CSE 215L: Programming Language II Lab
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Lab 09 – Fall 2019

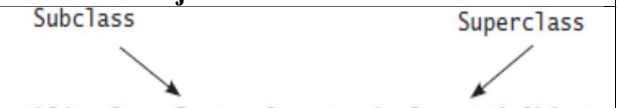
Objective:
After today's lab, the students should be able:

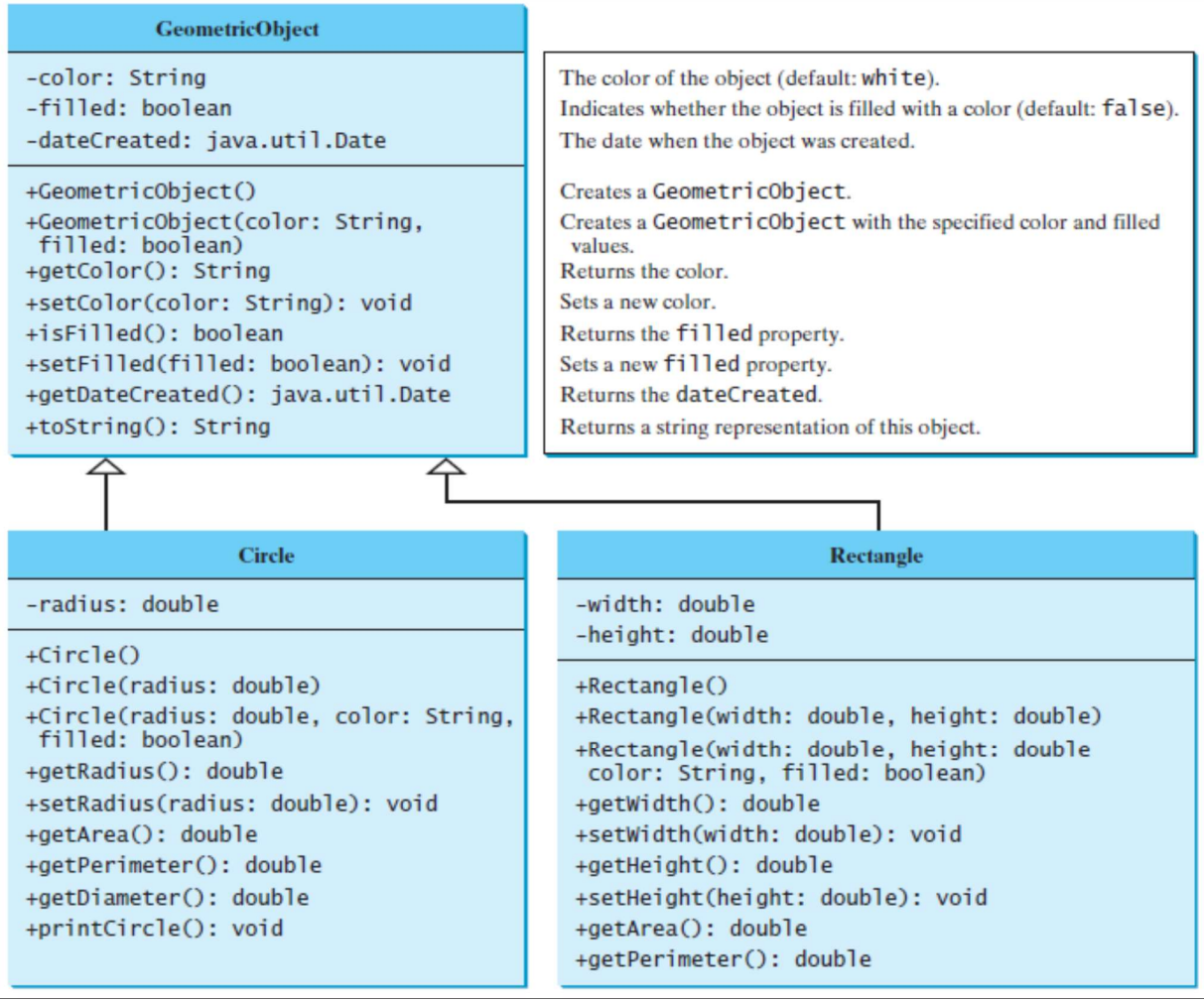
- To define a subclass from a superclass through inheritance.
- To invoke the superclass's constructors and methods using the **super** keyword.
- To override instance methods in the subclass.
- To distinguish differences between overriding and overloading.
- To explore the **toString()** method in the **Object** class.

Superclasses and Subclasses

Syntax for Circle class extends the GeometricObject

Syntax for Rectangle class extends the GeometricObject





Task – 1

(*The **Triangle** class*) Design a class named **Triangle** that extends **GeometricObject**. The class contains:

■ Three **double** data fields named **side1**, **side2**, and **side3** with default values **1.0** to denote three sides of the triangle.
■ A no-arg constructor that creates a default triangle.
■ A constructor that creates a triangle with the specified **side1**, **side2**, and **side3**.
■ The accessor methods for all three data fields.
■ A method named **getArea()** that returns the area of this triangle.
■ A method named **getPerimeter()** that returns the perimeter of this triangle.
■ A method named **toString()** that returns a string description for the triangle.

The formula to compute the area of a triangle:

$$s = (\text{side1} + \text{side2} + \text{side3})/2;$$

$$\text{area} = \sqrt{s(s - \text{side1})(s - \text{side2})(s - \text{side3})}$$

The formula to compute the perimeter of a triangle:

$$\text{perimeter} = \text{side1} + \text{side2} + \text{side3};$$

The **toString()** method is implemented as follows:

return "Triangle: side1 = " + side1 + **" side2 = "** + side2 + **" side3 = "** + side3;

Draw the UML diagrams for the classes **Triangle** and **GeometricObject** and implement the classes. Write a test program that prompts the user to enter three sides of the triangle, a color, and a Boolean value to indicate whether the triangle is filled. The program should create a **Triangle** object with these sides and set the **color** and **filled** properties using the input. The program should display the area, perimeter, color, and true or false to indicate whether it is filled or not.

Task – 2

(*The **Person**, **Student**, **Employee**, **Faculty**, and **Staff** classes*) Design a class named **Person** and its two subclasses named **Student** and **Employee**.

Make **Faculty** and **Staff** subclasses of **Employee**. A person has a name, address, phone number, and email address. A student has a class status (freshman, sophomore, junior, or senior). Define the status as a constant. An employee has an office, salary, and date hired. Use **MyDate** class to create an object for date hired. Java API has the **GregorianCalendar** class in the **java.util** package, which you can use to obtain the year, month, and day of a date. You may use the **GregorianCalendar** class to simplify coding.) A faculty member has office hours and a rank. A staff member has a title. Override the **toString** method in each class to display the class name and the person's name.

Draw the UML diagram for the classes and implement them. Write a test program that creates a **Person**, **Student**, **Employee**, **Faculty**, and **Staff**, and invokes their **toString()** methods.