**ICS 108 – Object-Oriented Programming**

**Lab # 10 – Polymorphism**

**Objectives:**

In this lab, the following topic will be covered:

1. Polymorphism

**Task**

Given below the classes Lab10, Person, Employee, and Student, complete the following program to produce the output provided.

**Note:**

* **Write the missing methods only.**
* **Do not modify the classes Person, Employee, Student.**
* **Do not change the main method.**
* **Put each class in a separate file**

Here is a sample run of the program:

List of Employees

Name Phone ID Salary

Saad 0563428255 200003 16000

Salem 0501331845 200001 9000

avg salary of = 12500.0

List of Students

Name Phone ID GPA

Reem 0564448202 20000 3.6

Hasan 0594448202 20002 2.8

avg GPA of students = 3.2

*// file Lab10.java*

**import** java.util.ArrayList;  
**public class** Lab10 {  
 **public static void** main(String[] args) {  
 ArrayList<Person> personList = *createPersonList*();  
*//1. This method prints the employees only*

*printEmployees*(personList);  
*//2. This method finds the average salary of employees*

**double** avgSalary = *avgSalary*(personList);  
 System.***out***.println(**"avg salary of = "** + avgSalary);  
*//3. This method prints the students only*

*printStudents*(personList);  
*//4. This method finds the average GPA of students*

**double** avgGpa = *avgGpa*(personList);  
 System.***out***.println(**"avg GPA of students = "** + avgGpa);  
 }  
  
 **private static** ArrayList<Person> createPersonList() {  
 ArrayList<Person> personList = **new** ArrayList<>();  
 personList.add(**new** Employee(**"Saad"**, **"0563428255"**, 200003, 16000));  
 personList.add(**new** Student(**"Reem"**, **"0564448202"**, 20000, 3.6));  
 personList.add(**new** Employee(**"Salem"**, **"0501331845"**, 200001, 9000));  
 personList.add(**new** Student(**"Hasan"**, **"0594448202"**, 20002, 2.8));  
 **return** personList;  
 }  
}

*// file Person.java*

**public class** Person {  
 **private** String **name**, **phone**;  
  
 **public** Person(String name, String phone) {  
 **this**.**name** = name;  
 **this**.**phone** = phone;  
 }  
  
 @Override  
 **public** String toString() {  
 **return name** + **"\t"** + **phone**;  
 }  
}

*// file Employee.java*

**public class** Employee **extends** Person{  
 **private int sid**;  
 **private int salary**;  
  
 **public** Employee(String name, String phone, **int** sid, **int** salary) {  
 **super**(name, phone);  
 **this**.**sid** = sid;  
 **this**.**salary** = salary;  
 }  
  
 **public int** getSalary() {  
 **return salary**;  
 }  
  
 @Override  
 **public** String toString() {  
 **return super**.toString() + **"\t"** + **sid** + **"\t"** + **salary**;  
 }  
}

*// file Student.java*

**public class** Student **extends** Person{  
 **private int sid**;  
 **private double gpa**;  
  
 **public** Student(String name, String phone, **int** sid, **double** gpa) {  
 **super**(name, phone);  
 **this**.**sid** = sid;  
 **this**.**gpa** = gpa;  
 }  
  
 **public double** getGpa() {  
 **return gpa**;  
 }  
  
 @Override  
 **public** String toString() {  
 **return super**.toString() + **"\t"** + **sid** + **"\t"** + **gpa**;  
 }  
}