

CMPS 2010 Guided Lab 12

Spring 2024

Part 1 - Setup and Review

- Create a new folder called lab12
- Inside of the lab12 folder download this zip file using wget:
<https://cs.csub.edu/~paul/cs2010/code/week13/lab12.zip>
- Unzip the folder with this command:
unzip lab12.zip
- Review the provided code:
 - The Shape class is an abstract base class with virtual functions getArea and toString.
 - While there is no constructor defined for the Shape class, a setLabel function is provided.
 - The Rectangle class has been completed and provided as an example. Notice how it inherits from the Shape class and expands on it.
 - Main.cpp provides some code to test your classes as you build them.

Part 2 - Inheritance, Hierarchies, and Abstract Classes

Declare and define the following classes in Shapes.h and Shapes.cpp:

- Class Square
 - This class will be derived from the Rectangle class.
 - Define a constructor with one parameter **double length** and do the following:
 - Call it's parent constructor (Rectangle) and pass **length** as both the width and height
 - Call setLabel to update the label to "Square"
 - No other variables or functions need to be declared or defined, as they will be inherited
- Class Triangle
 - This class will be derived from the Shape class.
 - Define two private variables: **double base**, and **double height**
 - Define a constructor that will do the following:
 - Take two doubles and assign them to the objects base and height
 - Call setLabel to update the label to "Triangle"
 - Define the functions getArea and toString
- Class Circle
 - This class will be derived from the Shape class
 - Define one private variable: **double radius**
 - Define a constructor that will do the following:
 - Take one double and assign it to the object's radius
 - Call setLabel to update the label to "Circle"
 - Define the functions getDiameter, getCircum, getArea, and toString
(HINT: I have provided the constant double PI for you to use.)

To compile this weeks labs use: `g++ Main.cpp Shapes.cpp -o main`

When you have completed the assignment, your program's output should look like this:

```
SHAPE: Rectangle
WIDTH: 10.000000
HEIGHT: 5.000000
AREA: 50.000000 (square units)
CIRC: 30.000000

SHAPE: Square
WIDTH: 10.000000
HEIGHT: 10.000000
AREA: 100.000000 (square units)
CIRC: 40.000000

SHAPE: Triangle
BASE: 10.000000
HEIGHT: 5.000000
AREA: 25.000000 (square units)

SHAPE: Circle
RADIUS: 10.000000
DIAMETER: 20.000000
CIRCUMFERENCE: 62.831800
AREA: 314.159000 (square units)
```

Run this command from your [lab12](#) folder to submit your work.

```
/home/fac/paul/s/submit.sh
```