COMP 102 : Test

2019, Apr 1

Instructions

- Time allowed: **50 minutes**
- Attempt **all** the questions. There are 50 marks in total.
- Write your answers in this test paper and hand in all sheets.
- If you think a question is unclear, ask for clarification.
- Brief Java documentation is provided with the test
- This test contributes 15% of your final grade
  (But your mark will be increased to your exam mark if that is higher.)
- You may use dictionaries and calculators.
- You may write notes and working on this paper, but make sure your answers are clear.

Questions	Marks	
1. Understanding Input/Output and **if**	[5]	
2. Writing programs with **if**	[12]	
3. Writing methods that use objects	[8]	
4. Defining methods with parameters	[10]	
5. Writing programs with **for**	[15]	
	TOTAL:	

Question 1. Understanding Input/Output and if [5 marks]

The following method asks the user for two numbers. Suppose the user enters 30 as the first number and 20 as the second number. Write what this method will print out.

```
public void printStuff (){
    double x = UI.askDouble("First number:");
    double y = UI.askDouble("Second number:");
    double z = x − y;
    UI. println (x + " and " + y + " makes "+ z);
    if  (x > y) {
        x = x + 10;
        UI. println ("x is " + x);
    }
    else {
        y = y + 5;
        UI. println ("y is " + y);
    }
}
```

Hint: *write the values of the variables in the boxes*

x: [   ]

y: [   ]

z: [   ]

[   ]

Question 2. Writing programs with if   **[12 marks]**

Complete the following calculateTax method to calculate income tax.

The method should

- Ask the user for the amount of taxable income.
- Calculate the income tax based on the following tax rates:

Taxable Income	Rate (%)
First $20,000	10
Next $20,000	20
The remaining	30

   For example,

      if the income is $18,000, the tax is $18,000 * 10%;
      if the income is $30,000, the tax is $20,000 * 10% + $10,000 * 20%;
      if the income is $85,000, the tax is $20,000 * 10% + $20,000 * 20% + $45,000 *
      30%.

- Print out the income tax payable rounded to 2 decimal places, for example

```
Enter income:  $30000
The tax is:  $4000.00
```

```java
public void calculateTax () {
    double tax = 0.0;      // The tax is  initialized  to zero



















    }
```

Question 3. Defining a method with parameters [8 marks]

The program on the facing page has two methods. The drawPicture method calls the draw-Triangle method to draw two triangles in different places.

- Complete the drawTriangle method to draw a triangle by drawing three lines between three given points. You are required to use six parameters to specify the coordinates of the three points that form a triangle.

- Complete the drawPicture method to draw two triangles by calling drawTriangle twice using different arguments. Your method should draw the triangles shown below.
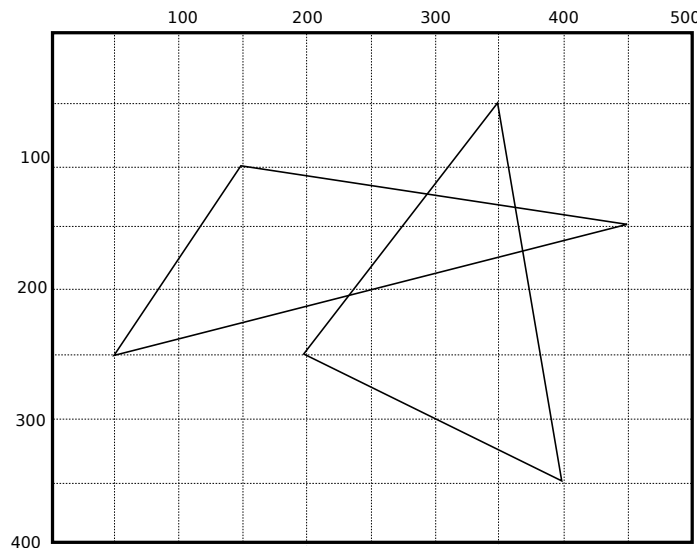
```java
public void drawPicture(){


    this.drawTriangle(


    this.drawTriangle(

}
public void drawTriangle(











}
```

Question 4. Writing methods that use objects [10 marks]

This question is about a program that creates and animates two cartoon mice in a simple 6 * 6 maze.

The documentation for the Mouse class is given below.


```
// Constructor:
   public Mouse(String name, Color col)
   /** Creates a new mouse object of the specified name. e.g. "Micky",
       Draws the mouse with a hat of the specified colour, e.g. Color.red
       The mouse is drawn at the start position, facing the maze entrance */

//Methods:
   public void turn(String dir)
   /** The parameter can only be either "left" or "right"
       This method draws the mouse again facing a new direction */

   public void move(int step)
   /** Moves the mouse forward for the number of squares as long as there is space
       in the maze */
```

Complete the animate method on the facing page so that it

1. Creates the first mouse named "Micky", using the red color.
2. Creates a second mouse named "Mini", using the blue color.
3. Calls a sequence of five methods on each mouse, which will make the first mouse go through the maze but leave the second mouse inside the maze.
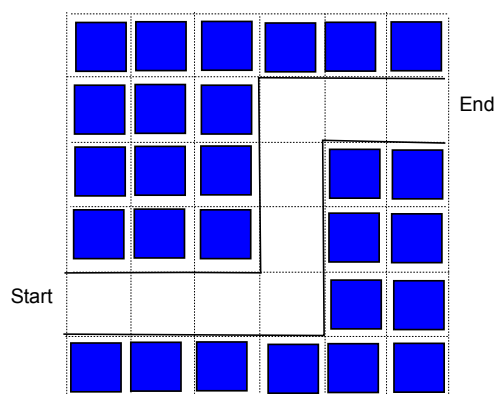
```
public void animate(){



}
```

Question 5. Writing methods with for [**15 marks**]

This question asks you to do some analysis on a sequence of numbers.

The first analyse method is done for you. It asks the user for a sequence of numbers and saves the numbers in an ArrayList. This method calls the other two methods to be completed by you.

(a) [**5 marks**] Complete the findMaximum method to find and return the maximum of the numbers.

(Question 5 continued)

```
public void analyse(){
      ArrayList<Double> numbers = UI.askNumbers("Enter numbers [0, 350]");
      UI.println("The maximum number is " + this.findMaximum(numbers));
      this.plotNumbers(numbers);
  }

public double findMaximum(ArrayList<Double> numbers){





















  }
```
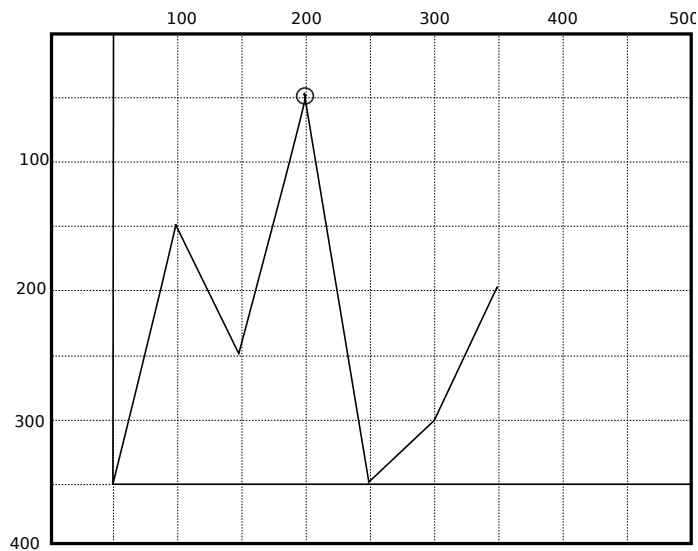
(Question 5 continued)

(b) **[10 marks]** Complete the plotNumbers method to draw a line plot of the numbers on the graphics pane with a small circle on the maximum value(s)

- Draw the x-axis and the y-axis. The origin should be at (50, 350)
- Draw the points every 50 units. You should start the line plot from the origin. You may assume the user enters at least one and at most nine numbers and all numbers are in the range of [0, 350].
- Draw a small circle for the maximum number(s).

For example, if the user enters the following numbers:

```
200
100
300
0
50
150
done
```

The line plot should look like this:

(Question 5 continued)

```
public void plotNumbers(ArrayList<Double> numbers){




















    }
```

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

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.