Time: 80 minutes

BIRZEIT UNIVERSITY
COMP1331 (2nd Semester 2021/2022)
Midterm Exam (May 25, 2022)

/100

Student Name: _____ Student ID#:_____

Instructor	Lab
Dr. Mohammad	Lab1 – R ○
Dr. Bassem	Lab2 – T ○
	Lab3 – R ○
Mr. Hafez	Lab4 – W ○
	Lab5 – R ○
Dr. Mamoun	Lab6 – W ○
	Lab7 – T ○

[Q1 15%]:
What is the output of the following code?

	Code	Output

1	`public class Test {`
	`  public static void main(String[] args) {`
	`  System.out.print("Computer");`
	`  System.out.print("Science!");`
	`  }`
	`}`
		ComputerScience!

2	`public class Test {`
	`  public static void main(String[] args) {`
	`  int[] x = { 1, 2 };`
	`  int i = 1;`
	`  m(i, x);`
	`  System.out.print(i + " , " + x[0]);`
	`  }`
	
	`  public static void m(int i, int[] list) {`
	`  i = 11;`
	`  list[0] = 11;`
	`  }`
	`}`
		1 , 11

3	`public class Test {`
	`  public static void main(String[] args) {`
	`  int[] list1 = { 1, 2, 3 };`
	`  int[] list2 = list1;`
	`  list2[1] = 10;`
	`  System.out.println(list1[1]);`
	`  }`
	`}`
		10

4	`public class Test {`
	`  static int count = 0;`
	
	`  public static void main(String[] args) {`
	`  f(4);`
	`  System.out.println(count);`
	`  }`
	
	`  public static int f(int n) {`
	`  count++;`
	`  if (n == 0)`
	`  return 1;`
	`  else`
	`  return f(n - 1) + n * n;`
	`  }`
	`}`
		5

5	`public class Test {`
	`  public static void main(String[] args) {`
	`  A a1 = new A();`
	`  System.out.print(a1.j);`
	`  A a2 = new A();`
	`  System.out.print(" " + a2.j);`
	`  }`
	`}`
	
	`class A {`
	`  int i = 1;`
	`  static int j = 1;`
	
	`  A() {`
	`  i++;`
	`  j++;`
	`  }`
	`}`
		2 3

[Q2 20%]
For each of the following programs, determine the error and highlight/explain it.

	Code	Error

1	`class Test {`
	`  private double i;`
	`  public Test(double i) {`
	`  this.t();`
	`  this.i = i;`
	`  }`
	`  public Test() {`
	`  System.out.println("Default constructor");`
	`  this(1);`
	`  }`
	`  public void t() {`
	`  System.out.println("Invoking t");`
	`  }`
	`}`
		this(1) must be called before System.out.println("Default constructor").

2	`public class Test {`
	`  public static void main(String[] args) {`
	`  int n = 2;`
	`  xMethod(n);`
	`  System.out.println("n is " + n);`
	`  }`
	`  private void xMethod(int n) {`
	`  n++;`
	`  }`
	`}`
		xMethod is not declared static.

3	`public class Test {`
	`  int x;`
	`  public Test(String t) {`
	`  System.out.println("Test");`
	`  }`
	`  public static void main(String[] args) {`
	`  Test test = new Test();`
	`  System.out.println(test.x);`
	`  }`
	`}`
		Test does not have a default constructor.

4	`class Test {`
	`  public static void main(String[] args) {`
	`  Random r;`
	`  System.out.println("r is " + r);`
	`  }`
	`}`
		r is not initialized

5	`public class Test {`
	`  public static void main(String[] args) {`
	`  int list = new int[4];`
	`  for (int i = 0; i <= list.length(); i++) {`
	`  sum += list[i];`
	`  }`
	`  }`
	`}`
		<= ArrayIndexOutOfBoundException.

[Q3 30%]
Write a java program that displays a **Pascal triangle**. The program prompts the user to enter the number of **rows** and displays the triangle. Here is a sample run:
Note: You might need to write a method that computes the value V(r, c) = $\frac{r!}{(r-c)!c!}$

Where **r** is for row number (starts from 0) and **c** for the column number (starts from 0). e.g. **V(4, 2) = 6** ➔

```
Enter the number of rows: 6
                1
              1   1
            1   2   1
          1   3   3   1
        1   4   6   4   1
      1   5  10  10   5   1
```

```
import java.util.*;

public class Test {
    public static void main(String[] args) {
        System.out.print("Enter the number of rows: ");
        Scanner in = new Scanner(System.in);
        int n= in.nextInt();
        for(int r=0; r<n; r++){
            for(int s=r; s<n;s++)
                System.out.print("   ");
            for(int c=0; c<=r; c++)
                System.out.printf("%4d",v(r,c));

            System.out.println("");
        }
    }
    private static int v(int r, int c){
        return f(r)/(f(r-c)*f(c));
    }
    private static int f(int n){
        int res = 1;
        for(int i = 2; i<=n; i++)
            res *=i;
        return res;
    }
```


[Q4 35%]
A) Design a class named **Student**. The class contains:

- A public ***id*** number with a default value of ***1234567***.
- A String **name** with a default value of ***Abbass***.
- A private char ***gender*** with a default value of ***M*** and a setter method. Note gender valid values are ***M*** or ***F***.
- A private double array for ***grades*** with a default value of one grade ***55*** and add a setter method that takes double array.
- A private Date for ***enrollment date*** with a default value of current system date.
- A private static int for ***study plan*** with a default value of ***129*** and a getter method.
- A no-argument constructor that creates a default student object using the default values.
- An argument constructor that takes id, name, and gender to create a student object using the input arguments.
- A private method ***calculateAverage*** that calculates and returns the average grades.
- A public method ***getLetterGrade*** that calculates the grades and return the letter grade according to the following criteria:
  - Average >= 90 ➔ **A**
  - 90 > Average > 80 ➔ **B**
  - 80 >= Average > 70 ➔ **C**
  - 70 >= Average >= 60 ➔ **D**
  - Average < 60 ➔ **F**
- A public method ***printStudentInfo*** that generate an output like the following:

```
Student ID: 1213456
Name: Mamoun
Gender: M
Study Plan: 129
Enrollment Date: Sat May 21 09:28:48 AST 2022
Letter Grade: B
```

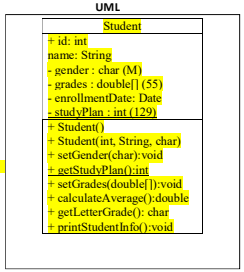
Draw a UML diagram for the **Student** class and then implement the class:

```
import java.util.Date;
public class Student {

    public int id;
    String name;
    private char gender = 'M';
    private double[] grades = {55};
    private Date enrollmentDate;
    private static int studyPlan = 129;

    public Student() {
        this(1234567, "Abass", 'M');
    }
    public Student(int id, String name,
            char gender) {
        this.id = id;
        this.name = name;
        setGender(gender);
        enrollmentDate = new Date();
```

UML




```
    }
    public void setGender(char gender) {
        if(gender == 'M' || gender == 'F')
            this.gender = gender;
    }
    public static int getStudyPlan() {
        return studyPlan;
    }

    public void setGrades(double[] grades) {
        this.grades = new double[grades.length];
        System.arraycopy(grades, 0, this.grades, 0, grades.length);
    }

    private double calculateAverage() {
        double res = 0;
        for(double d: grades)
            res += d;
        return res/grades.length;
    }
    public char getLetterGrade() {
        double res = calculateAverage();
        if(res >= 90)                   return 'A';
        else if (res > 80)              return 'B';
        else if (res > 70)              return 'C';
        else if (res >= 60)             return 'D';
        return 'F';
    }
    public void printStudentInfo() {
        System.out.println("Student ID: " + id +
                "\nName: " + name +
                "\nGender: " + gender +
                "\nStudy Plan: " + studyPlan +
                "\nEnrollment Date: " + enrollmentDate +
                "\nLetter Grade: " + getLetterGrade());
    }
```

B) Write a test program that create a student object with the following information:

- Id ➔ 1213456
- Name ➔ Mamoun
- Gender ➔ M
- Grades ➔ 95.5 , 87.6, and 70.4

Then call method ***printStudentInfo***

```
public class Driver {
    public static void main(String[] args) {
        double[] grades = {95.5, 87.6, 70.4};
        Student s1 = new Student(1213456, "Mamoun", 'M');
        s1.setGrades(grades);
        s1.printStudentInfo();
    }
}
```

Good Luck!!