

Family Name: Other Names:

Student ID: Signature.....

Java Programming: Test 1

2016, Oct 10 ** WITH SOLUTIONS **

Instructions

- Time allowed: **90 minutes**
- Answer **all** the questions. There are 50 marks in total.
- Write your answers in this test paper and hand in all sheets.
- If you think some question is unclear, ask for clarification.
- Brief Java documentation is provided with the test
- This test contributes 10% of your final grade
(But your mark will be increased to your exam mark if that is higher.)
- You may use dictionaries.
- You may write notes and working on this paper, but make sure your answers are clear.

Questions

Marks

1. Programs with variables	[11]	<input type="text"/>
2. Programs with text input and output	[7]	<input type="text"/>
3. Programs with Strings	[6]	<input type="text"/>
4. Programs with graphical output	[12]	<input type="text"/>
5. Programs with objects	[9]	<input type="text"/>
6. Programs with methods and parameters	[5]	<input type="text"/>
	TOTAL:	<input type="text"/>

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
Specify the question number for work that you do want marked.

Question 1. Programs with variables**[11 marks]**(a) **[5 marks]**

What will the following printStuff method print out if the user types the values 5 and 11 in response to the questions?

```
public void printStuff (){  
    double abc = Ul.askDouble("First number:");  
    double def = Ul.askDouble("Secnd number:");  
    Ul.println (abc);  
    Ul.println ("not " + def);  
    double ghi = abc * def;  
    Ul.println (abc + " plus " + def + " makes "+ ghi);  
}
```

Note: the first two lines with the questions are shown already.

```
First number: 5  
Secnd number: 11  
5.0  
not 11.0  
5.0 plus 11.0 makes 55.0
```

(b) [6 marks]

What will the following printValues method print out?

```
public void printValues(){
    double x = 50;
    double y = 20;
    double z = x + y;
    Ul.println("z is " + z);

    x = y;
    y = x;
    Ul.println("x is " + x);
    Ul.println("y is " + y);

    z = z + y;
    Ul.println("z is " + z);

    z = x - z;
    Ul.println("z is " + z);
}
```

x:

y:

z:

```
z is 70.0
x is 20.0
y is 20.0
z is 90.0
z is -70.0
```

Question 2. Programs with text input and output**[7 marks]**

Complete the following `calculateCylinder` method that will ask the user for the height and radius of a cylinder and then print out the volume of the cylinder ($2\pi r^2 h$).

You may use the value 3.14159 or the constant `Math.PI` in your method.

```
public void calculateCylinder (){
    double height = UI.askDouble("Height:");
    double radius = UI.askDouble("Radius:");
    double vol = 2 * Math.PI * height * radius * radius;
    UI.println ("Volume " + vol);
}
```

Question 3. Programs with Strings**[6 marks]**

You may need to refer to the String class on the documentation page for this question.

What will the following processWords method print out if the user gives the answer "Ping Yang Li" to the question?

```
public void processWords(){
    String place = UI.askString("Where do you live");
    UI.println ("One: " + place);

    UI.println ("Two: " + place.length());

    String loc = place.toUpperCase();
    UI.println ("Three: " + loc);

    place = place + place;
    UI.println ("Four: " + place);

    String mid = place.substring (0,4);
    UI.println ("Five: " + mid);

    mid = place.substring (5,11);
    UI.println ("Six: " + mid);
}
```

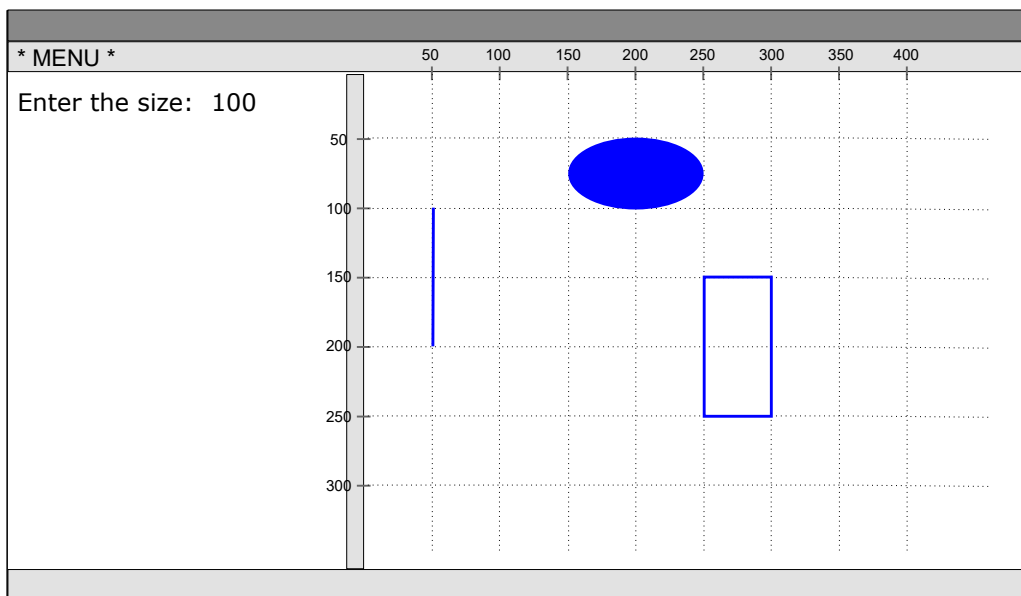
```
Where do you live: Ping Yang Li
One: Ping Yang Li
Two: 12
Three: PING YANG LI
Four: Ping Yang LiPing Yang Li
Five: Ping
Six: Yang L
```

Question 4. Programs with graphical output**[12 marks]**

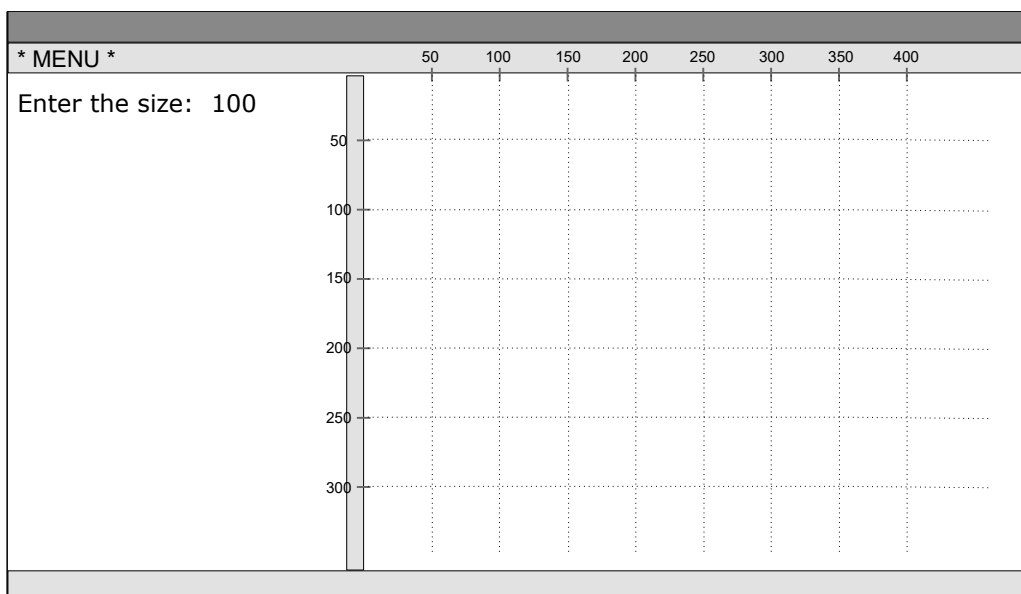
(a) [5 marks] Sketch what the following drawlt() method will draw in the graphics pane, if the user types 100 when asked for the size?

```
public static final double width = 50;

public void drawlt(){
    double size = UI.askDouble("Enter the size:");
    UI.drawRect(250, 150, width, size);
    UI.fillOval (150, 50, size, width);
    UI.drawLine(width, size, width, 2 * size);
}
```

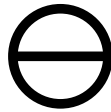


Extra copy (in case you made a mistake):



(b) [7 marks]

Complete the following drawSign() method so that it draws the following sign in the UI window.



drawSign should

- Ask the user for the center of the sign (x and y) and the diameter.
- Compute values of the left, top, and right of the sign, and put them in variables.
- Set the line width to be 1/10 of the diameter,
- Draw the sign, using the variables.

```
public void drawSign(){
    double x = UI.askDouble("x:");
    double y = UI.askDouble("y:");
    double diam = UI.askDouble("diam:");
    double left = x - diam/2;
    double top = y - diam/2;
    double right = x + diam/2;

    UI.setLineWidth(diam/10);
    UI.drawOval(left, top, diam, diam);
    UI.drawLine(left, y, right, y);

}
```


Question 5. Programs with objects**[9 marks]**

A turtle robot is a small mobile robot with a pen that can be “off” or “on”. The robot can move around on a large sheet of paper. If its pen is “on”, then it will leave a line on the paper as it moves; if its pen is “off”, then it moves without leaving a line.

The TurtleRobot class defines simulated turtle robots. It has a constructor and four methods. Here is the documentation:

```

/** Constructor: */
    TurtleRobot(Color penColor)
    // Creates a new TurtleRobot at the center of the window, facing to the right.
    // The parameter specifies the color of the robot's pen.
    // The pen is initially "off".

/** Methods: */
    void penOff()
    // Lift the pen up, so it won't leave a line.

    void penOn()
    // Put the pen down, so it will leave a line.

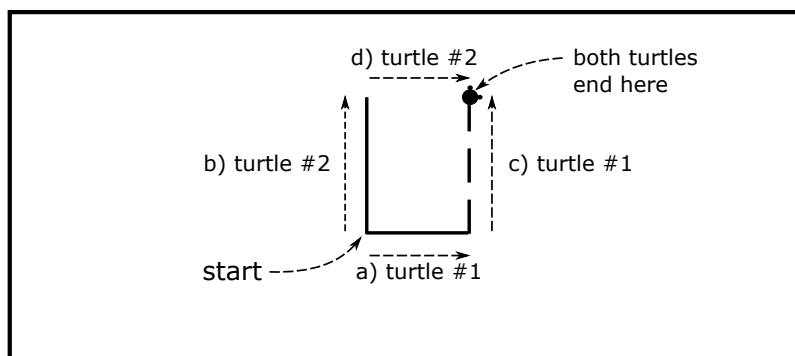
    void forward(double distance)
    // Move forward by the specified distance.
    // Leave a line of the turtle's color if the pen is on

    void turn(double angle)
    // Change the direction of the turtle by the specified angle (in degrees).
    // Positive angle turns to the right; Negative angle turns to the left.

```

Complete the following testTurtles method to test the TurtleRobot class. It should

- Create a turtle robot with a green pen.
- Make the robot draw a line 30 units long from the center towards the right of the window.
- Create another turtle robot with a red pen.
- Make the second robot draw a line 40 units long from the center towards the top of the window.
- Make the first robot draw a dashed line towards the top of the window (— — —) where each dash is 10 units long and the spaces between are 5 units long.
- Make the second robot move to the same position as the first robot, without drawing a line.



```
public void testTurtles (){
    TurtleRobot t1 = new TurtleRobot(Color.green);
    t1.penOn();
    t1.move(30);
    TurtleRobot t2 = new TurtleRobot(Color.red);
    t2.turn(-90);
    t2.penOn();
    t2.move(40);

    t1.turn(-90);
    t1.move(10);
    t1.penOff();
    t1.move(5);
    t1.penOn();
    t1.move(10);
    t1.penOff();
    t1.move(5);
    t1.penOn();
    t1.move(10);

    t2.turn(90);
    t2.penOff();
    t2.move(30);
}
```

Question 6. Programs with Methods and Parameters**[5 marks]**

The following fancyTurtles() method makes a collection of TurtleRobots draw some shapes on the window.

It uses the fancy(TurtleRobot t, double ang, double distance) method that is also given below.

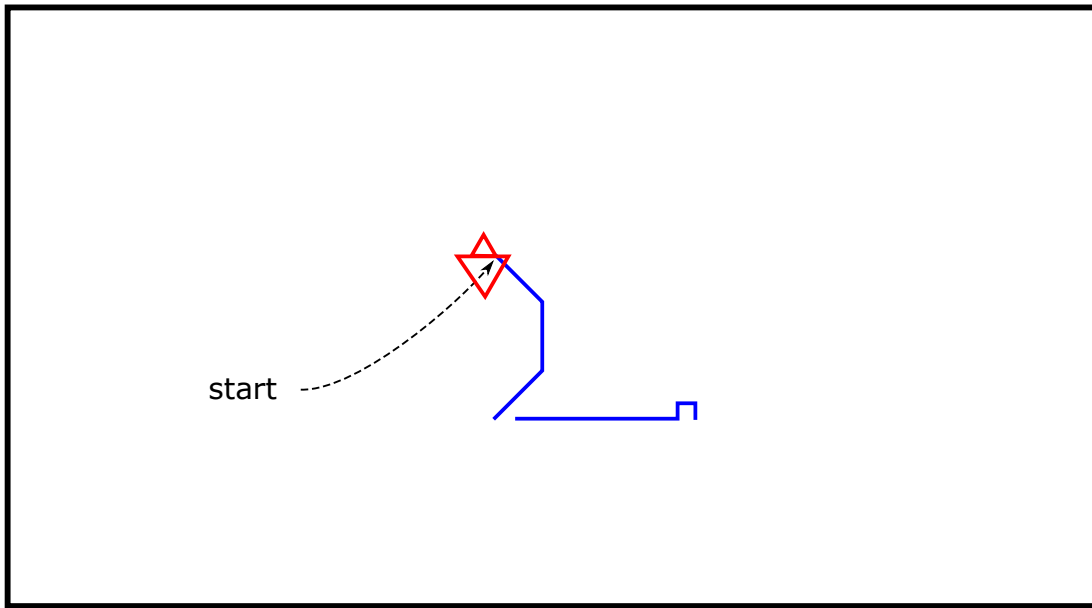
In the box, sketch what fancyTurtles() will draw on the window.

(You may use any empty space to draw it if you get it wrong the first time.)

```
public void fancyTurtles () {
    TurtleRobot t1 = new TurtleRobot(Color.blue);
    this.fancy(t1, 45, 50);
    TurtleRobot t2 = new TurtleRobot(Color.red);
    this.fancy(t2, -120, 20);
    this.fancy(t2, 120, 40);
    this.fancy(t1, 0, 40);
    this.fancy(t1, -90, 10);
}

public void fancy(TurtleRobot t, double ang, double dist) {
    t.penOn();
    t.turn(ang);
    t.move(dist);
    t.turn(ang);
    t.move(dist);
    t.turn(ang);
    t.move(dist);
    t.turn(-3*ang);
    t.penOff();
    t.move(10);
}
```

(Question 6 continued)



Extra copy (in case you made a mistake):

