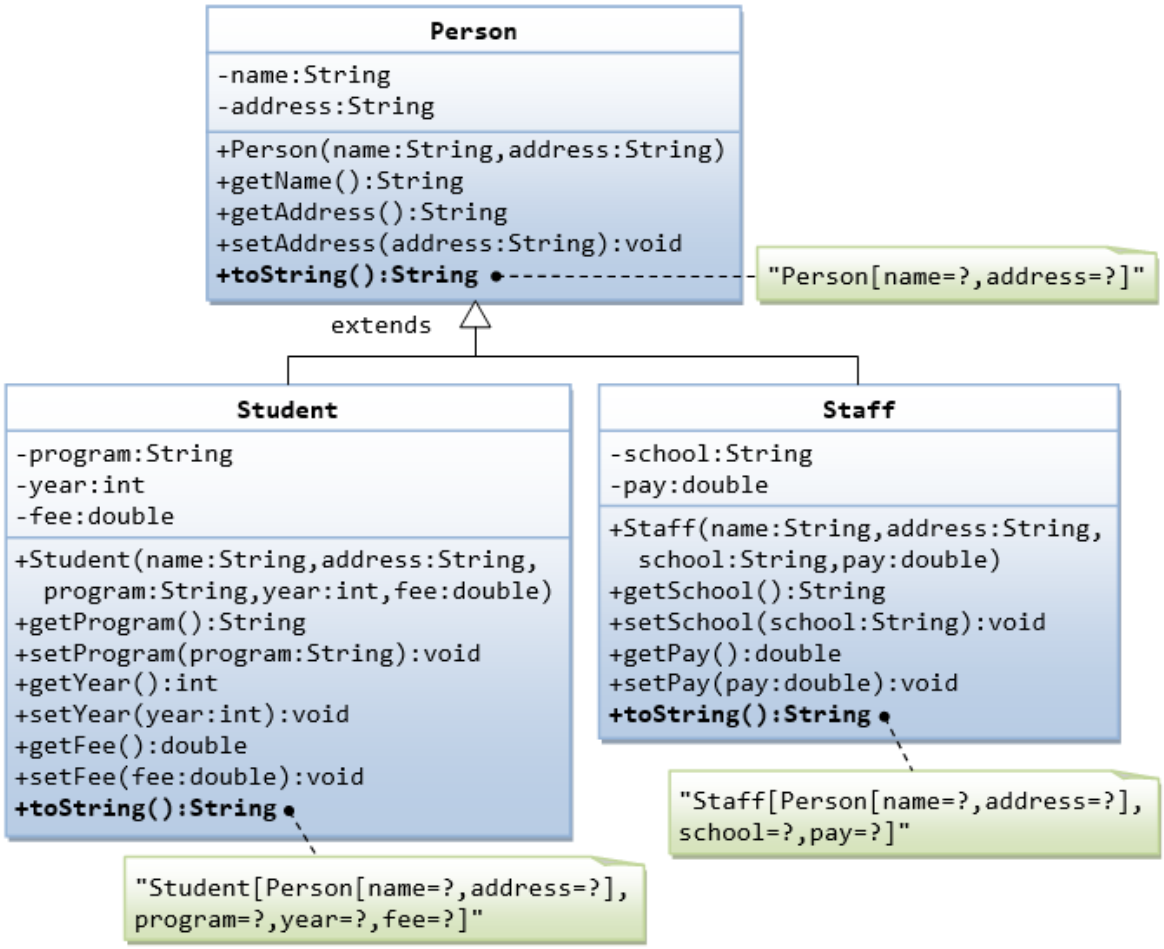
# JAVA PROGRAMMING

## Tutorial 05

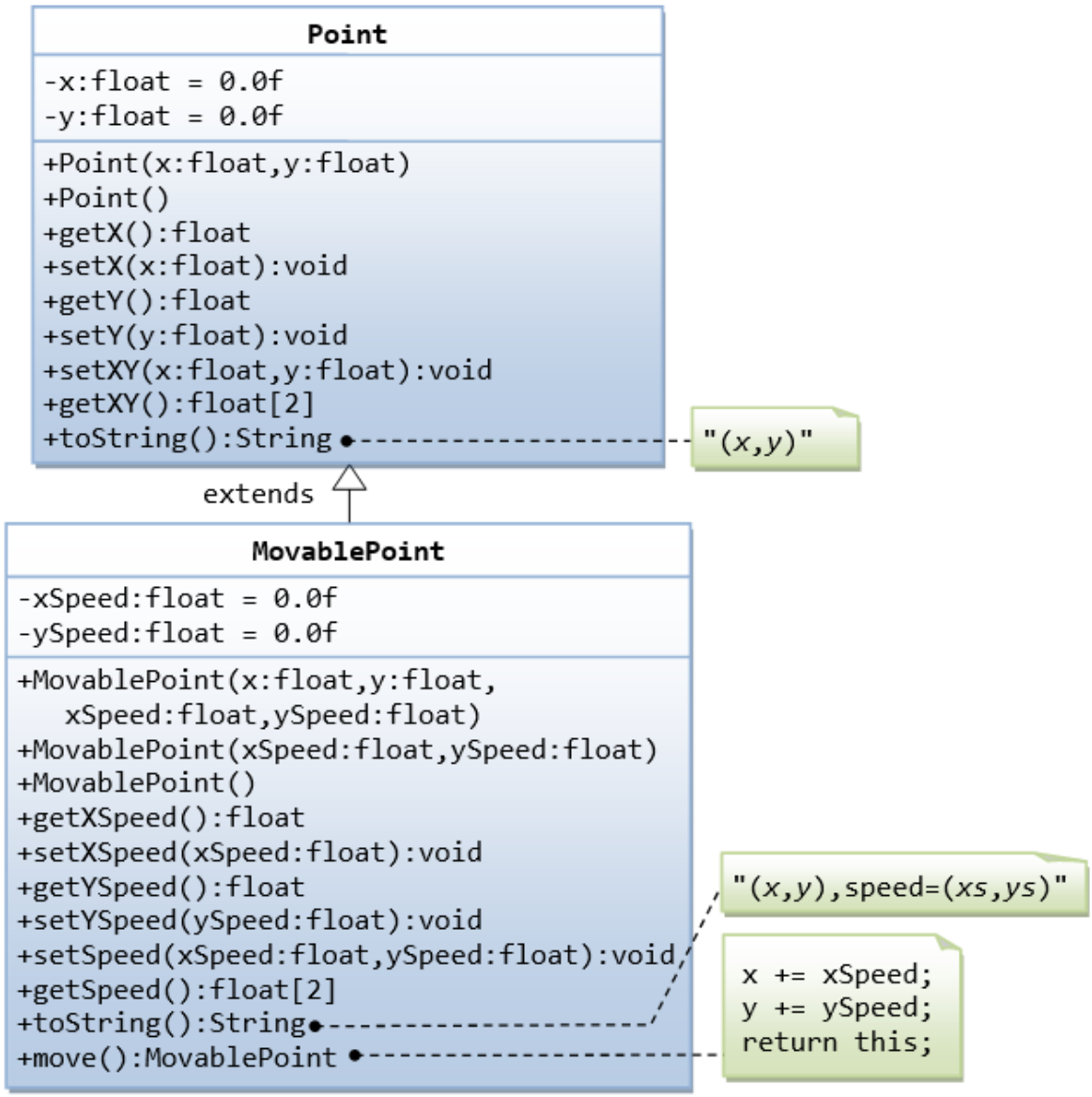
### Activity 1: Person

Implement the following classes defined as shown in the diagram. Note that you should mark all overridden methods with the annotation @Override.



## Activity 2: Point

Implement the following classes defined as shown in the diagram. Note that you should mark all overridden methods with the annotation @Override.




**Notice:**

- Floating-point literals are written with a decimal point. By default, a floating-point literal is treated as a **double** type value. For example, **5.0** is considered a **double** value, not a **float** value. You can make a number a **float** by appending the letter **f** or **F**, and you can make a number a **double** by

appending the letter **d** or **D**. For example, you can use **100.2f** or **100.2F** for a **float** number, and **100.2d** or **100.2D** for a **double** number.

- A private data field cannot be accessed by an object from outside the class that defines the private field. However, a client often needs to retrieve and modify a data field. To make a private data field accessible, provide a *getter* method to return its value. To enable a private data field to be updated, provide a *setter* method to set a new value. The getter method is also referred to as an *accessor* and a setter to a *mutator*.

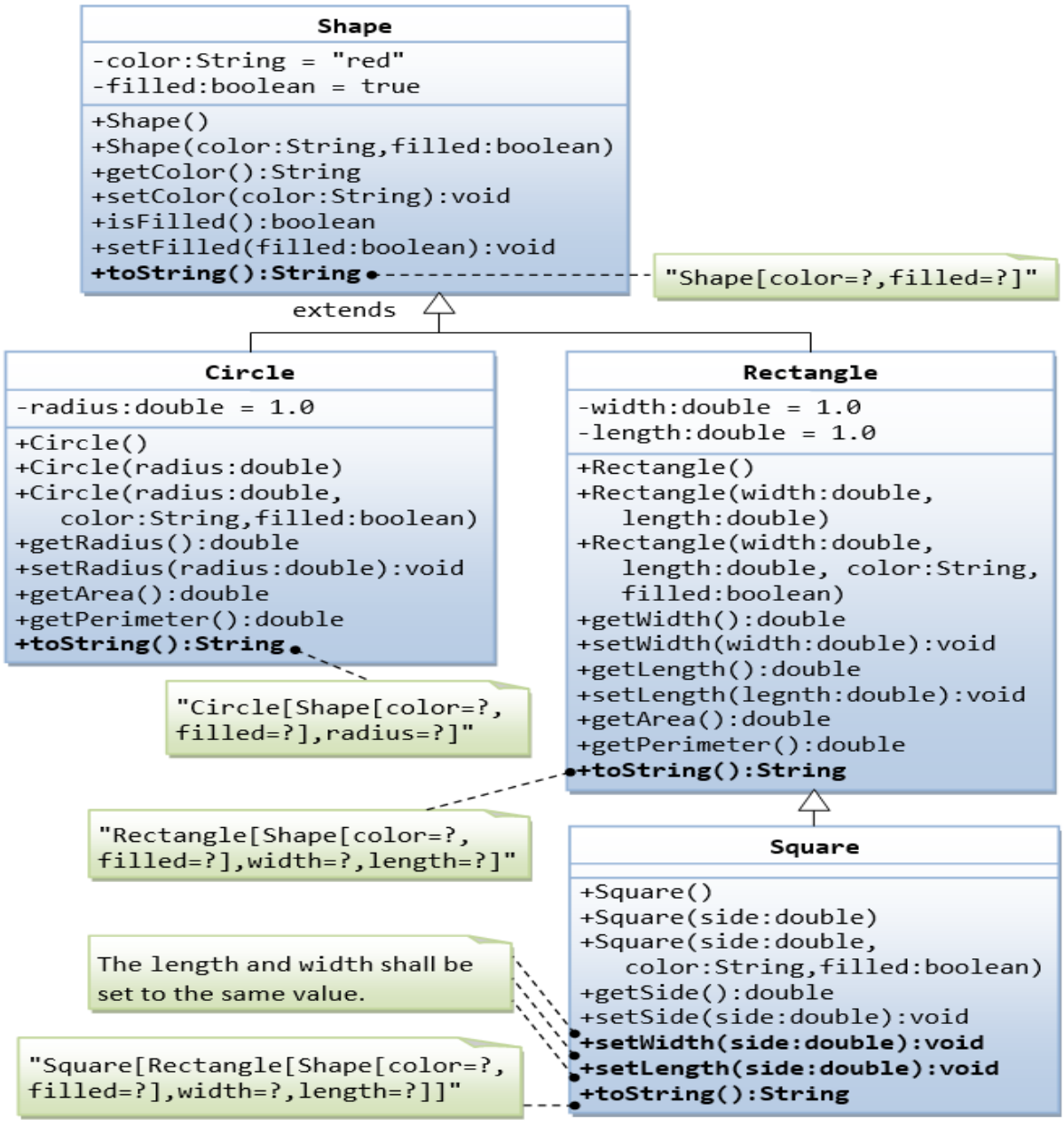
  - A getter method has the following signature:
    **public** returnType get*PropertyName*()

  - If the **returnType** is **boolean**, the getter method should be defined as follows by convention:
    **public boolean** is*PropertyName*()

  - A setter method has the following signature:
    **public void** set*PropertyName*(*dataType propertyValue*)

## Activity 3: Shape

In this exercise, you will be creating a Java program that models shapes using object-oriented programming principles. The program will include a superclass called **`Shape`**, which represents generic shapes, and two subclasses: **`Circle`** and **`Rectangle`**. Additionally, you will create a subclass of **`Rectangle`** called **`Square`**. The properties and methods defined as shown in the following diagram. Note that you should mark all overridden methods (denoted as **bold**) with the annotation @Override.



## Activity 4: SortingAlgorithm.java

In this exercise, your mission is to create a hierarchy of sorting integer arrays algorithms. You will start with a superclass called **`IntSortingAlgorithm`**, which will serve as the base class for implementing various sorting algorithms. The class should have the following properties and methods:

- **Properties:**
  - **name:** a string representing the name of the sorting algorithm.
  - **array:** an integer array to be sorted.
  - **sortedArray:** the sorted array.
- **Methods:**
  - **sort():** A method to sort an integer array in ascending order utilizing a specific sorting algorithm. The method should not return any value but store the sorted array in the `**sortedArray**` attribute of the class.
  - **isSorted ()**: a method to determine if the array is sorted in ascending order. It should return true if the array is sorted, otherwise false.
  - **toString()**: a method to return a string representation of the sorted array.

Any necessary methods such as getters, setters, and validators should also be implemented.

You are required to implement at least three more sorting algorithms that are inherited from the superclass. Examples of sorting algorithms you can implement include **Bubble sort**, **Quick sort**, **Merge sort**, etc. Note to draw the UML diagram.

## Activity 5: Cryptography (Optional)

In this exercise, you will implement a simple encryption. You will start with a superclass called `Cryptography`, which will serve as the base class for implementing various algorithms. The class should have (at least) the following properties and methods:

- **Properties:**
  - **plainText:** a string representing the plain text to be encrypted.
  - **cipherText:** a string representing the encrypted text.
- **Methods:**
  - **encrypt():** a method to implement the cipher encryption algorithm. The method should not return any value but store the encrypted text in the `**cipherText**` attribute of the class.
  - **decrypt()**: a method to implement the cipher decryption algorithm. The method should not return any value but store the plain text in the `**plainText**` attribute of the class.

Any necessary methods such as getters, setters, and validators should also be implemented.

You are required to implement at least three more algorithms that are inherited from the superclass. Examples of algorithms you can implement include **AES**, **RSA**, **Substitution Cipher**, **Caesar Cipher**, etc. Note to draw the UML diagram.

## Submission

Submit a zip file containing all Java programs to this tutorial's submission box in the course website on FIT Portal.