Function exercises

1. Write a complete C++ program that prompts the user to enter an integer value, then the program computes and displays all the divisors of this integer. Divisor is an integer that divides an integer evenly. For example 12/4 is 3, so 4 is a divisor for 12; another example: 160 divides 40 is 4, so 40 is a divisor for 160.

2. Write a complete C++ program that will read integer values from a data file. This program will display the total number of values read from the data file, the largest number read, the smallest number read, and the average of all the values read.

3. Write a **complete C++ program** for the following problem.

Prompt the user to enter the radius of a sphere. Then compute and display the surface area and volume of the sphere. The formulae for the computation are:

$$surface\ area = 4\pi R^2, \qquad volume = \frac{4}{3}\pi R^3$$

where R is the radius of the sphere.

You are required to write the following three user defined functions for this program:

- **GetRadius**: This function prompts the user to enter the radius value. It checks to see if the radius value is valid, i.e., it is greater than 0. It continues to prompt the user until a valid radius value is entered. It then returns the radius value to the calling function.
- **ComputeStatistics:** This function computes the **surface area** and the **volume** based on the radius of a sphere. The computed values are sent back to the calling function with reference parameters.
- **DisplayResults:** This function displays the radius value, the surface area, and the volume of a sphere.

Make sure to include all the function declarations and definitions. Think carefully whether to use void function or value returning function, and for parameter passing, whether to use value parameter or reference parameter.

4. Write a **C++ program** to count and display the number of occurrence of the word "**to**" in a line of text entered by user.

   Example Run:

   Enter Text: ***to be or not to be, that is going to be the hard question.*** ← *user input*

   The word appeared 3 times in this sentence. ← *program output*

5. Write a complete C++ program to read a list of movie titles from a data file named "**movies.dat**". The movie titles are written one title per line in the data file. Your program reads the movie titles and displays them one by one on screen. The capacity of the array is set to 100. The program reads the movie titles til the end of the data file is reached or a maximum of 100 values is read**.** The program then displays a message showing the number of movie titles read from the data file.

6. Function related problems:

Multiple choice questions:

1) Given the function prototype

void FixThis(char&, int&, float, int);

which of the following is an appropriate function call? (someChar is of type char, someInt is of type int, and someFloat is of type float.)

A) FixThis('o', someInt, 6.85, int('c'));
B) someFloat = 0.3 * FixThis(someChar, someInt, someInt, someFloat);
C) FixThis('p', someInt + 5, someFloat, 50);
D) FixThis(someChar, someInt, someFloat, int('c'));
E) FixThis(someChar, someInt, someFloat);

2) Consider the function definition

```
void DoThis( int & alpha,   int & beta  ) {
        int temp;

        temp=50;
        temp = alpha;
        alpha = beta;
        beta = temp;
        return;
}
```

Suppose that the caller has integer variables **gamma** and **delta** whose values are 10 and 20, respectively. What are the values of gamma and delta after the following function call?

```
DoThis(gamma, delta);
```

A) gamma = 50 and delta = 20
B) gamma = 20 and delta = 10
C) gamma = 50 and delta = 10
D) gamma = 10 and delta = 20
E) gamma = 20 and delta = 20

3) Consider the function definition

```
void  Demo( int    value1,     float& value2 )
{
        value1 =  value1* 3;
        value2 = int(value2) + 5.5;
        return;
}
```

Suppose that the caller has variables **myInt** and **myFloat** whose values are 5 and 2.5, respectively. What are the values of myInt and myFloat after return from the following function call?

```
Demo(myInt, myFloat);
```

A) myInt = 15 and myFloat = 5.5
B) myInt = 15 and myFloat = 7.5
C) myInt = 5 and myFloat = 5.5
D) myInt = 5 and myFloat = 7.5
E) none of the above

4) Given the function definition:

```
void Twist( int  a,    int& b )
{
        int  c;

        a = b + 2;
        c = a * 3;
        b = c + a;
}
```

What is the output of the following code fragment that calls function Twist? (All variables are of type int.)

```
r = 1;
s = 2;
t = 3;
Twist(s, t);
cout << r << ' ' << s << ' ' << t << endl;
```

2. Given the function declaration for "Processing" and local variables declared in the main function:

```
#include <iostream>
using namespace std;
void Processing(float &, float, int &,  int, char);
int main ()
{
    //  local variable declaration
    int     id, socialSecurity;
    float  salary, tax;
    char   init;

    // the rest of the program omitted
    …….
}


void  Processing(float    & n1,
                 float       n2,
                 int       & sSN,
                 int         id,
                 char        finitial)
{
    // content of function omitted
    ……
}
```

(a) Which parameters are passed by value? Which parameters are passed by reference?

(b) State whether each of the following four calls of the function "Processing" in the main function is correct or incorrect. If it is incorrect, briefly explain why.

(1) Processing(35.5, 0.0085, socialSecurity, id, 'F');

(2) Processing(salary, tax, socialSecurity, 41);

(3) Processing(salary*0.15, tax*0.2, socialSecurity, id, 'L');

(4) Processing(salary, tax, socialSecurity, 45.5, 'L');

3. Show the output of the following program:

```
#include <iostream>
using namespace std;
void Test (int&, int);

int  main ( )
{
   int d=12;
   int e=14;

   Test(d, e);
   cout << "In the main function after the first call, d=" << d << ", e=" << e << endl;

   d=15;
   e=18;
   Test (e, d);
   cout << "In the main function after the second call, d=" << d << ", e=" << e << endl;

   return 0;
}

void  Test(int &s,   int  t)
{
   s=5;
   s = s+10;
   t = 4*s;
   cout << "in function Test, s=" << s << "  " << "t=" << t << endl;

   return;
}
```

4. Write a ***value returning function*** named **ComputePostage** that returns the cost of mailing a package, given the weight of the package in pounds and ounces, and the cost per ounce. (1 pound = 16 ounces) Fill in the following incomplete program:

(a) the declaration of the function
(b) call to function **ComputePostage** that computes the postage for a package
(c) Show the definition of the function

// fill in function declaration here

```
int    main( )
{
     int   pounds, ounces;
     float  costPerOunce;
     float   cost;

     cout << "How much does the package weight? (enter pounds and ounces)" << endl;
     cin >> pounds >> ounces;

     cout << "What is the cost of the package per ounce? " << endl;
     cin >> costPerOunce;


     // fill in function call here


     _____________________________
     cout << "This package costs $" << cost  << "." << endl;

     return 0;
}
```

// fill in function definition here