2. What is the output of the following C++ program?

```
#include <iostream>
using namespace std;
void f(int a, int &b)
{
   cout << a << " " << b << endl;
   a = a + 2;
   b = b + 3;
   cout << a << " " << b << endl;
}
int main()
{
   int x = 4, y = 5;
   cout << x << " " << y << endl;
   f(x, y);
   cout << x << " " << y << endl;
   return 0;
}</pre>
```

- 3. What are the five basic built-in C++ data types?
- 4. What are the differences between the Python conditional statement and the corresponding C++ conditional statement?
- 5. What are the differences between the Python and C++ while loop statements?
- 6. What are the differences between the Python list type and C++ arrays?
- 7. What is the purpose of a C++ header file?
- 8. What do the terms *scope* and *lifetime* mean with respect to variables?

## Programming Exercises

- 1. Write a C++ program that prints the multiplication table for all possible products of the numbers 0 through 9.
- 2. Write a C++ program that inputs the number of cents (an integer between 0 and 99) and outputs the number of quarters, dimes, nickels, and pennies that add up to that amount and minimizes the number of coins needed.

- 3. Write a C++ program that allows the user to enter non-negative numbers (pressing the Return key after each number is entered). A negative number entered by the user indicates the end of the list of numbers. Output the total and average of the numbers the user entered excluding the negative number.
- 4. Write a C++ program that asks a user to enter the coefficients a, b, and c of a quadratic equation  $a*x^2 + b*x + c = 0$  and outputs the solution(s). The program should indicate if there are no real solutions.
- 5. Write a C++ function that determines if the int parameter it is passed is a prime number. Use this function to write a program that outputs all the prime numbers less than or equal to a number the user inputs.
- 6. Write a C++ program that inputs an annual investment amount, the interest rate earned every year, and the number of years. The program outputs the final value of the investment assuming the same amount is invested at the beginning of each year and the interest is compounded annually.
- 7. Modify the selection\_sort code in this chapter to use an inline swap function that accepts two parameters passed by reference.
- 8. Write a C++ function named linear\_search that accepts an integer value to search for, an array of integers, and the number of integers in the array. Using the linear search algorithm, the function must return the position of the first parameter in the array. If the first parameter is not in the array, the function returns -1.
- 9. Write a C++ binary\_search function with the same parameters as the linear\_search function described in the previous exercise. Search the list using the binary search algorithm and return the location of the first parameter in the array (returning -1 if the value is not found). The array that is passed to the binary search algorithm must be sorted.
- 10. Place the linear\_search and binary\_search functions in a file named searches.cpp with a corresponding header file named searches.h. Create a file named test\_searches.cpp that initializes an array of one million integers in order and tests the searches with inputs that result in both the best and worst running time of each algorithm.