Programming Fundamentals LAB – Spring 2020
(BS-CS-F19 Morning & Afternoon)

Lab # 1

Instructions:

- **Attempt the following tasks exactly in the given order.**
- **Indent** your pseudo-code properly.
- Use meaningful variable names. Use the **camelCase** notation to name variables.
- Use meaningful prompt lines/labels for all input/output that is performed by your algorithms.

You are required to write algorithm in **pseudo-code** form and draw **flowchart** for each of the following tasks:

Task # 1

A company has determined that its annual profit is typically 23 percent of total sales. Design an algorithm that asks the user to enter the amount of total sales, and then determines and displays the annual profit that will be made from that amount.

Task # 2

Design an algorithm that will ask the user to enter the amount of a purchase. The algorithm should then compute the federal and provincial sales tax. Assume that the federal sales tax is 4 percent and the provincial sales tax is 2 percent. The algorithm should display the amount of the purchase, the federal sales tax, the provincial sales tax, the total sales tax, and the total of the sale (which is the sum of the amount of purchase plus the total sales tax).

Task # 3

A car's mileage in kilometers per liter (KMPL) can be calculated with the following formula:

$$KMPL = Kilometers\ driven\ /\ Liters\ of\ petrol\ used$$

Design an algorithm that asks the user for the number of kilometers driven and the liters of petrol used. It should calculate the car's KMPL and display the result on the screen.

Task # 4

Design an algorithm that asks the user how many eggs he/she has bought and then tells the user how many dozen eggs he/she has and how many extra eggs are left over. A sample run of your algorithm is given below. Text shown in **red** is entered by the user.

Sample run:

```
How many Eggs you bought: 40
You bought 3 dozen and 4 extra Eggs
```

Hint: Use the division operator (**/**) and the modulus (**%**) operator.

Task # 5

The area of a rectangle is the rectangle's length times its width. Design an algorithm that asks for the length and width of two rectangles. The algorithm should tell the user which rectangle has the greater area, or whether the areas are the same.

Note: In your algorithm, you are only allowed to use one-way selection (**`if`**). You are **NOT** allowed to use two-way selection (**`if-else`**).

Task # 6

A book store awards points to its customers based on the number of books purchased each month. The points are awarded as follows:

- If a customer purchases 0 books, he or she earns 0 points.
- If a customer purchases 1 book, he or she earns 5 points.
- If a customer purchases 2 books, he or she earns 15 points.
- If a customer purchases 3 or more books, he or she earns 30 points.

Design an algorithm that asks the user to enter the number of books that he or she has purchased this month and displays the number of points awarded.

Note: In your algorithm, you are only allowed to use one-way selection (**`if`**). You are **NOT** allowed to use two-way selection (**`if-else`**).

Task # 7

Design an algorithm that asks the user to enter **two** integers, and determines and displays the larger number.

Note: In your algorithm, you are only allowed to use one-way selection (**`if`**). You are **NOT** allowed to use two-way selection (**`if-else`**).

Task # 8

Design an algorithm that asks the user to enter an integer, and determines whether the integer is Even or Odd.

Hint: Use the modulus (**%**) operator.

Note: In your algorithm, you are only allowed to use one-way selection (**`if`**). You are **NOT** allowed to use two-way selection (**`if-else`**).

Task # 9

Design an algorithm which asks the user to enter a 3-digit positive integer. Then, the algorithm should calculate and display the sum of the digits of that integer. For example, if the user enters 786, then your algorithm should display 21 on screen.

Task # 10

Design an algorithm that takes two integers from the user, displays them on screen, **swap**s them, and again displays them on screen.

Task # 11

Design an algorithm that takes the marks obtained by a student in a course and determines whether the student was PASS or FAIL in the course. Assume that the passing marks are 50. Your algorithm should display an appropriate error message, if the marks entered by the user are negative or greater than 100.

Note: In your algorithm, you are only allowed to use one-way selection (**`if`**). You are **NOT** allowed to use two-way selection (**`if-else`**).

Task # 12

Design an algorithm that asks the user to enter a 3-digit positive integer, and stores its reverse in another variable, and then, displays both integers on screen.

Task # 13

Design an algorithm that asks the user to enter **three** integers, and determines and displays the largest number.

Note: In your algorithm, you are only allowed to use one-way selection (**`if`**). You are **NOT** allowed to use two-way selection (**`if-else`**).

Task # 14

The colors **red**, **blue**, and **yellow** are known as the primary colors because they cannot be made by mixing other colors. When you mix two primary colors, you get a secondary color, as shown here:

- When you mix **red** and **blue**, you get **purple**.
- When you mix **red** and **yellow**, you get **orange**.
- When you mix **blue** and **yellow**, you get **green**.

Design an algorithm that prompts the user to enter the names of two primary colors to mix. If the user enters anything other than "red," "blue," or "yellow," the algorithm should display an error message. Otherwise, the algorithm should display the name of the secondary color that results.

Note: In your algorithm, you are only allowed to use one-way selection (`if`). You are **NOT** allowed to use two-way selection (`if-else`).

Task # 15

In a right triangle, the square of the length of one side is equal to the sum of the squares of the lengths of other two sides. Design an algorithm that prompts the user to enter the lengths of three sides of a triangle and then displays a message indicating whether the triangle is a right triangle or not.