

EECE 1080C / Programming for ECE

Summer 2019

Laboratory 2: Programming operators

Plagiarism will not be tolerated:

all students who share files will receive a 75% penalty on this assignment

Topics covered:

- C++ program development practice.
- Arithmetic, comparative and logical operators.

Objective:

- To practice program development by using programming operators. The student will create several short programming assignments to create a solid understanding of how arithmetic, comparative and logical operators can be used in programming environments.

Highlights:

- To receive full credit for this laboratory please sign the attendance sheet.
- Please access the laboratory assignment via the canopy/blackboard link. The descriptions for each problem are contained within this document.
- **Submit on Blackboard using the assignment dropbox.**

Grading:

- Each part should be worked on separately. You will need a separate project for each part of this assignment when working within your IDE.

Rubric: 100 points

- Part A = 20 points
- Part B = 15 points
- Part C = 15 points
- Part D = 15 points
- Part E = 15 points
- Part F = 20 points

Tasks:

A. Equation practice

- Create a program that inputs four variables (a, b, c, d) and displays the output of the following three formulas.
- Define each formula as a function, **type: double**.

$$x = \frac{a + b + c}{2ac}$$

$$y = \frac{a^2}{b} + \frac{c}{d}(a + b)$$

$$z = a^{2+b+c} + a - c + 4$$

- **Example:**

Enter four numbers: 1 2 3 4

Formula 1: 1

Formula 2: 2.75

Formula 3: 3

B. Freezer temperature

- Create a program that inputs two variables (hours and minutes since a power outage) and outputs the approximate temperature of the freezer in your home.
- The equation to approximate the freezer temperature can be found using the following formula:

$$FT = \frac{4t^2}{t + 2} - 20$$

Where t is the time since power outage **in hours** and FT is freezer temperature **in Fahrenheit**.

- **Example:**

Enter hours: 4

Enter minutes: 30

Approximate temperature: -7.5 F

C. Determine substance from boiling point

- The table below shows the normal boiling points **in Celsius** for various substances.

Table 1. Boiling point for various substances.

Item	Substance	Boiling point (°C)
1	Water	100
2	Mercury	357
3	Copper	1187
4	Silver	2193
5	Gold	2660

- Write a program to determine the type of substance from an observed boiling point. Please make sure that your program checks the range plus or minus 5% around each boiling point. If the boiling point does not match any substance just display “Unknown”.
- Example:**

Enter boiling point: 102

Your substance is Water

- Hint:** Try using logical operators [not(!), and (&&), or(||), etc.] when establishing the temperature ranges for each boiling point.

D. Richter Scale

- The National Earthquake Center has asked you to write a program to characterize possible earthquake damage based on the size of a quack measured on the Richter Scale. Please see the table below:

Table 2. Richter Scale number characterization.

Item	Scale	Message
1	$R < 5.0$	Little damage
2	$5 < R < 5.5$	Some damage
3	$5.5 < R < 6.5$	Damage
4	$6.5 < R < 7.5$	Serious damage
5	$R > 7.5$	Catastrophic damage

- Example:**

Enter Richter Scale number: 5

Little damage

E. Determine quadrant

- Write a program that takes in a pair (x, y) and determines the quadrant of said pair.
- **Example:**

Enter pair (x, y): 1.0 2.5

Pair is located in quadrant 1

Enter pair (x, y): -1.0 -2.5

Pair is located in quadrant 3

Enter pair (x, y): 0.0 4.8

Pair is located on Y-axis

Enter pair (x, y): 4.8 0.0

Pair is located on X-axis

Enter pair (x, y): 0.0 0.0

Pair is located on origin

- Note that the input is in **bold** above.
- The following is a reference that you might find useful:

<https://www.mathsisfun.com/data/cartesian-coordinates.html>

F. Dice game

- Write a program that simulates a two dice game using random numbers for input. You will solve this problem using an “if/else if/else” cascade.
- First, you will input **a seed** value for the random number generator between 1000 and 10000. Once the seed is inputted, you will generate random numbers between 1 and 6 to simulate rolls of a die.
- Then you will compare the dice total to the Winning, Losing, and Play Again conditions below and display the proper text (see examples). You will need to keep rolling (using a loop (do-while)) the dice until you either reach a winning or losing condition.

Table 3. Condition table for dice game.

Item	Conditions	Numbers
1	Winning	7, 9 and 11
2	Losing	2, 3 and 5
3	Roll again	All other numbers

- **Example 1:**

Enter seed: 444

```
You rolled Die 1: 5 and Die 2: 2 for a total of: 7 was rolled
                                     You are a Winner!
                                     Game Over!
```

- **Example 2:**

Enter seed: 4444

```
You rolled Die 1: 6 and Die 2: 2 for a total of: 8 was rolled
                                     Please Roll Again
You rolled Die 1: 6 and Die 2: 4 for a total of: 10 was rolled
                                     Please Roll Again
You rolled Die 1: 5 and Die 2: 6 for a total of: 11 was rolled
                                     You are a Winner!
                                     Game Over!
```

- **Example 3:**

Enter seed: 5555

```
You rolled Die 1: 4 and Die 2: 1 for a total of: 5 was rolled
                                     You are NOT a Winner!
                                     Game Over!
```

- Note that the input is in **bold** above.