

# CSCI 201 – Computer Science 1

## Lab assignment 2: Implementing conditionals using an if/else if statement

**Due date:** Day 4 of Module 1.

**Objectives:** *Become familiar with designing a solution that requires a series of condition checks. Learn how to translate such a design into code using the if/else if statements in C++.*

One of the common uses of the `if/else if` statement is to determine the range in which a given input value falls. (This problem falls into the category of “point location” problems; this is a one-dimensional point location problem). In this exercise, we convert a floating point input that specifies a wavelength in nanometers, into the appropriate color of the visible spectrum. The input to the program is a real value that lies between 400.0 and 700.0. The color conversions are:

$400 \leq \text{Violet} < 445$ ;  $445 \leq \text{Indigo} < 475$ ;  $475 \leq \text{Blue} < 510$ ;  $510 \leq \text{Green} < 570$ ;  $570 \leq \text{Yellow} < 590$ ;  $590 \leq \text{Orange} < 650$ ;  $650 \leq \text{Red} < 700$ .

**Assumption:** We shall assume for now that the input always falls within this range (the user of the program must take on the responsibility of ensuring that the input is correct, and if the input is outside the range, the program is not expected to give correct answers; see the second sample execution).

The entire range of input values can be represented by the following structure:

400...445...475...510...570...590...650...700

The lowest possible input value is 400.0 and the highest possible value is 700.0 Each of the in-between numbers (such as 445, 475) serves as a “divider”; put together, they partition the entire range into 7 sub-ranges.

We can write a conditional statement to achieve this partition. Note that at each step we are comparing the input with one of the “dividers”, thus narrowing the range within we much we must continue the search.

**Strategy.** Our strategy is as follows: Compare the input number with the first divider(445). If the number is smaller than the divider, we print the answer “Violet”; if not we continue with the next divider.

Sample execution(good input):

```
Please input a wavelength between 400.0 and 700.0: 475.0
Your wavelength corresponds to the color Blue
Thank-you for using our program!
```

Sample execution(input outside the range):

```
Please input a wavelength between 400.0 and 700.0: 823.0
Your wavelength corresponds to the color Red
Thank-you for using our program!
```

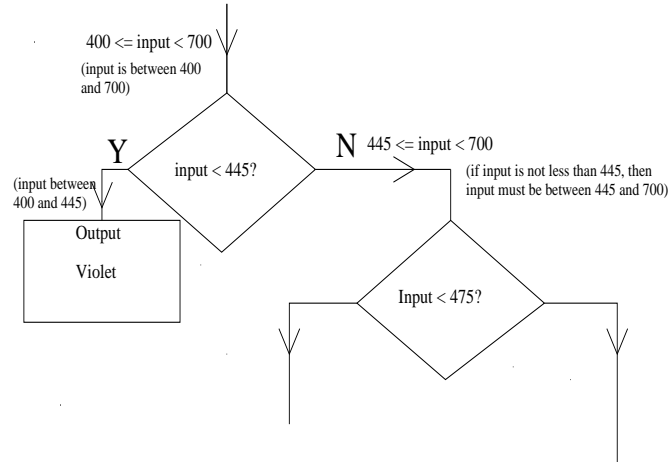


Figure 1: Partial flowchart for the lab depicting conditional to find color of given visible wavelength

**Question 1:** Using Raptor, complete the partial labeled flowchart for this problem from Figure 1. Each arrow has a label that specifies the possible range of values that the input can have when execution reaches that point. For instance, before the first branch, we have the expression  $400 \leq \text{input} < 700$ . On the outgoing arrows, we have the labels  $400 \leq \text{input} < 445$  (which gives us the output “Violet”) and  $445 \leq \text{input} < 700$  (which deals with all the other possible colors). Simulate your flowchart using **Raptor** and verify that your design is correct. Take a printout of your flowchart.

**Note:** Each conditional expression must compare the input value against one divider only.

**Question 2:** Implement the above flowchart in a C++ program using **if/else if** (not the nested if-else) statements.

**What to submit:** Within your starid folder in CourseFiles, create a folder named **Lab2**. Upload the raptor file, your source code, and a script showing the tests.