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

ID Number: ..... **Signature** .....

COMP102: Test 1

10 August, 2012

Model Solutions

Instructions

- Time allowed: **45 minutes** .
- Answer **all** the questions. There are 45 marks in total.
- Write your answers in the boxes 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 15% of your final grade
  (But your mark will be boosted up to your exam mark if that is higher.)
- You may use paper translation dictionaries, and calculators without a full set of alphabet keys.
- You may write notes and working on this paper, but make sure your answers are clear.

Questions	**Marks**	
1. Components of Java Programs	[8]	
2. Understanding variables	[7]	
3. Defining a Method	[10]	
4. Calling methods	[6]	
5. Using Objects	[6]	
6. Extracting Methods	[8]	
	TOTAL:	

Please answer the following question. (Your answer will not affect your mark in any way.)

How much programming had you done before starting the course?

- ☐ Little or none
- ☐ Some (used variables, if's, and loops)
- ☐ Lots (eg, used arrays, defined methods/functions with parameters, used libraries)

ANSWERS

Question 1. Components of Java Programs [8 marks]

The questions on the facing page refer to the code below.

```
1  import comp102.*;
2
3  public class Question1{
4
5      public void payDay(){
6          int hours = UI.askInt("Worked hours: ");
7          double payment = this.computePay(hours, 28.0);
8          this.printSlip(hours, payment);
9      }
10
11     public double computePay(int hours, double rate){
12         double raw = hours * rate;
13         double tax = raw * 0.199;
14         return (raw - tax);
15     }
16
17     public void printSlip(int x, double y){
18         UI.printf("You have worked for %d hours\n", x);
19         UI.printf("Payment will be $%4.2f\n", y);
20     }
21
22 }
```

(Question 1 continued on next page)

ANSWERS

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(Question 1 continued)

The following questions refer to the code on the facing page:

(a) [1 mark] List every line that contains the header of a method definition.

5, 11, 17

(b) [1 mark] What type of value is returned by the computePay method?

double

(c) [1 mark] List every line that contains a literal String.

6, 18, 19

(d) [1 mark] List the variables that contains a literal integer value.

hours, x is also acceptable

(e) [1 mark] What types of arguments does the printSlip method require?

int, double

(f) [1 mark] List every line that contains a call to a method that returns a value.

6, 7

(g) [1 mark] List every line that contains a declaration of a variable.

6, 7, 12, 13
(the parameter declarations in lines 11 and 17 are also acceptable

(h) [1 mark] List the parameters used in this program.

hours, rate, x, y

ANSWERS

Question 2. Understanding programs with variables [7 marks]

Consider the printNumbers method below. In the box on the facing page (p5), write the output that printNumbers would produce. Note that the first part of each line of output is provided for you.

Hint: draw a box for each variable and keep track of the value that is put into it.

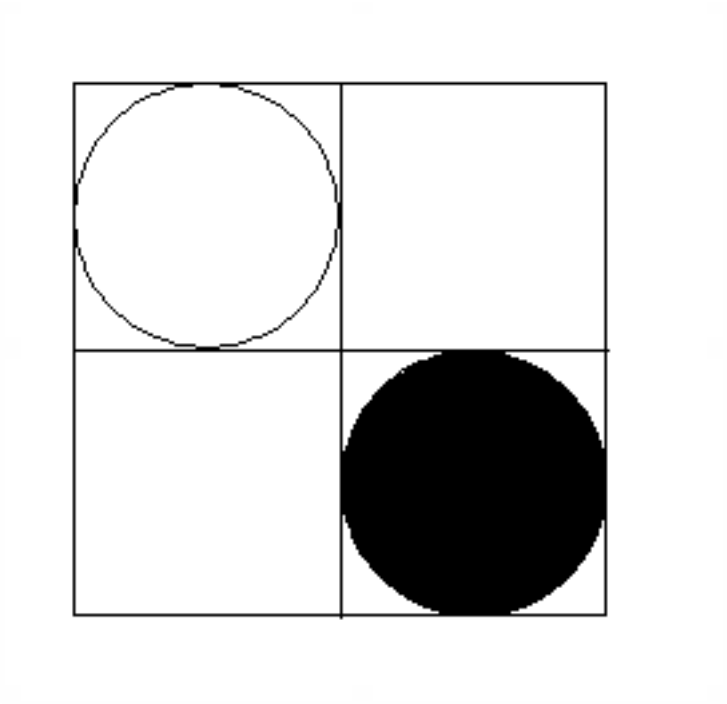
```
public void printNumbers(){
    String stage = "one";
    int x = 2;
    int y = 3;
    int z = x + y;
    UI.println("stage:" + stage);
    UI.println("first: " + x);
    UI.println("second: " + z);
    UI.println("last: " + y);

    x = x + 1;
    y = x - 3;
    stage = stage + "-" + z;

    UI.println("stage: " + stage);
    UI.println("one: " + y);
    UI.println("two: " + z);
    UI.println("three: " + x);

    stage = "end" + x + y;
    x = y;
    y = z;
    z = x;

    UI.println("stage: " + stage);
    UI.println("a: " + z);
    UI.println("b: " + y);
    UI.println("c: " + x);
}
```

(Question 2 continued on next page)

(Question 2 continued)

```
stage:   One
first:   2
second:   5
last:   3
stage:   One-5
one:   0
two:   5
three:   3
stage:   end30
a:   0
b:   5
c:   0
```

Question 3. Defining a method [10 marks]



The figure above shows a small 2X2 game board with two disks: one white and one black. Write a method to draw this board on an UI window. The method should

- ask the user for the size of the board
- ask the user for the x coordinate of the top left corner
- ask the user for the y coordinate of the top left corner
- draw the board with the two disks

```
public void drawBoard(){


    int size = UI.askInt("Size:");
    int left = UI.askInt("left position:");
    int top = UI.askInt("top position:");
    int centerx = left + size/2;
    int centery = top + size/2;
    int bottom = top + size;
    int right = left +size;
    UI.drawRect(left, top, size, size);
    UI.drawOval(left, top, size/2, size/2);
    UI.drawLine(centerx, top, centerx, bottom);
    UI.drawLine(left, centery, right, centery);
    UI. fillOval (centerx, centery, size/2, size/2);









}
```

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.

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Question 4. Calling methods [6 marks]

What will the following printReport method print out? Note that printReport calls printOne which is also defined below.

```
public void printReport(){
    double x = 0.2;
    double y = 0.5;
    double t = this.printOne("Assignment", 70, x);
    UI.println(t);
    UI.println("-------------");
    t = t + this.printOne("Test", 80, 0.3);
    UI.println(t);
    UI.println("-------------");
    t = t + this.printOne("Exam", 90, y);
    UI.println(t);
}

public double printOne(String s, int m, double r){
    double num = m * r;
    UI.println(s + ":  " + num);
    return num;
}
```

```
Assignment:  14.0
14.0
---------------------------------------------
Test:  24.0
38.0
---------------------------------------------
Exam:  45.0
83.0
```

ANSWERS

Question 5. Using objects [6 marks]

Suppose the Figure class has one constructor and three methods:

Constructor:

```
public Figure(int x, int y)
// constructs a Figure object
// draw the figure as an image
// the two arguments specify the position (center at (x,y))
```

Methods:

```
public void jump(int d)
// the jumps up d units to a new position
// erase the old image and draw a new image using the new y position, y = y − d
public void walk(String dir, int d)
// dir can have two values, left or right
// the figure moves d units in the dir direction (either to left or right)
// erase the old image, draw a new image with the new x position, either x = x + d or x = x−d
public void dance()
// the figure dances at the same position
```

(Question 5 continued on next page)

ANSWERS

(Question 5 continued)

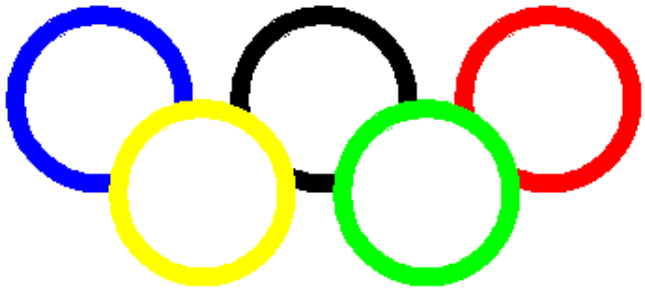
Complete the following threeFigures method in the playFigure class. Your method should

- create three Figure objects at different positions, you may decide the positions.
- let the first figure walk to the left 100 units.
- let the second figure jump 150 units.
- let the third figure dance.
- let the first figure jump 200 units.

```
public class Playfigure {

    public void threeFigures() {

        Figure f1 =
                          new Figure(100, 200);
           Figure f2 = new Figure(300, 400);
           Figure f3 = new Figure(50, 150);
           f1.walk( left '', 100);
           f2.jump(150);
           f3.dance();
           f1.jump(200);









    }
```

Question 6. Extracting Methods [8 marks]

The following drawFiveRings method draws a picture with five rings (as shown in the figure below).



```
public void drawFiveRings(){
    UI.setColor(Color.blue);
    UI. fillOval (100, 100, 100,100);
    UI.setColor(Color.white);
    UI. fillOval (110, 110, 80,80);
    UI.setColor(Color.black);
    UI. fillOval (220, 100, 100,100);
    UI.setColor(Color.white);
    UI. fillOval (230, 110, 80,80);
    UI.setColor(Color.red);
    UI. fillOval (340, 100, 100,100);
    UI.setColor(Color.white);
    UI. fillOval (350, 110, 80,80);
    UI.setColor(Color.yellow);
    UI. fillOval (150, 150, 100,100);
    UI.setColor(Color.white);
    UI. fillOval (160, 160, 80,80);
    UI.setColor(Color.green);
    UI. fillOval (270, 150, 100,100);
    UI.setColor(Color.white);
    UI. fillOval (280, 160, 80,80);
}
```

(Question 6 continued on next page)

(Question 6 continued)

The drawFiveRings method is not well designed: it has quite a bit of repetition, and repeated literal constants specifying various dimensions. It would be better design to define another method called drawOneRing which draws a single "Ring" (two filled ovals) and make drawFiveRings call the drawOneRing method five times, as in the version of drawFiveRings below.

Complete the definitions of drawFiveRings and drawOneRing below. You will need to determine the appropriate arguments for the calls to drawOneRing, the appropriate parameters in the definition of drawOneRing, as well as the statements in drawOneRing.

```
public void drawFiveRings(){
    double x = 100.0;
    double y = 100.0;

    this.drawOneRing(                                          );
                          x,y,Color.blue
    this.drawOneRing(                                          );
                           x+120, y,  Color.black
    this.drawOneRing(                                          );
                           x+240, y,  Color.red
    this.drawOneRing(                                          );
                           x+50, y+50, Color.yellow
    this.drawOneRing(                                          );
}                          x+120+50, y+50, Color.green


public void drawOneRing(        double x,  double y,  Color c          ){

    UI.setColor(c);
    UI. fillOval (x,  y,  100,100);
    UI.setColor(Color.white);
    UI. fillOval (x+10,y+10, 80,80);









}
```

****

SPARE PAGE FOR EXTRA ANSWERS

Cross out rough working that you do not want marked.
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