ECE25100 Object Oriented Programming
Lab 1: Hello, Java World

Description:

The purpose of this lab is to help you:

get familiar with JDK and JCreator/Eclipse IDE.

understand how to perform simple computations, format numbers for display purposes and make use of the **IF** statement.

To get credit for the lab, you need to demonstrate to the instructor/lab assistant that you have completed all the requirements, and sign your name on the grade sheet.

QUESTION 1:

Compile, run and test the examples from the lecture notes.

QUESTION 2:

Complete the code below (i.e., copy/paste into a new file called **StarDisplay.java**) to display a banner like this

```
************
************
**
**
**
************
************
          **
          **
          **
************
************
```

```
public class StarDisplay {
   public void displayStar( ){
   // display the banner
   }
}
```

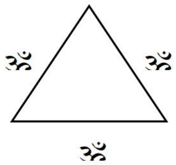
Copy/paste the source code below into a new file called **StarDisplayTest.java** and test the class **StarDisplay**.

```
public class StarDisplayTest {
   public static void main(String args[]) {
      StarDisplay s = new StarDisplay( );
      s.displayStar();
   }
}
```

QUESTION 3:

The area of an equilateral triangle is computed as follows (given that all sides have length **a**):

$\frac{S2}{3}$'ॐ^{1}(



Complete the code below (i.e., copy/paste into new files called **AreaProgram.java** and **AreaProgramTest.java**) to compute the area of the triangle. Test your code to see whether it is correct. When **a=1** the area is around **0.433**, when **a=5** the area is around **10.825**.

```
public class AreaProgram {
   double  a;
   double  area;
   public double computeArea( ){
      // compute the area
   }
}

public class AreaProgramTest {
   public static void main(String args[]) {
   AreaProgram areaProgram = new AreaProgram( );
   System.out.println("The area is "+areaProgram.computeArea( ));
   }
}
```

QUESTION 4:

Below is some code to display some monetary values. Create new files called **MoneyProgram.java** and **MoneyProgramTest.java** and paste the code below in them, then compile and run the code:

```
public class MoneyProgram {
   float    a = 10.00f;
   float    b = 20.20f;
   float    c = 3.01f;
   float    d = 0.12f;
   float    e = 67.78923f;

   public void display(){
      System.out.println(a);
      System.out.println(b);
      System.out.println(c);
      System.out.println(d);
      System.out.println(e);
   }
}

public class MoneyProgramTest {
   public static void main(String args[]) {
   MoneyProgram  m = new MoneyProgram( );
      m.display();
   }
}
```

The code produces the following output:

```
10.0
20.2
3.01
0.12
67.78923
```

Adjust the code so that it produces the nicely formatted output as shown below. You may use the **printf** (see below for hint).

```
$10.00
$20.20
$3.01
$0.12
$67.79
```

Hint: Here are some examples of how you may do this:

```
System.out.printf("printf displays it as %.2f   \n", 67.78923);
```

QUESTION 5:

Here is a simple piece of code that asks the user whether they are male or female. Save, compile, run and test the code in two file called **UnderstandingIFProgram.java and UnderstandingIFProgramTest.java**:

```
public class UnderstandingIFProgram{
   private char input;
   private boolean male;

   public void question(){
       System.out.print("Are you (M)ale or (F)emale ? ... ");
       input = new java.util.Scanner(System.in).nextLine().charAt(0);

       if ((input == 'M') || (input == 'm'))
          male = true;
       else
          male = false;

       if (male == false)
          System.out.println("OK, now I know that you are a female.");
       else
          System.out.println("OK, now I know that you are a male.");
   }
}
public class UnderstandingIFProgramTest {
   public static void main(String args[]) {
      UnderstandingIFProgram u = new UnderstandingIFProgram();
      u.question();
   }
}
```

The code is not efficient. Replace all of this code:

```
if ((input == 'M') || (input == 'm'))
    male = true;
else
    male = false;
```

with this:

```
male = (input == 'M') || (input == 'm');
```

Can you explain why the code still works the same? Now replace this line:

```
if (male == false)
```

with this one:

```
if (!male)
```

Do you understand why the code works the same way? It is important to understand how booleans can be used efficiently with **IF** statements as shown here.

QUESTION 6:

Write a class named Robot that takes a point (x,y) to represent a robot's initial location (in centimeters) as well as its orientation (an angle called **theta** which is a value between 0 and 360 degrees). You can either set these values in your code directly or ask the user for them (using the **Scanner** class). They could all be integers.

Assume the robot moves forward **d** centimeters. Compute and display the final location of the robot after it moves. The new location is computed as point
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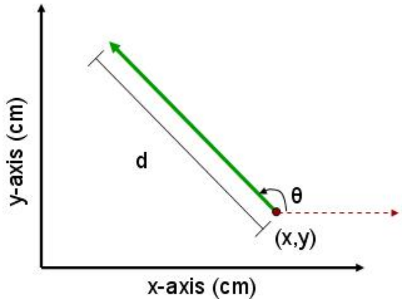
Remember that the sine and cosine functions in JAVA use radians, not degrees.

To convert degrees to radians, you need to multiply the degrees by **Math.PI/180** and if you need to convert from radians to degrees you can multiply the radians by **180/Math.PI**.

Write a class called RobotTest to test your code...remembering that 0 degrees is to the right (as shown below in red), 90 degrees is up, 180 degrees is left and the angle **theta** shown below is around 135 degrees.


y-axis (cm)
d
θ
(x,y)
x-axis (cm)