Family Name:. . . . .   **Other Names:** . . . .

Student ID:. . . . .   **Signature** . . . .

Java Programming: Test 1

2017 Nov 23 ** WITH SOLUTIONS **

Instructions

- Time allowed: **90 minutes**
- Answer **all** the questions. There are 55 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	[16]	
2. Programs with text input and output	[7]	
3. Programs with Strings	[6]	
4. Programs with graphical output	[12]	
5. Programs with objects	[9]	
6. Programs with loops	[10]	
	TOTAL:	

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 [16 marks]

(a) **[5 marks]**

What will the following printStuff() method print out if the user types the values "Fish" and "20" in response to the questions?

```java
public void printStuff (){
    String abc = UI.askString("Item:");
    double def = UI.askDouble("Number:");
    UI. println (abc);
    UI. println ("not " + def);
    double ghi = 4 * def;
    UI. println (def + "bags of" + abc + " is "+ ghi);
}
```

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

Item: **Fish**

Number: **20**

Fish

not 20.0

20.0bags ofFish is 80.0

(b) **[5 marks]**

What will the following printValues() method print?

```java
public void printValues (){
    String first  = "Jiang";
    String second = "Jane";

    UI. println ("A: " + first );
    UI. println ("B: " + second + first );

    first  = first  + " " + first;

    UI. println ("C: " + first + " ("+ second + ")");
}
```

first: [   ]

second: [   ]

```
A:  Jiang

B:  Jane Jiang

C:  Jiang Jiang (Jane)
```

(c) **[6 marks]**

What will the following summarise() method print if the user types in these values:

`4 2 5 10 1`

```java
public void summarise(){
    ArrayList<Double> values = UI.askNumbers("Enter values");
    double ans = 0;

    UI. println ("Output:");
    for(double num : values){
        if (num > ans) {
            UI. println (num);
            ans = ans + num;
        }
    }
    UI. println ("ans is " + ans);
}
```

values: | 4 | 2 | 5 | 10 | 1 |

ans:

```
Output:

4.0

2.0

5.0

10.0

1.0

ans is 19.0
```

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

Complete the following calculateDistance() method that asks the user for the initial speed of a car (s), its acceleration (a), and the time (t), and then prints the distance the car travels (d).

Note: $(d = st + \frac{1}{2}at^2)$.

```
public void calculateDistance (){
    double initial  = UI.askDouble("Initial speed:");
    double acceleration = UI.askDouble("Acceleration:");
    double time = UI.askDouble("Time:");
    double dist = initial ∗ time + 0.5 ∗ acceleration ∗ time ∗ time;
    UI. println ("Distance " + dist);




    }
```

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 "Campus Hotel" to the question?

```java
public void processWords(){
    String place = UI.askString("Where do you live");

    UI. println ("One: "+ place);

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

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

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

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

    mid = place. substring (4,10);
    UI. println ("Six: " + mid);
}
```

```
Where do you live:   Campus Hotel

One:   Campus Hotel

Two:   12

Three:   campus hotel

Four:   Campus HotelCampus Hotel

Five:   Camp

Six:   us Hot
```

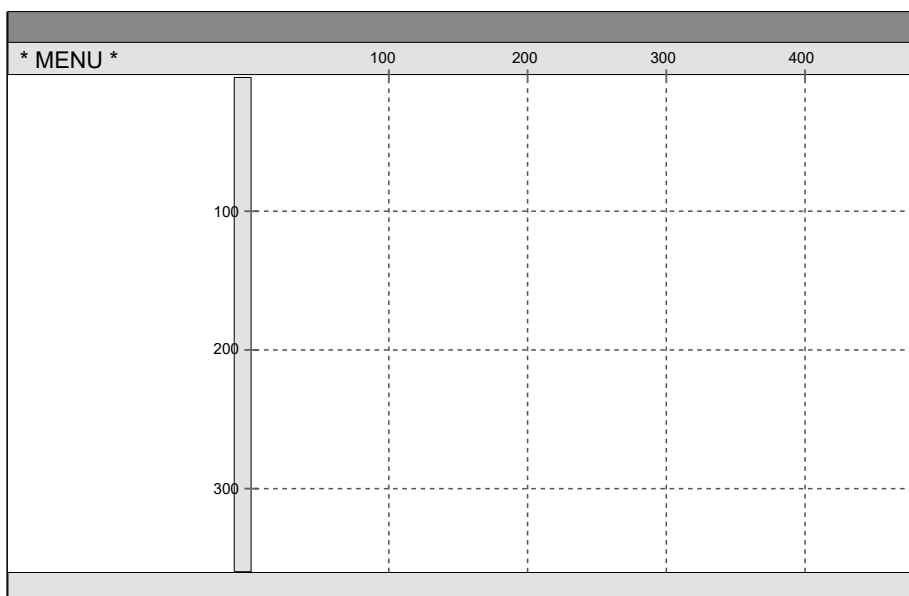## Question 4. Programs with graphical output [12 marks]

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

```java
public static final double SIZE = 150;

public void drawStuff(){
    double dist = UI.askDouble("Enter the distance:");
    UI.drawOval(dist, 50, SIZE, SIZE);
    UI. fillRect (200, dist, 2*dist, dist/2);
    UI.setLineWidth(10);
    UI.drawLine(400, 2*SIZE, dist, 2*dist);
}
```
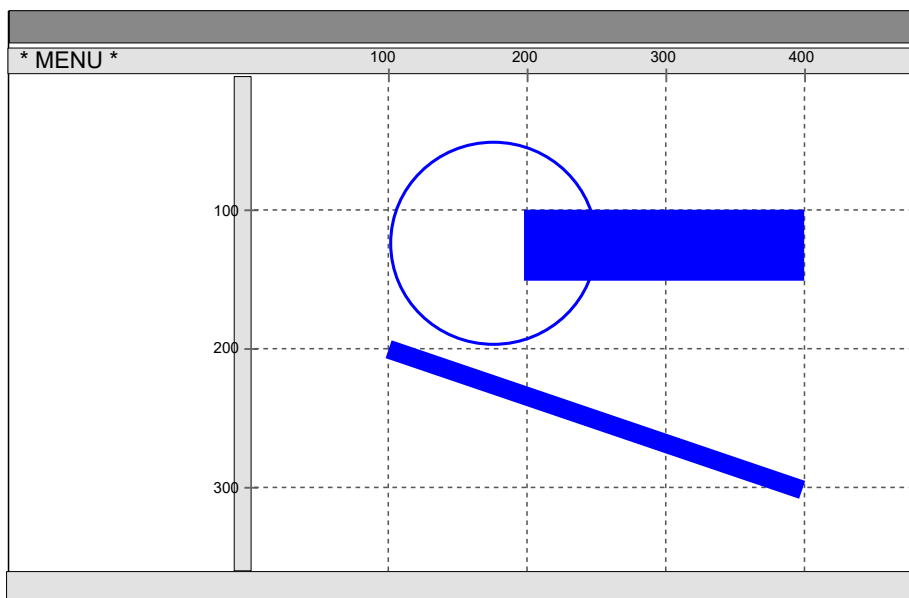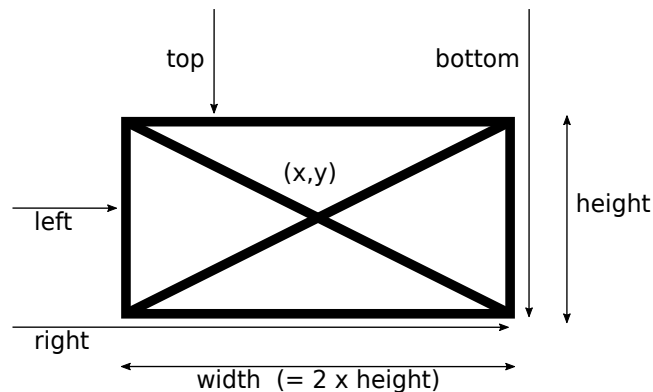

Extra copy (in case you made a mistake):

(Question 4 continued)

(b) **[7 marks]**

Complete the following drawSymbol() method so that it draws the following symbol in the UI window. The width should be 2 times the height.

drawSymbol should
- Ask the user for the center of the symbol (x and y) and the height.
- Compute the value of the width and put it in a variable.
- Compute the values of left, right, top, and bottom of the symbol, and put them in variables.
- Set the line width to be 1/20 of the height,
- Draw the sign, using the variables.

```java
public void drawSymbol(){
    double x = UI.askDouble("x:");
    double y = UI.askDouble("y:");
    double height = UI.askDouble("height:");

    double width = 2 * height;
    double left  = x - height;
    double right  = left + width;
    double top = y - height/2;
    double bot = y + height/2;

    UI.setLineWidth(height/20);

    UI.drawRect(left, top, width, height);
    UI.drawLine(left, top, right, bot);
    UI.drawLine(left, bot, right, top);


}
```

Question 5. Programs with objects [9 marks]

A Sprite is a character in a video game that can move around the screen and hide things on the screen by making colored clouds.

The Sprite class defines Sprite characters. It has a constructor and four methods. Here is the documentation:

```
/** Constructor: */
    public Sprite(double x, double y, Color cloudColor)
        // Creates a new Sprite at the position (x, y)
        // The cloudColor parameter specifies the color of clouds the Sprite makes.

/** Methods: */
    public void moveTo(double x, double y)
        // move the sprite to the position (x, y)

    public void makeCloud(String size)
        // Make a cloud at the current position, of the sprite's color.
        // size can be "small" or "large"

    public void clearClouds()
        // Clear all the clouds that the sprite has made
```

Complete the testSprites method on the next page to test the Sprite class. It should
- Create a Sprite with green clouds at position 200, 200.
- Move the sprite to (300,400) and then make a small cloud.
- Create another Sprite with blue clouds at position 10, 50.
- Make the second sprite make a large blue cloud.
- Move the first sprite to the same position as the second sprite, and make a large green cloud.
- Move the second sprite to (10, 400), then to (400, 400).
- Make the second sprite make a small cloud.
- Clear all the green clouds.

```java
public void testSprites (){
      Sprite s1 = new Sprite(200, 200, Color.green);
      s1.moveTo(300, 400);
      s1.makeCloud("small");
      Sprite s2 = new Sprite(10, 50, Color.blue);
      s2.makeCloud("large");
      s1.moveTo(10, 50);
      s1.makeCloud("large");
      s2.moveTo(10, 400);
      s2.moveTo(400, 400);
      s2.makeCloud("small");
      s1.clearClouds ();



}
```

Question 6. Programs with Loops [10 marks]

Complete the following processNames method so that it

1. reads a list of names from the user, (this is done for you)
2. prints out (using UI.println(...)) all the names that start with "J",
3. finds and prints out the length of the shortest name (some bits are done for you)
4. draws all the names at random positions on the window (using UI.drawString(...))

Hints: See the documentation sheet!

- Useful methods on Strings include startsWith(...) and length()
- Math.random()*500 will give a random number between 0 and 500.

```java
public void processNames(){
    //−− Step 1 −−
    ArrayList<String> names = UI.askStrings("Enter names:");

    //−− Step 2 −−
    for (String name : names){
        if (name.startsWith("J")){
            UI. println (name);
        }
    }


    //−− Step 3 −−
    int min = Integer.MAX_VALUE;
    for (String name : names){
        if (name.length()<min){
            min = name.length();
        }
    }



    UI. println ("Minimum length = " + min);

    //−− Step 4 −−
    for (String name : names){
        double x = Math.random()*500;
        double y = Math.random()*500;
        UI.drawString(name, x, y);
    }



}
```

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