

ITEC1620: Object-Based Programming

Assignment 1

Assignment instructions. Please READ CAREFULLY.

- a- The due date for this assignment is **Oct. 9, 2020, 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 mark 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_A , y_A) coordinate of a point A and the slope (a) and the slope-intercept (b) of a straight line, reads these data, and calculate the distance from this point A to the given straight line:

Line equation: $y = ax + b$

After reading the coordinates of the point and the line equation, you need to get the equation of the line that passes through A and 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 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 A: 1
Enter the y coordinate of point A: 1
Enter the slope of the line: 1
Enter the slope-intercept of the line: 10
```

```
The slope of the perpendicular line is: -1.0
The slope intercept of the perpendicular line is: 2.0
```

```
The corrdinates of the intersection point are x = -4.0 and y = 6.0
```

```
The distance from point A to the line is: 7.0710678118654755!!
```

- 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, initialize, and use “incrementation” and addition expressions to print these numbers. You should also use “**escape sequences**” as well when printing out these drawings. **The first message should be entered by a user through the keyboard.** Make sure to have the spaces in your code, otherwise, **marks will be deducted.**

The output is as follows.

```
Enter greeting message:
Here are some shapes
```

```
Here are some shapes
```

```

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

*****
*      *
*      *
*      *
*      7      *
*      8      *
*      *
*     14      *
*     16      *
*      *
*      *
*      *
*****

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

```

```
\ 'Enjoy!' \\\
```

- 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!