`
4. `quantities[3] = 7;`
5. c. `total = getTotal(quantities, 20);`

Mini-Quiz 11-2

1. c. `total += orders[2];`
2. c. `if (orders[3] > 25)`
3. `bonus = sales[0] * 0.15;`
4. c. `if (sub >= 0 && sub < 10)`
5. a. `while (x < 20)`

Mini-Quiz 11-3

1. `if (prices[x] < lowest)`
2. sorting
3.
   ```
   for (int x = 0; x < 10; x += 1)
         orders[x] -= 3;
   //end for
   ```

Answers to Chapter 11 Labs

LAB 11-1 Stop and Analyze

1. The `domestic` and `international` arrays are parallel arrays because the elements in one array are related by their subscripts to the elements in the other array. For example, the first element in both arrays contains the sales made in January; the second element contains the February sales, and so on.
2. The `domestic[1]` element contains 30200.
3. The total company sales made in February can be calculated by adding the contents of the `domestic[1]` element to the contents of the `international[1]` element.

4. The highest subscript in the `international` array is 5.

5. The assignment statement would need to be changed to `totalSales += domestic[x - 1] + international[x - 1];`.

6. No answer required.

7.
```
//Lab11-1.cpp - calculates the total sales
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int domestic[6] = {75000, 30200, 67800,
                       45000, 60000, 67500};
    int international[6] = {40000, 75000, 64000,
                            32600, 47800, 39000};
    int totalDomestic = 0;
    int totalInternational = 0;
    int totalSales = 0;

    for (int x = 0; x < 6; x += 1)
    {
        totalDomestic += domestic[x];
        totalInternational += international[x];
    }  //end for
    totalSales = totalDomestic + totalInternational;

    //display total domestic sales, total international
    //sales, and total sales
    cout << "Total domestic sales: $"
        << totalDomestic << endl;
    cout << "Total international sales: $"
        << totalInternational << endl;
    cout << "Total sales: $" << totalSales << endl;
    return 0;
}   //end of main function
```

8.
```
//Lab11-1.cpp - calculates the total sales
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int domestic[6] = {75000, 30200, 67800,
                       45000, 60000, 67500};
    int international[6] = {40000, 75000, 64000,
                            32600, 47800, 39000};
    int monthSales[6] = {0};

    int totalDomestic = 0;
    int totalInternational = 0;
    int totalSales = 0;

    for (int x = 0; x < 6; x += 1)
    {
        totalDomestic += domestic[x];
        totalInternational += international[x];
        monthSales[x] = domestic[x] + international[x];
    }  //end for
    totalSales = totalDomestic + totalInternational;

    //display total domestic sales, total international
    //sales, and total sales
    cout << "Total domestic sales: $"
        << totalDomestic << endl;
    cout << "Total international sales: $"
        << totalInternational << endl;
    cout << "Total sales: $" << totalSales << endl << endl;

    //display total sales made in each month
    for (int x = 0; x < 6; x += 1)
    {
        cout << "Month " << x + 1 << " sales: $"
            << monthSales[x] << endl;
    }  //end for
    return 0;
}   //end of main function
```

LAB 11-2 Plan and Create

No answer required.

LAB 11-3 Modify

```
//Lab11-3.cpp - stores finish times in an array
//and displays the average and lowest times
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;
```

```
//function prototypes
void getAverage(double times[], int numElements, double &avg);
void getLowest(double times[], int numElements, double &lowest);

int main()
{
    double finishTimes[5] = {0.0};
    double avgTime = 0.0;
    double lowestTime = 0.0;

    //enter finish times
    for (int x = 0; x < 5; x += 1)
    {
        cout << "Time for race " << x + 1 << ": ";
        cin >> finishTimes[x];
    }  //end for

    getAverage(finishTimes, 5, avgTime);
    getLowest(finishTimes, 5, lowestTime);

    cout << fixed << setprecision(1) << endl;
    cout << "Average 5K finish time: " << avgTime << endl;
    cout << "Lowest 5K finish time: " << lowestTime << endl;
    return 0;
}   //end of main function

//*****function definitions*****
void getAverage(double times[], int numElements, double &avg)
{
    double total = 0.0;

    for (int x = 0; x < numElements; x += 1)
        total += times[x];
    //end for
    avg = total / numElements;
}  //end of getAverage function

void getLowest(double times[], int numElements, double &lowest)
{
    lowest = times[0];
    for (int x = 1; x < numElements; x += 1)
        if (times[x] < lowest)
            lowest = times[x];
        //end if
    //end for
}  //end of getLowest function
```

LAB 11-4 What's Missing?

```
//Lab11-4.cpp - Displays the average stock price
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

//function prototype
double getTotal(double prices[], int numElements);

int main()
{
    double stockPrices[10] = {35.6, 37.8, 39, 38.9, 38.9,
                              37.8, 37.8, 37.8, 39, 39.5};
    double total = 0.0;
    double average = 0.0;

    total = getTotal(stockPrices, 10);
    average = total / 10;
    cout << fixed << setprecision(2);
    cout << "Average stock price: $" << average << endl;
    return 0;
}     //end of main function

//*****function definitions*****
double getTotal(double prices[], int numElements)
{
    double sumPrices = 0.0;
    for (int sub = 0; sub < numElements; sub += 1)
        sumPrices += prices[sub];
    //end for
    return sumPrices;
}   //end of getTotal function
```

LAB 11-5 Desk-Check

Desk-check:

midterms[0]	midterms[1]	midterms[2]	midterms[3]	midterms[4]
~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
90.0	88.0	77.0	85.0	45.0

finals[0]	finals[1]	finals[2]	finals[3]	finals[4]
~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
100.0	68.0	75.0	85.0	32.0

averages[0]	averages[1]	averages[2]	averages[3]	averages[4]
~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~
95.0	78.0	76.0	85.0	38.5

x	y
~~0~~	~~0~~
~~1~~	~~1~~
~~2~~	~~2~~
~~3~~	~~3~~
~~4~~	~~4~~
5	5

The `for` loop will display the following:

```
Student 1 average: 95
Student 2 average: 78
Student 3 average: 76
Student 4 average: 85
Student 5 average: 38.5
```

LAB 11-6 Debug

To debug the program, change the condition in the `for` clause to `x < 10`. Also change the `increase += quantities[x];` statement in the `for` loop to `quantities[x] += increase;`.

Answers to Chapter 12 Mini-Quizzes

Mini-Quiz 12-1

1. a. `int quantities[6][3] = {0};`
2. 18
3. `quantities[0][0]`
4. `quantities[5][2]`
5. `quantities[1][0] = 20;`

Mini-Quiz 12-2

1. c. `total += purchases[2][1];`
2. c. `if (scores[1][2] > 25)`
3. `bonus = sales[0][1] * 0.15;`
4. a. `if (row >= 0 && row < 10)`

Answers to Chapter 12 Labs

LAB 12-1 Stop and Analyze

1. 39000
2. The total company sales made in February can be calculated by adding the contents of the `company[0][1]` element to the contents of the `company[1][1]` element.
3. The highest row subscript in the `company` array is 1. The highest column subscript is 5.
4. The January international sales are stored in the `company[1][0]` element.
5. The assignment statement would need to be changed to `companySales += company[location][month - 1];`.
6. No answer required.
7.

```
//Lab12-1.cpp - calculates the total company sales
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int company[2][6] = {{75000, 30200, 67800,
                          45000, 60000, 67500},
                         {40000, 75000, 64000,
                          32600, 47800, 39000}};
    int companySales = 0;
    int domesticSales = 0;
    int internationalSales = 0;

    for (int month = 0; month < 6; month += 1)
    {
        domesticSales += company[0][month];
        internationalSales += company[1][month];
    }   //end for
    companySales = domesticSales + internationalSales;
    cout << "Domestic sales: $" << domesticSales << endl;
    cout << "International sales: $" << internationalSales << endl;
    cout << "Company sales: $" << companySales << endl;
    return 0;
}   //end of main function
```

8.

```
//Lab12-1.cpp - calculates the total company sales
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int company[2][6] = {{75000, 30200, 67800,
                          45000, 60000, 67500},
                         {40000, 75000, 64000,
                          32600, 47800, 39000}};
    int monthSales[6] = { 0 };
    int companySales = 0;
    int domesticSales = 0;
    int internationalSales = 0;

    for (int month = 0; month < 6; month += 1)
    {
        domesticSales += company[0][month];
        internationalSales += company[1][month];
        monthSales[month] = company[0][month] + company[1][month];
    }  //end for
    companySales = domesticSales + internationalSales;

    cout << "Domestic sales: $" << domesticSales << endl;
    cout << "International sales: $" << internationalSales << endl;
    cout << "Company sales: $" << companySales << endl;

    for (int x = 0; x < 6; x += 1)
        cout << "Month " << x + 1 << " sales: $"
            << monthSales[x] << endl;
    //end for
    return 0;
}   //end of main function
```

LAB 12-2 Plan and Create

No answer required.

LAB 12-3 Modify

```
//Lab12-3.cpp - displays the shipping charge
//Created/revised by <your name> on <current date>

#include <iostream>
using namespace std;

int main()
{
    int shipCharges[3][2] = {{101, 0},
                             {51, 10},
                             {1, 20}};
    int numOrdered = 0;
    int rowSub = 0;

    cout << "Number ordered " <<
        "(negative number or 0 to end): ";
    cin >> numOrdered;

    while (numOrdered > 0 && numOrdered <= 999999)
    {
        //search array
        rowSub = 0;
        while (rowSub < 3 && numOrdered < shipCharges[rowSub][0])
                rowSub += 1;
        //end while

        cout << "Shipping charge for a quantity of "
            << numOrdered << " is $"
            << shipCharges[rowSub][1] << endl << endl;

        cout << "Number ordered " <<
            "(negative number or 0 to end): ";
        cin >> numOrdered;
    }    //end while
    return 0;
}    //end of main function
```

LAB 12-4 What's Missing?

```
//Lab12-4.cpp - Displays the average stock price
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
using namespace std;

//function prototype
double getTotal(double prices[2][5]);
```

```
int main()
{
    double stockPrices[2][5] = {{35.6, 37.8, 39, 38.9, 38.9},
                                {37.8, 37.8, 37.8, 39, 39.5}};
    double total = 0.0;
    double average = 0.0;

    total = getTotal(stockPrices);
    average = total / 10;
    cout << fixed << setprecision(2);
    cout << "Average stock price: $" << average << endl;
    return 0;
}    //end of main function

//*****function definitions*****
double getTotal(double prices[2][5])
{
    double sumPrices = 0.0;
    for (int row = 0; row < 2; row += 1)
        for (int col = 0; col < 5; col += 1)
            sumPrices += prices[row][col];
        //end for
    //end for
    return sumPrices;
}  //end of getTotal function
```

LAB 12-5 Desk-Check

sales[0][0]	sales[0][1]
3567.85	2589.99

sales[1][0]	sales[1][1]
3239.67	2785.55

sales[2][0]	sales[2][1]
1530.5	1445.8

total	store	book
~~0.0~~	~~0~~	~~0~~
~~3567.85~~	~~1~~	~~1~~
~~6157.84~~	~~2~~	~~2~~
~~9397.51~~	3	~~0~~
~~12183.06~~		~~1~~
~~13713.56~~		~~2~~
15159.36		~~0~~
		~~1~~
		2

LAB 12-6 Debug

To debug the program, change the `numbers[row][0] = counter * counter;` statement in the first `for` loop to `numbers[row][1] = counter * counter;`, and then enter the `counter += 1;` (or `counter = counter + 1;`) statement below the `numbers[row][1] = counter * counter;` statement.

Answers to Chapter 13 Mini-Quizzes

Mini-Quiz 13-1

1. c. `const string CITY = "Fort Knox";`
2. b. `string state = "";`
3. a. `getline(cin, streetAddress, '\n');`
4. c. `cin.ignore(10, '\n');`

Mini-Quiz 13-2

1. a. `while (employee.length() > 20)`
2. `if (code.length() == 7)`
3. d. both a and b
4. `cout << college.substr(college.length() – 1);`

Mini-Quiz 13-3

1. a. `location = cityState.find(",", 0);`
2. 13
3. d. all of the above

Mini-Quiz 13-4

1. d. none of the above
2. a. `sentence = sentence + temp.assign(4, '!');`
3. b. `areaCode = "(" + areaCode + ")";`

Answers to Chapter 13 Labs

LAB 13-1 Stop and Analyze

1. The purpose of the loop on Lines 20 through 33 is to access each character in the `sales` variable, one character at a time, in order to count the number of number of numbers, periods, and other characters.
2. The statement on Line 22 assigns the current character from the `sales` variable to the `currentChar` variable.
3. The selection structure on Lines 35 through 39 determines whether the sales amount entered by the user is either valid or invalid. An invalid sales amount is one that either contains more than one period or contains at least one character that is either not a number and not a period.
4. The statement on Line 32 allows the program to access the next character in the `sales` variable.
5. No answer required.
6.

```
//Lab13-1.cpp
//Created/revised by <your name> on <current date>

#include <iostream>
#include <string>
using namespace std;

int main()
{
    string sales = "";
    string currentChar = "";
    string otherChars = "";
    int numNumbers = 0;
    int numPeriods = 0;
    int numOtherChars = 0;

    cout << "Sales amount: ";
    getline(cin, sales);

    for (int sub = 0; sub < sales.length(); sub += 1)
    {
        currentChar = sales.substr(sub, 1);
        if (currentChar == ".")
            numPeriods += 1;
        else
            if (currentChar < "0" || currentChar > "9")
            {
                numOtherChars += 1;
                otherChars += currentChar;
            }
            else
```

```
                numNumbers += 1;
            //end if
        //end if
    }   //end for

    if (numPeriods > 1 || numOtherChars > 0)
        cout << "Invalid sales amount" << endl;
    else
        cout << "Valid sales amount" << endl;
    //end if
    cout << "Numbers: " << numNumbers << endl;
    cout << "Periods: " << numPeriods << endl;
    cout << numOtherChars << " other characters: "
        << otherChars << endl;

    return 0;
}   //end of main function
```

LAB 13-2 Plan and Create

No answer required.

LAB 13-3 Modify

```
//Lab13-3.cpp - Guess the Word game
//Created/revised by <your name> on <current date>

#include <iostream>
#include <string>
//#include <cstdlib>
using namespace std;

int main()
{
    string origWord = "";
    string letter = "";
    char dashReplaced = 'N';
    char gameOver = 'N';
    int numIncorrect = 0;
    string displayWord = "-----";
    int numChars = 0;

    //get original word
    cout << "Enter a word in uppercase: ";
    getline(cin, origWord);
```

```
numChars = origWord.length();
displayWord.assign(numChars, '-');

system("cls");  //clear the screen

//start guessing
cout << "Guess this word: " <<
displayWord << endl;
while (gameOver == 'N')
{
    cout << "Enter an uppercase letter: ";
    cin >> letter;

    //search for the letter in the original word
    for (int x = 0; x < numChars; x += 1)
    {
        //if the current character matches
        //the letter, replace the corresponding
        //dash in the displayWord variable and then
        //set the dashReplaced variable to 'Y'
        if (origWord.substr(x, 1) == letter)
         {
            displayWord.replace(x, 1, letter);
            dashReplaced = 'Y';
         }  //end if
    }  //end for

    //if a dash was replaced, check whether the
    //displayWord variable contains another dash
    if (dashReplaced == 'Y')
    {
        //if the displayWord variable does not
        //contain any dashes, the game is over
          if (displayWord.find("-", 0) == -1)
          {
            gameOver = 'Y';
            cout << endl << "Yes, the word is "
                << origWord << endl;
            cout << "Great guessing!" << endl;
          }
          else  //otherwise, continue guessing
          {
             cout << endl << "Guess this word: "
                << displayWord << endl;
            dashReplaced = 'N';
          } //end if
    }
    else  //processed when dashReplaced contains 'N'
    {
        //add 1 to the number of incorrect guesses
        numIncorrect += 1;
        //if the number of incorrect guesses is 10,
                //the game is over
                if (numIncorrect == 10)
                {
                    gameOver = 'Y';
                    cout << endl << "Sorry, the word is "
                        << origWord << endl;
                } //end if
            } //end if
        }  //end while
        return 0;
    }    //end of main function
```

LAB 13-4 What's Missing?

```
//Lab13-4.cpp - displays a comma (if necessary) in the output
//Created/revised by <your name> on <current date>

#include <iostream>
#include <string>
using namespace std;

int main()
{
    string population = "";
    int highSub = 0;

    cout << "Enter the population: ";
    cin >> population;
    highSub = population.length() - 1;

    while (highSub >= 3)
    {
        population.insert(highSub - 2, ",");
        highSub -= 3;
    }  //end while

    cout << population << endl;
    return 0;
}    //end of main function
```

LAB 13-5 Desk-Check

Desk-check:

message	subMessage1	subMessage2
~~vexprealjik~~	________	________
~~vexprealk~~	~~vexprea~~	~~!!!!!~~

~~vexpreadalk~~	~~vexgrea~~	day!!!!!
~~vexpreaday~~	~~vegrea~~	
~~Haveagreatday!!!!!~~	~~veagrea~~	
~~Have agreatday!!!!!~~	~~veagreat~~	
~~Have a greatday!!!!!~~	Haveagreat	
Have a great day!!!!!		

The code will display the following: Message: Have a great day!!!!!

LAB 13-6 Debug

To debug the program, change the `cout << message.substr(x) << endl;` statement in the `for` loop to `cout << message.substr(x, 1) << endl;`.

Answers to Chapter 14 Mini-Quizzes

Mini-Quiz 14-1

1. b. `#include <fstream>`
2. d. `ios::in`
3. the Boolean value false
4. `ofstream outAlbums;`
5. c. `outAlbums.open("mine.txt", ios::app);`

Mini-Quiz 14-2

1. c. `outInv << quantity << endl;`
2. d. `outFile << score1 << '#' << score2 << endl;`
3. d. `inInv >> number;`

Mini-Quiz 14-3

1. c. `while (!inInv.eof())`
2. the Boolean value false
3. `outInv.close();`

Answers to Chapter 14 Labs

LAB 14-1 Stop and Analyze

1. The instruction on Line 5 is necessary because the program uses the `cin` and `cout` objects. The instruction on Line 6 is necessary because the program uses the `string` class. The instruction on Line 7 is necessary because the program uses the `ofstream` class.
2. Each record contains two fields: the movie title and the year the movie was released.
3. The movies.txt file will contain only the two records written during the second run of the program. This is because the program opens the movies.txt file for output, which means the file's contents will be erased each time the program is run.
4. To save the previous records, you need to open the file for append. You do this by changing the *mode* in the `open` function in Line 17 to `ios::app`.
5. `if (outFile.is_open() == true)`
6. The purpose of the # character is to separate the movie title field from the year released field in each record.
7. The statement in Line 32 closes the output file. Neglecting to close a file can result in a loss of data.
8. No answer required.
9. No answer required.
10. No answer required.
11. Change the `outFile.open("movies.txt", ios::out);` statement in Line 17 to `outFile.open("movies.txt", ios::app);`.
12. No answer required.

LAB 14-2 Plan and Create

No answer required.

LAB 14-3 Modify

```
//Lab14-3.cpp - saves records to a sequential access
//file and also calculates and displays the total
//of the sales amounts stored in the file
//Displays the records and the average sales amount
//Created/revised by <your name> on <current date>
```

```
#include <iostream>
#include <string>
#include <fstream>
using namespace std;

//function prototypes
int getChoice();
void addRecords();
void displayRecords();
void displayTotal();
void displayAvg();

int main()
{
    int choice = 0;
    do
    {
        //get user's menu choice
        choice = getChoice();
        if (choice == 1)
            addRecords();
        else if (choice == 2)
            displayRecords();
        else if (choice == 3)
            displayTotal();
        else if (choice == 4)
            displayAvg();
        //end if
    }    while (choice != 5);
    return 0;
}    //end of main function

//*****function definitions*****
int getChoice()
{
    //displays menu and returns choice
    int menuChoice = 0;
    cout << endl << "Menu Options" << endl;
    cout << "1  Add Records" << endl;
    cout << "2  Display Records" << endl;
    cout << "3  Display Total Sales" << endl;
    cout << "4  Display Average Sales" << endl;
    cout << "5  Exit" << endl;
    cout << "Choice (1 through 5)? ";
    cin >> menuChoice;
    cin.ignore(100, '\n');
    cout << endl;
    return menuChoice;
}    //end of getChoice function
```

```
void addRecords()
{
    //saves records to a sequential access file
    string name = "";
    int sales = 0;
    ofstream outFile;

    //open file for append
    outFile.open("sales.txt", ios::app);

    //if the open was successful, get the
    //salesperson's name and sales amount and
    //then write the information to the file;
    //otherwise, display an error message
    if (outFile.is_open())
    {
        cout << "Salesperson's name (X to stop): ";
        getline(cin, name);
        while (name != "X" && name != "x")
        {
            cout << "Sales: ";
            cin >> sales;
            cin.ignore(100, '\n');

            outFile << name << '#'     << sales << endl;

            cout << "Salesperson's name "
                << "(X to stop): ";
            getline(cin, name);
        } //end while
        outFile.close();
    }
    else
        cout << "sales.txt file could not be opened"
             << endl;
    //end if
}    //end of addRecords function

void displayRecords()
{
    //displays the contents of the sales.txt file
    string name = "";
    int sales = 0;
    ifstream inFile;

    //open file for input
    inFile.open("sales.txt");

    //if the open was successful, read a
    //record and then display the record
    //otherwise, display an error message
    if (inFile.is_open())
    {
        getline(inFile, name, '#');
        inFile >> sales;
        inFile.ignore();

        while (!inFile.eof())
        {
            cout << name << "     $" << sales << endl;
            getline(inFile, name, '#');
            inFile >> sales;
            inFile.ignore();
        } //end while
        inFile.close();
    }
    else
        cout << "sales.txt file could not be opened." << endl;
    //end if

}  //end of displayRecords function

void displayTotal()
{
    //calculates and displays the total sales
    string name = "";
    int sales = 0;
    int total = 0;
    ifstream inFile;

    //open file for input
    inFile.open("sales.txt");

    //if the open was successful, read the
    //salesperson's name and sales amount, then add
    //the sales amount to the accumulator, and then
    //display the accumulator; otherwise, display
    //an error message
    if (inFile.is_open())
    {
        getline(inFile, name, '#');
        inFile >> sales;
        inFile.ignore();

           while (!inFile.eof())
        {
            total += sales;
            getline(inFile, name, '#');
            inFile >> sales;
            inFile.ignore();
        } //end while
        inFile.close();
        cout << "Total sales $" << total
            << endl << endl;
    }
    else
        cout << "sales.txt file could not be opened"
             << endl;
    //end if
}    //end of displayTotal function

void displayAvg()
{
    //calculates and displays the average sales
    string name = "";
    int sales = 0;
    int totalSales = 0;
    int numSales = 0;
    double avgSales = 0.0;
    ifstream inFile;

    //open file for input
    inFile.open("sales.txt");

    //if the open was successful, read the
    //salesperson's name and sales amount, then add
    //the sales amount to the accumulator and add 1
    //to the counter; otherwise, display an error message
    if (inFile.is_open())
    {
        getline(inFile, name, '#');
        inFile >> sales;
        inFile.ignore();

        while (!inFile.eof())
        {
            totalSales += sales;
            numSales += 1;
            getline(inFile, name, '#');
            inFile >> sales;
            inFile.ignore();
        } //end while
        inFile.close();

        //calculate and display the average sales
        avgSales =
            static_cast<double>(totalSales) / numSales;
        cout << "Average sales $" << avgSales
            << endl << endl;
    }
    else
        cout << "sales.txt file could not be opened." << endl;
    //end if
}  //end of displayAvg function
```

LAB 14-4 What's Missing?

```
//Lab14-4.cpp - saves records to and reads records from a file
//Created/revised by <your name> on <current date>

#include <iostream>
#include <string>
#include <fstream>

using namespace std;

int main()
{
    string firstName = "";
    string lastName = "";
    ifstream inFile;
    ofstream outFile;

    outFile.open("Lab14-4.txt", ios::out);
    for (int num = 1; num < 6; num += 1)
    {
        cout << "First name: ";
        cin >> firstName;
        cout << "Last name: ";
        cin >> lastName;
        outFile << firstName << '#' << lastName << endl;
    }  //end for
    outFile.close();

    inFile.open("Lab14-4.txt", ios::in);
    if (inFile.is_open())
    {
        for (int num = 1; num < 6; num += 1)
        {
            getline(inFile, firstName, '#');
            getline(inFile, lastName, '\n');
            cout << lastName << ", " << firstName << endl;
        }  //end for
        inFile.close();
    }
    else
        cout << "Can't locate the Lab14-4.txt file.";
    //end if
    return 0;
}    //end of main function
```

LAB 14-5 Desk- Check

Desk-check:

store1Sales	store2Sales	store1Total	store2Total
~~0~~	~~0~~	~~0~~	~~0~~
~~15400~~	~~23600~~	~~15400~~	~~23600~~
~~12345~~	~~25350~~	~~27745~~	~~48950~~
~~18450~~	~~30900~~	~~46195~~	~~79850~~
16750	31000	62945	110850

The code will display the following:
Store 1's total sales: $62945
Store 2's total sales: $110850

LAB 14-6 Debug

To debug the program, add the `cin.ignore(100, '\n');` statement below the `cin >> num2;` statement.

Answers to Chapter 15 Mini-Quizzes

Mini-Quiz 15-1

1. object-oriented programming
2. b. False
3. b. an instance of the class
4. b. behaviors

Mini-Quiz 15-2

1. b. False
2. declaration, implementation
3. d. variable declarations
4. a. True
5. `Check payCheck;`
6. a. `paycheck.getCheck()`

Mini-Quiz 15-3

1. scope resolution operator
2. `Item();`
3.

```
Item::Item()
{
     code = ' ';
     price = 0;
}  //end of default constructor
```

Mini-Quiz 15-4

1. signature
2. `Item(int);`
3. overloaded

Answers to Chapter 15 Labs

LAB 15-1 Stop and Analyze

1. The names of the private data members are `id` and `price`.
2. The name of the default constructor is `Item`. The constructor's purpose is to initialize the private variables in the class.
3. The `setData` method assigns the program values to the private variables in the class.
4. The `getIncreasedPrice` method calculates and returns the new price of the item.
5. The code on Line 36 determines whether the value stored in the `rate` variable is greater than 1.0, which indicates that the rate was entered as an integer rather than as a decimal number. (For example, the user entered 15 rather than .15 as the rate.) The code on Line 37 converts the integer to its decimal equivalent by dividing the integer by 100.
6. The `computer.setData(computerId, computerPrice);` statement is missing from Line 69.
7. The `<< computer.getIncreasedPrice(incRate)` code is missing from Line 74.

LAB 15-2 Plan and Create

No answer required.

LAB 15-3 Modify

In the Lab15-3.cpp file, change `double lawnLength = 0.0;` to `int lawnLength = 0;`. Also change `double lawnWidth = 0.0;` to `int lawnWidth = 0;`. In the Lab15-3 Rectangle.h file, add the `void setDimensions(int, int);` prototype below the existing `setDimensions` prototype. Also add the following setDimensions function:

```
void Rectangle::setDimensions(int len, int wid)
{
    //assigns dimensions to private data members
    if (len > 0 && wid > 0)
    {
        length = len);
        width = wid;
    }  //end if
} //end of setDimensions method
```

LAB 15-4 What's Missing?

```
//Parallelogram.h
//Created/revised by <your name> on <current date>

//declaration section
class Parallelogram
{
public:
     Parallelogram();
     double calcArea(double, double);
private:
     double length;
     double height;
};

//implementation section
Parallelogram::Parallelogram()
{
     length = 0.0;
     height = 0.0;
}  //end of default constructor
```

```
double Parallelogram::calcArea(double l, double h)
{
    double area = 0.0;

    if (l >= 0.0 && h >= 0.0)
        area = l * h;
    else
        area = -1;
    //end if
    return area;
}  //end of calcArea method

//Lab15-4.cpp - displays the area of a parallelogram in square yards
//Created/revised by <your name> on <current date>

#include <iostream>
#include <iomanip>
#include "Parallelogram.h"
using namespace std;

int main()
{
    Parallelogram parkingLot;
    double lotLength = 0.0;
    double lotHeight = 0.0;
    double lotArea = 0.0;

    cout << "Length (in feet): ";
    cin >> lotLength;
    cout << "Height (in feet): ";
    cin >> lotHeight;

    lotArea = parkingLot.calcArea(lotLength, lotHeight) / 9;
    cout << fixed << setprecision(2) << endl;
    cout << "Square yards: " << lotArea << endl;
    return 0;
}    //end of main function
```

LAB 15-5 Desk-Check

Desk-check:

BONUS_RATE	name	dollars	bonus
0.05	______	~~0.0~~	~~0.0~~
	~~Carla Rensen~~	12456.75	622.84
	X		

dollarAmt.sales	~~s~~	~~r~~
~~0.0~~	~~12456.75~~	~~0.05~~
12456.75		

The code will display the following: Carla Rensen bonus: $622.84

LAB 15-6 Debug

To debug the program, enter the `#include "Lab15-6 Inventory.h"` directive in the Lab15-6.cpp file. Also change the `if` clause in the `setItem` method in the Lab15-6 Inventory.h file to `if (num > 0)`.