

Programming and Data Structures

Active Learning Activity 1: Review of Java Fundamentals and OOP concepts

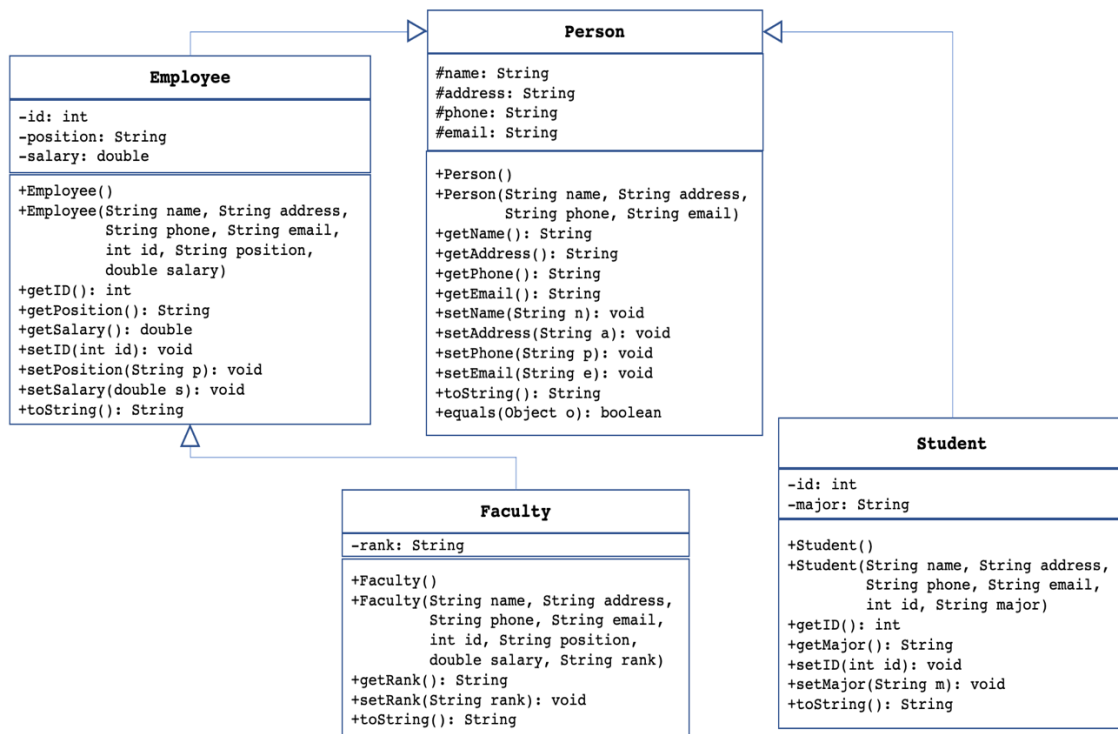
Activity Objectives

At the end of this activity, students should be able to:

1. Create classes in Java with the specified data members and methods
2. Create subclasses from a super class using inheritance
3. Override methods from the super class in the sub classes
4. Use super constructors in the subclasses
5. Use super and subclasses in a test program
6. Define methods that accept an array of objects of the super type and the array holds instances of the super and subclasses

Activity

1. Implement the hierarchy of classes shown in the UML diagram below:



2. Create a main class named **Test**. In the main method, create an array named **people** of type **Person** and size **4**. Create four objects of type **Person**, **Student**, **Employee**, and **Faculty**, and store them in the array **people**. Use the sample attributes provided below to create each object.

Type	Attributes
Person Object	Name: Helen Brown Address: 222 10th Street Bethlehem Phone: 610-334-2288 Email: hbrown@gmail.com
Student Object	Name: Paul Leister Address: 972 4th Street Allentown Phone: 610-331-7177 Email: gleister@gmail.com ID: 12345 Major: CSE
Employee Object	Name: Beth Down Address: 234 Main Street Philadelphia Phone: 484-222-4433 Email: bdown@gmail.com ID: 33442 Position: Systems Administrator Annual Salary: \$75000.00
Faculty Object	Name: Mark Jones Address: 21 Orchid Street Bethlehem Phone: 610-333-2211 Email: mjones@gmail.com ID: 22222 Position: Faculty Annual Salary: \$90000.00 Rank: Associate Professor

3. Print the information of the four objects by calling a method **printArray**. Sort the four objects based on the names by calling a method **sortArray** and call **printArray** again to display the sorted objects.
4. Define the method **printArray** that accepts an array of type **Person** and prints the information of the objects in the array.

5. Define the method **sortArray** that accepts an array of type **Person** and sorts the objects in the array based on the data member **name**. Use the selection sort algorithm (provided below for type **int**).

```
public static void selectionSort(int[] list){
    for(int i=0; i<list.length; i++){
        int minIndex = i;
        for(int j=i+1; j<list.length; j++){
            if(list[j] > list[minIndex])
                minIndex=j;
        }
        int temp = list[i];
        list[i] = list[minIndex];
        list[minIndex] = temp;
    }
}
```

IMPORTANT NOTE: In all the derived classes, the constructors should call the corresponding constructors from the base class and the method **toString()** should call **toString()** method from the base class. Your code must include Javadoc comments for each class and each method (see the Javadoc comments provided in the sample class **Person**).

Submit the files **Person.java**, **Student.java**, **Employee.java**, **Faculty.java**, and **Test.java** on Github.

A sample output of the program is provided below for testing.

Original list:

Name: Helen Brown

Address: 222 10th Street Bethlehem

Phone: 610-334-2288

Email: hbrown@gmail.com

Name: Paul Leister

Address: 972 4th Street Allentown

Phone: 610-331-7177

Email: pleister@gmail.com

ID: 12345

Major: CSE

Name: Beth Down
Address: 234 Main Street Philadelphia
Phone: 484-222-4433
Email: bdown@gmail.com
ID: 33442
Position: Systems Administrator
Salary: \$75000.00

Name: Mark Jones
Address: 21 Orchid Street Bethlehem
Phone: 610-333-2211
Email: mjones@gmail.com
ID: 22222
Position: Faculty
Salary: \$90000.00
Rank: Associate Professor

Sorted list:
Name: Beth Down
Address: 234 Main Street Philadelphia
Phone: 484-222-4433
Email: bdown@gmail.com
ID: 33442
Position: Systems Administrator
Salary: \$75000.00

Name: Helen Brown
Address: 222 10th Street Bethlehem
Phone: 610-334-2288
Email: hbrown@gmail.com

Name: Mark Jones
Address: 21 Orchid Street Bethlehem
Phone: 610-333-2211
Email: mjones@gmail.com
ID: 22222
Position: Faculty
Salary: \$90000.00
Rank: Associate Professor

Name: Paul Leister
Address: 972 4th Street Allentown
Phone: 610-331-7177
Email: pleister@gmail.com
ID: 12345
Major: CSE