CSE-165-Lab 7

Write a separate .cpp file for each of the following tasks. For each question try to come up with various test cases to test your code. You may be evaluated based on test cases provided during demo.

1. References in C++(5 Points)

Study the file refs.cpp. It makes use of a function named triple which returns a number multiplied by three. Provide this function in a file named refs.h.

Sample output from refs.cpp

Enter a number: 5
15

2. Polymorphism in C++ (5 points)

Study the files catsDogs.cpp, Cat.h, Dog.h and Animal.h. The program does not compile in its current form. A piece of code is missing from Animal.h. Add that code and submit the new Animal.h.

Sample output from catsDogs.cpp

Woof, woof!
Meow, meow!

3. Copy Constructors (10 Points)

Get the file objects.cpp. It instantiates some Object classes and prints out the value of the count variable, which simply keeps track of how many instances of Object have been created.

Your task is to implement the Object class. It only needs to have a static member named count, which should be incremented each time a new instance of the class is created. You should also provide the appropriate constructors. Do not worry about destructors for this exercise. Save your class in a file named Object.h

Sample output from objects.cpp

3

4. Copy Constructors II (10 Points)

In the previous question, where we were counting the objects, there were 3 instances. One of them was created because we passed the object into the function f by value. Modify the function so that this does not happen. Your program should report that there are 2 objects, not 3. Upload your modified version of objects.cpp.
Sample output from objects1.cpp
2

5. (30 Points)

You are required to complete the following tasks:

- Create a AppWindow class that will contain as member a rectangle class AppRect defining its position and size. AppWindow will have the following two constructors:

```
/*! Constructor receives the window area size. */
AppWindow ( int x, int y, int w, int h );
AppWindow ( const AppRect& r );
```

- Write a method to retrieve the rectangle:
```
const AppRect& AppWindow::rect();
```

- Write the resize() virtual method as described below. Every time this method is called your implementation is supposed to change the coordinates of the internal rectangle of the window.

```
/*! Method resize will be called by the system every time the window
is resized */
virtual void AppWindow::resize ( int w, int h );
```

Write now two classes deriving AppWindow: CircleWin, and RectWin. These classes will have correct constructors as needed and will override the resize method such that:

- CircleWin will get the minimum dimension (among w and h) and will print it like this: "radius: <min>", where <min> is the minimum dimension;

- RectWin will print the area like this: "area: <area>"

Upload your three classes as a single header file named Header.h. Your code will be tested for correctness using the file <a virtualMethods.cpp.

**Sample output from virtualMethods.cpp**
radius: 2
area: 8
radius: 1
area: 4

6. **(40 Points)** This week, we will learn more about Qt application development framework. We will follow the same tutorial(https://wiki.qt.io/Qt_for_Beginners) as last week and learn about Qt Class hierarchy, Parenting System, QWidget and the most important features of Qt framework ie., Signals and Slots. We will further learn how Signals and Slots transmit information and how can they be customized based on our needs.

Next, you will design a Calculator as shown below using QT framework

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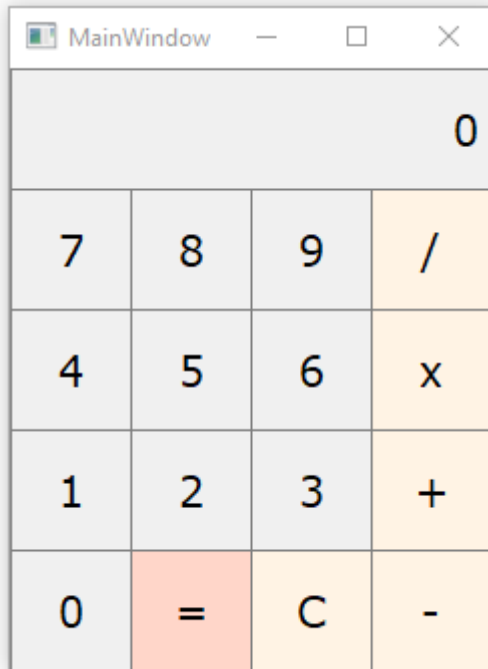
Your calculator should have following functionalities:
a. Numbers ranging from 0 to 9
b. Allow addition, subtraction, multiplication and division.
c. Clear button to clear digits in the output
d. Should be able to perform arithematic operation when "=" is pressed.
e. You are allowed to change the color of the button. You should make sure that you have some form of style to button. For example, you can change color of buttons or anything you would like.

Hint: You can follow any online lectures or
https://www.youtube.com/watch?v=FhV1ZEVNK08

Instruction for submission:
1. Create folder for each solution and Zip all your folder together
2. Submit the zip folder to catcourse