CPE 150 Laboratory 2: Introduction to C++ Programming II

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1 Objectives

- To write simple computer program in C++. This lab steps you through the creation of your first C++ programs.

- To use simple input and output statements in C++. This lab introduces `cout` statements to output both text and variables and `cin` statements to input data from the user.

- To become familiar with fundemental data types. After completing this lab, you should be able to declare and use variables that contain both integer values and floating-point values.

- To use arithmetic operators. This lab demonstrates how to use the standard arithmetic operators in C++ programs.

- To understand the precedence of arithmetic operators; forgetting this precedence can result in logic errors in your programs.

- This lab gives you the practice using simple decision-making statments to control the actions of a computer program.

2 Lab Exercise 1 - Sum, Average, Max, and Min

Write a program that reads three integers from the keyboard, and prints the sum, average, product, smallest and largest of these numbers. The screen dialogue should appear as follows:

```
Input three different integers: 13 27 14
Sum is 54
Average is 18
Product is 4914
Smallest is 13
Largest is 27
```

Follow-Up Questions and Activities

1. Modify your solution to use three seperate `cin` statements rather than one. Write a separate prompt for each `cin`.

2. Does it matter whether `<` or `<=` is used when making comparisons to determine the smallest integer? Which did you use and why?

3. In the program you probably used a `double` or `float` variable to store the average. Change the type of that variable to integer. Is the output different from what you observed previously?

3   Lab Exercise 2 - Multiples

Write a program that reads in two integers and determines and prints if the first is a multiple of the second. [*Hint*: Use the modulus operator.]

```
Enter two integers: 22 8
22 is not a multiple of 8
```

Follow-Up Questions and Activities

1. Can the modulus operator be used with non-integer operands? Can it be used with negative numbers? Assume the user entered the following sets of numbers. For each set, what does the experssion in the third column output? If there is an error, explain why.

Integer 1	Integer 2	Expression	Output
73	22	cout << 73 % 22;	_____
0	100	cout << 0 % 100;	_____
100	0	cout << 100 % 0;	_____
-3	3	cout << -3 % 3;	_____
9	4.5	cout << 9 % 4.5;	_____
16	2	cout << 16 % 2;	_____

2. What if we place a semicolon (`;`) after the end of the condition expression of an `if` statement?

3. Modify the program to determine whether a number entered is even or odd. [*Note*: Now, the user needs to enter only one number.]

4   Lab Exercise 3 - Separating Digits

Write a program that inputs a five-digit number, sperates the number into its individual digits and prints the digits separated from one another by three spaces each. [*Hint*: Use integer dividsion and the modulus operator.] For example, if the user inputs `42339`, the program should print what is shown in the sample output.

```
Enter a five-digit integer: 42339
Separate digits: 4   2   3   3   9
```

Follow-Up Questions and Activities

1. What are the results of the following expressions?

   ```
   24 / 5 = _____
   18 % 3 = _____
   13 % 9 = _____
   13 / 2 % 2 = _____
   ```

2. What happens when the user inputs a number which has a fewer than five digits? Why? What is the output when 1763 is entered?

3. The program you completed in this lab exercise inputs a number with multiple digits and separates the digits. Write an inverse program, a program which asks the user for three one-digit numbers and combines them into a single three-digit number.

5   Postlab Exercises

1. Write a C++ program that reads three inetger numbers from the keyboard and find the middle number among the three numbers. Assume that all three numbers are different. [*Hint*: Find the largest and smallest values first.]

2. Write a C++ program that calculates $f(x) = x^3 - x^2 + 5$ for $x = \{0, 1, 2, 3, 4, 5\}$ as follows:

   ```
   ***********
   x      f(x)
   ***********
   0      5
   1      5
   2      9
   3      23
   4      53
   5      105
   ***********
   ```