Programming Fundamentals

BS IT F22 Morning

Lab 06

Note: Input must be validated for all questions. You also need to write driver code(main) for Q2-Q5. Prompt the user to enter height. Input validation should be performed on the height. Height must not be negative.

Q1. You have made a calculator multiple times now. We'll do it one more time (easy, right?). This time, however, you need to do it by using functions. **(25 marks)**

- Display a menu as a shown (Remember it is sentinel controlled loop). You should display the menu options using a separate function displayMenu which takes no argument and returns nothing. The function prototype (or the function declaration) is as follows:
  void displayMenu();
- **Input validation** must be performed on the choice. (You should keep on taking input until the user enters a choice which is range of 1-7).
- Use a boolean function isInRange to implement the check.
  bool isInRange(int choice);
- Write functions for each operation. Prototypes are as follows:
  double addition(double num1, double num2);
  double subtraction(double num1, double num2);
  double multiplication(double num1, double num2);
  double division(double num1, double num2);
  double square(double num);
  double squareRoot(double num);
  double ceilNum(double num);
  double floorNum(double num);

- Show **division by zero** error where applicable. Similarly, if the user has selected squareRoot and enters a negative number, you should display the message **"The square root is a complex number".**

Note: Use can use pow(), sqrt(), ceil() and floor() functions from math.h library by writing **#include<math.h>.** Ceil function rounds **up** to the nearest integer. For example, ceil(3.1) would give 4. Floor function rounds **down** to the nearest integer. For example, floor(3.9) would give 3.

```
Select an operation to perform the calculation in C Calculator:
1 Addition              2 Subtraction
3 Multiplication        4 Division
5 Square                6 Square Root
7 Ceil                  8 Floor
9 Exit

Please, Make a choice 6
You chose: Square Root
Enter Number: 8
Square Root of number is: 2.828427

********************************************************************************
Select an operation to perform the calculation in C Calculator:
1 Addition              2 Subtraction
3 Multiplication        4 Division
5 Square                6 Square Root
7 Ceil                  8 Floor
9 Exit

Please, Make a choice 9
You chose: Exit
PS C:\Users\user\Downloads>
```

Q2. Write a function to print right-angled triangle pattern. **(5)**

The function prototype is as follows:

void printRightAngleTriangle(int height);

where **height** represent the number of rows you want to print, for example, if **height=5** the following pattern will be displayed:

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Q3. Write a function to display a triangle as shown below. **(10)**

The function prototype is as follows:

void printTriangle(int height);

where **height** represent the number of rows you want to print, for example, if **height=5** the following pattern will be displayed:

Q4. Write a function to display an upside-down triangle as shown below. **(10)**

The function prototype is as follows:

void printUpsideSideDownTriangle(int height);

where **height** represent the number of rows you want to print, for example, if **height=6** the following pattern will be displayed:

Q5. Now use both of your functions and write another function to print a diamond pattern as shown below. **(10)**

Use may find it useful to modify your **printUpsideSideDownTriangle** function and include a **continue;** statement for the first row of the upside-down triangle.

The function prototype is as follows:

void printDiamondPattern(int height);

where **height** represents the distance between first row and center row, for example, if **height=5** the following pattern will be displayed: