Lab 11: Making decisions **Due:** 10/24/24

This assignment consists of two parts in which you will solve the same problem but using two different control structures.

Part A: Solves the problem using **complex conditional expressions**

In this first part of the lab, you will practice using if statements with complex conditional expressions to perform decision making.

Problem: Suppose you are asked to write a program that displays the corresponding telephone digit for a given letter. The user must enter the letter in upper case and a function returns the corresponding digit as a character. If an invalid value is entered (a lower-case letter or a nonalphabetical character) the program displays an error message.

The letters and digits on a telephone are grouped this way:

2 = ABC	4 = GHI	6 = MNO	8 = TUV
3 = DEF	5 = JKL	7 = PQRS	9 = WXYZ

Your task: implement in C++ the algorithm solution shown below.

Algorithm solution (in pseudocode):

To solve this problem your program must perform the following tasks:

Declare a variable named letter to hold the letter entered by the user
Declare a variable named digit to hold the digit returned by the functions
Display the title "Converts a capital letter to a digit on the telephone"
Prompt the user to enter a single capital letter
Get the value from the keyboard and store it in the corresponding variable
Display "Solution A"
Call **letter2digitA()** to get the corresponding digit for the given letter and assign it digit
If there is a matching digit for the letter entered
Display the message "letter ", letter, " corresponds to digit ", digit, " on the telephone"
Otherwise
Display the message "there is no matching digit for the letter ", letter, " entered"

You **must** define a value-returning function named **letter2digitA()** that uses **complex conditional expressions**[1] in **if-else statements** to determine the letter to digit correlation.
This function receives a **character**. If the character corresponds to any capital letter of the English alphabet it returns the corresponding telephone digit as a **character**; otherwise, it returns character '**?**' to indicate that an invalid character has been entered.

Part B: Solves the problem using **multi-branch if-else statements**

[1] **Complex conditional expressions** require you to combine relational expressions **using** Boolean (logical) operators.

Once you finish part A, use **multi-branch if statements** to solve the same problem solved in part A.
You **must** define a value-returning function named **letter2digitB()** that uses **multi-branch if-else statements**[2] to determine the letter to digit correlation.
This function receives a **character**. If the character corresponds to any capital letter of the English alphabet it returns the corresponding telephone digit as a **character**; otherwise, it returns character '**?**' to indicate that an invalid character has been entered.
Once you have defined this function add the steps shown below at the bottom of your program and implement them.

Display "Solution B"
Call **letter2digitB()** to get the corresponding digit for the given letter and assign it digit
If there is a matching digit for the letter entered
Display the message "letter ", letter, " corresponds to digit ", digit, " on the telephone"
Otherwise
Display the message "there is no matching digit for the letter ", letter, " entered"

IMPORTANT:

In **both solutions** (**A** and **B**), to determine the corresponding digit for a letter, you **must** work with **range** of letters (for example, if the letter is within the range 'M'-'O', the corresponding digit is '6'). **Tip:**Review examples **ifandex_2.cpp** and **iftextex2.cpp** posted on Week 8, they will help you with both solutions.
The program must compile without errors or warnings.

Open **lab11.cpp** in your IDE and implement the above algorithm (already provided in the source code as comments).

Note:

- Do NOT remove or modify the statements that I use to test certain things in your program.
- Pay attention to the input and the output formats. Your solution must behave exactly like mine.
- Carefully analyze the following figures and use them as a reference to ensure you do the right things.

```
Converts a capital letter to a digit on the telephone

Enter a single capital letter: H

Solution A

Letter H corresponds to digit 4 on the telephone

Solution B

Letter H corresponds to digit 4 on the telephone


Testing your solution
```

[2] **Multi-branch if-else statements** require you to nest the if-else statement in a way that gets the same results as using complex conditional expressions **without using** Boolean operators.

```
Converts a capital letter to a digit on the telephone

Enter a single capital letter: h

Solution A

There is no matching digit for the letter h entered

Solution B

There is no matching digit for the letter h entered


Testing your solution
```

- Test and compare your solution with mine for different letters and other characters. Create your own **test plans** to test your program with the necessary inputs to ensure that **all** possible letter to digit correlations are generated. Include tests for invalid inputs.
- Your program must pass all my tests.

Don't forget to include at the top of the program the comments shown below with your information (name, class and section number, etc.)

```
//////////////////////////////////////////////////////////////////
//
// Name: <Put your name here>
// Date: <Today's date>
// Class: <Your class number and section number, like: CSCI 1470.02>
// Semester: <This semester, like: Fall 2012>
// CSCI/CMPE 1470 Instructor: <Your lecture instructor's name>
//
// Program Description: Enter here your description of what the program does
//
//////////////////////////////////////////////////////////////////
```

When done, submit your solution through Blackboard using the "Assignments" tool. Do Not email it.

Paste the link to your final solution along with your source code in the textbox opened when you click on Create Submission before you click on Submit.

The following is the basic criteria to be used to grade this part of the assignment:

You start with 100 points and then lose points as you don't do something that is required.

Important: more points may be lost for other reasons not specified here.

-5: Minor mistakes
wrong identifiers (letter, digit)
wrong variable types
no comments or too few comments in source code

doesn't display the output as specified in algorithm
(Part A) doesn't properly determine letter to digit correlation (each group of letters)
(Part A) doesn't take care of invalid inputs
(Part B) doesn't properly determine letter to digit correlation (each group of letters)
(Part B) doesn't take care of invalid inputs
incorrect input format
incorrect output format
-10: Moderate mistakes
incorrect function call (each)
incorrect type of parameters (value or reference)
-20: Major mistakes
(Part A) does not work with range of letters
(Part B) does not work with range of letters
does not pass all tests
program does not implement the provided algorithm
Incorrect/missing source code
Incorrect/missing link to your solution
-30: incorrect implementation of the function (each) [For example, wrong type of function]
40: (**Part A**) **missing or wrong implementation** (doesn't use complex conditional expressions) of function letter2digitA()
-40: (**Part B**) **missing or wrong implementation** (doesn't use multi-branch if-else statements) of function letter2digitB()
-
-50: program doesn't compile
-100: The code submitted is not your creation (you got it from a web site or another person)
-10: Late

The following are sample runs of my solution:

```
Converts a capital letter to a digit on the telephone

Enter a single capital letter: G

Solution A

Letter G corresponds to digit 4 on the telephone

Solution B

Letter G corresponds to digit 4 on the telephone


Testing your solution
```

```
Converts a capital letter to a digit on the telephone

Enter a single capital letter: a

Solution A

There is no matching digit for the letter a entered

Solution B

There is no matching digit for the letter a entered


Testing your solution
```

```
Converts a capital letter to a digit on the telephone

Enter a single capital letter: Z

Solution A

Letter Z corresponds to digit 9 on the telephone

Solution B

Letter Z corresponds to digit 9 on the telephone


Testing your solution
```