## CSC 110 2.0 Object Oriented Programming Tutorial 09

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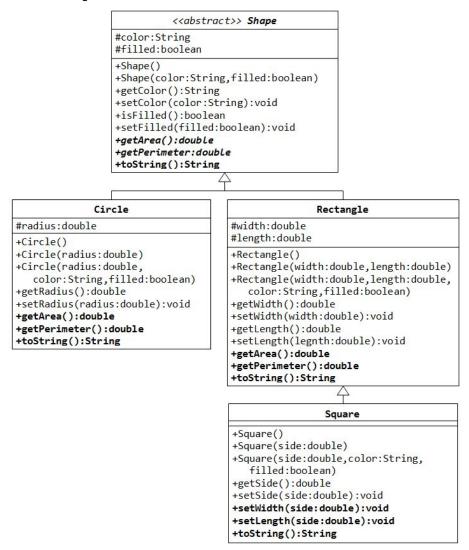
## Instructions:

- All questions must be attempted and answers submitted in a handwritten document, on or before
   8.00am on Tuesday, 22nd October 2019, to the Department Office.
- You must indicate your Index Number and the Tutorial Class to which you belong to (LCS1/ LCS2/ NFC3.1) clearly on the front page of your submission.
- Recommended Time Duration: 30 minutes

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Coding in Java [20 Marks]

Consider this UML class diagram.



In this exercise, Shape shall be defined as an abstract class, which contains:

- Two protected instance variables color(String) and filled(boolean). The protected variables can be
  accessed by its subclasses and classes in the same package. They are denoted with a '#' sign in
  the class diagram.
- Getter and setter for all the instance variables, and toString().

• Two abstract methods getArea() and getPerimeter() (shown in italics in the class diagram).

The subclasses Circle and Rectangle shall *override* the abstract methods getArea() and getPerimeter() and provide the proper implementation. They also *override* the toString().

Write a test class to test these statements involving polymorphism and explain the outputs. Some statements may trigger compilation errors. Explain the errors, if any.

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