Programming I - Assignment 5

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Question 1
ACME University, have requested the development of an application to collect exam result information for each student sitting exams. The application should allow the user to enter the name, ID number and exam results (which lie in the range of 0- 100) for each student. The student population is made up of both undergraduate and postgraduate students and students are each required to sit 3 exams. The calculation of a pass mark differs for both undergraduate and postgraduate students. Undergraduate Students pass if the average mark of their 3 exam results is greater than or equal to 40. Postgraduate students pass if the average mark over the 3 exams is 50 or above.

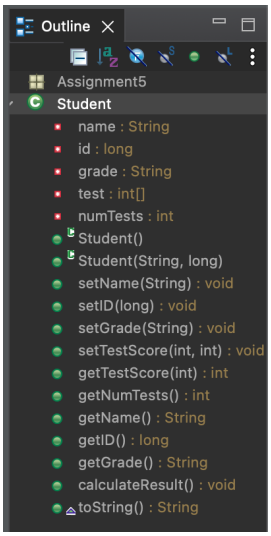
You are required to: Implement the inheritance hierarchy illustrated above. Implement a client class which implements an array of three students containing a mix of both postgraduate and undergraduate students and display their names, ID numbers and whether they have passed or failed.

Code for the Student Class:

```
package Assignment5;

/**
 *
 * This class is going to be the super class
 *
 */
public class Student {

	//Instance private variables
	private String name;
	private long id;
	private String grade;
	private int[] test = new int[3];
	private int numTests=3;

	// Create public constructor without return type
	// Initialize the variables
	public Student() {
		name ="Unassigned";
		id = 0l;


	}
	// Overloaded constructor with 2 arguments
	public Student(String name, long id) {
		this.name = name;
		this.id = id;

	}


	// Public Getters & Setters for each private variable
	public void setName(String name) {
```

```
		this.name = name;
	}

	public void setID(long id) {
		this.id = id;
	}

	public void setGrade(String grade) {
		this.grade = grade;
	}

	public void setTestScore(int index, int mark){
		test[index] = mark;

	}

	public int getTestScore(int num){
		return test[num];

	}

	public int getNumTests() {
		return numTests;


	   }


	public String getName() {
		return name;
	}

	public long getID() {
		return id;
	}

	public String getGrade() {

		return grade;
	}

	//Behavior is empty as it will be overridden  in the subclasses
	public void calculateResult() {


	}

	//Override toString to print the result in a predefined format
	public String toString() {
		return "Student [name=" + name + ", id=" + id + ", grade=" + grade + "]";
	}

} //end of class
```

Student Outline:

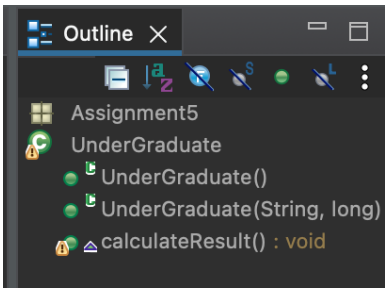


Code for the UnderGraduate Subclass:

```
package Assignment5;

import java.util.Scanner;

/**
 *
 * This is the subclass that will inherit all the methods from Student Class
 *
 */
public class UnderGraduate extends Student {

	public UnderGraduate() {
		super();
	}

	public UnderGraduate(String name, long id) {
		super(name, id);

	}

	/**
	 * Override the inherited calculateResult() method to take the 3 users inputs,
	 * sum them and calculate the average
	 * for Undergraduate students to pass the average must be equal or greater than 40
	 * This method will set the grade to either Pass or Fail
	 */
	public void calculateResult() {
		Scanner scanner = new Scanner(System.in);
		int sum = 0;
	   for(int i = 0; i< getNumTests(); i++) {
	      int score = scanner.nextInt();
	      setTestScore(i,score);
	      sum += getTestScore(i);
			int average = sum / getNumTests();

			if(average >= 40){
			   setGrade("Pass");
```

```
                    }else{
                        setGrade("Fail");
                    }

            }
    }
} // end of class
```

UnderGraduate Outline:

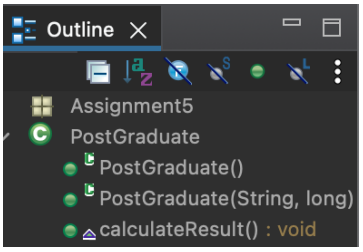


Code for the PostGraduate Subclass:

```
package Assignment5;

import java.util.Scanner;

/**
 *
 * This is the subclass that will inherit all the methods from the Student Class
 *
 */
public class PostGraduate extends Student {

        public PostGraduate() {
                super();
        }

        public PostGraduate(String name, long id) {
                super(name, id);
        }

        /**
         * Override the inherited calculateResult() method to take the 3 users inputs,
         * sum them and calculate the average for Undergraduate students to pass the
         * average must be equal or greater than 40 This method will set the grade to
         * either Pass or Fail
         */
        public void calculateResult() {
                Scanner scanner = new Scanner(System.in);
                int sum = 0;
                for (int i = 0; i < getNumTests(); i++) {
                        int score = scanner.nextInt();
                        setTestScore(i, score);
                        sum += getTestScore(i);
                        int average = sum / getNumTests();

                        if (average >= 50) {
```

```
                    setGrade("Pass");
                } else {
                    setGrade("Fail");
                }

            }

        }
} // end of class
```

PostGraduate Outline:



Code for the Client Class:

```
package Assignment5;

import java.util.Scanner;

public class Client {

    static Scanner scanner = new Scanner(System.in);

    public static void main(String[] args) {

        // Create an array of three students containing a mix of postgraduates and
        // undergraduates

        Student[] students = new Student[3];
        students[0] = new UnderGraduate("Bob", 101010l);
        students[1] = new UnderGraduate("Ana", 101011l);
        students[2] = new PostGraduate("Kim", 101012l);

        // Asking the user to enter the name, ID number and exam results and store their
        // response
        System.out.print("Please type your name: ");
        String name = scanner.nextLine();

        System.out.print("Please type your ID number: ");
        long studentID = scanner.nextLong();

        System.out.print("Please enter the three required exam results ( From 0 to 100): ");
        // Calling the getName() method to compare the name inputed by the user with the
        // name on the array
        for (int i = 0; i < students.length; i++) {
            if (students[i].getName().equalsIgnoreCase(name)) {
```

```
                                    // if the student is an Undergraduate, it will call the
                                    calculateResult() method from the UnderGraduate Class
                                    // and if the student is a Postgraduate, it will call the
                                    //calculateResult() method from the PostGraduate Class
                                    // then it calculates and prints out the user's final grade
                                    students[i].calculateResult();
                                    System.out.println(students[i].toString());
                            } // end of if
                    } // end of for loop

            } // end of main() method

} //end of class
```

Client output: