

ITEC1620: Object-Based Programming

Assignment 1

Assignment instructions. Please READ CAREFULLY.

- a- The due date for this assignment is **Oct. 11, 2022, at 11:59 pm (firm date)**. **No LATE SUBMISSIONS** are accepted.
- b- You need to submit your assignments to eClass. You should only submit .java or /txt files (**NO OTHER FORMAT IS ACCEPTED**). You need to use Eclipse IDE for the assignment. If you have any issues, please let your TA know; otherwise, you will not get any marks on the assignment if it is not submitted on eClass and by the due date.
- c- In each program, add at the beginning **a comment** with your name and student number.
- d- You need to add comments to your code to explain your solution steps in each question. Do not add unnecessary comments.
- e- For the below questions, **YOU SHOULD NOT USE LOOPS (for, while....) OR CONDITIONALS (if..else,...)**, otherwise, you will lose one mark out of 5. The objective of this assignment to assess your understanding of primitive data types and expressions.

Questions

- 1- Write a Java code that asks the user to enter the integer (x, y) coordinates of two points that form a straight line, reads these coordinates, and calculate the slope (a) and the slope-intercept (b) that form the equation of the straight line as follows:

$$\begin{aligned}y &= ax + b \\ a &= (y_2 - y_1)/(x_2 - x_1) \\ b &= y_2 - a * x_2\end{aligned}$$

Then ask the user to enter the integer (x_A , y_A) coordinate of a point A, read this data, and calculate the distance from this point A to the above straight line:

Then you need to get the equation of the line that passes through A and is perpendicular to the original one as follows:

The slope of the perpendicular line (a_P) is the negative inverse of the slope of the original line:

$$a_P = -1/a$$

The slope-intercept (b_P) of the perpendicular line is calculated by replacing the coordinates of point A into the equation:

$$b_p = y_A - a_p x_A$$

Once you get the equation of the perpendicular line, you need to calculate the coordinates (x_I, y_I) of the intersection point between the original line and the perpendicular one as follows.

$$x_I = \frac{b_p - b}{a - a_p}$$

$$y_I = ax_I + b$$

Lastly, get the distance as follows:

$$distance = \sqrt{(x_A - x_I)^2 + (y_A - y_I)^2}$$

When printing the slope and the slope-intercept values, DON'T ENTER THEM MANUALLY (otherwise marks will be deducted).

The output should be as follows

```
Enter the x coordinate of point 1: 3
Enter the y coordinate of point 1: 7
Enter the x coordinate of point 2: 5
Enter the y coordinate of point 2: 11

The slope of the line is: 2.0
The slope intercept of the line is: 1.0

The line equation is: y = 2.0x + 1.0!!

Here is the line equation with integer format: y = 2x + 1!!

Enter the x coordinate of point A: 1
Enter the y coordinate of point A: 1

The slope of the perpendicular line is: -0.5
The slope intercept of the perpendicular line is: 1.5

The coordinates of the intersection point are x = 0.2 and y = 1.4

The distance from point A to the line is: 0.8944271909999159!!
```

- 2- Write a Java program that prints the following output. Note that the numbers shown in the output should not be hardcoded (**should not be written manually when printing**), you should declare an integer variable, ask the user to give you lab and bonus marks, and then calculate the total and print the numbers accordingly. You should also use “**escape sequences**” as well when printing out these drawings. **The student info should be entered by the user.** Make sure to have the spaces in your code, otherwise, **marks will be deducted**. DON'T ENTER/WRITE THE STUDENT NAMES/MARKS/TOTAL MARK MANUALLY (OTHERWISE MARKS WILL BE DEDUCTED).

The output is as follows.

```
Let's do some printing :)

*
****
****
***
*

////////////////////////////////////////
Enter info
////////////////////////////////////////

Enter students names:
John
William
Ann
MaryLin

Enter students lab marks:
34
56
45
75

Enter students bonus marks:
3
4
2
5

////////////////////////////////////////
Student info
////////////////////////////////////////

Name          Lab      Bonus      Total
-----
John           34         3          37
William        56         4          60
Ann            45         2          47
MaryLin        75         5          80

*
*
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\ 'Enjoy the term!' \\\\\\\
```

- 3- Write a Java code that asks the user to enter the radius r of a sphere, reads it, and calculate the volume and area of the sphere as follows:

$$Area = 4\pi r^2$$

$$Volume = \frac{4}{3}\pi r^3$$

For this question, you should use Math function for doing the “power” and “ π ”. When printing the volume and the area values, DON’T ENTER THEM MANUALLY (otherwise marks will be deducted). Only print 2 numbers after the decimal points.

The output should be as follows

```
Enter the radius of the sphere: 10

The area of the sphere is: 1256.64
The volume of the sphere is: 4188.79
```

Good luck!