COMP102: Test

31 August, 2005

Instructions

- Time allowed: $1\frac{1}{2}$ **hours**.
- Answer **all** the questions.
- There are 100 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.
- This test will contribute 25% of your final grade.
- Numeric keypad calculators and non-electronic dictionaries are permitted.

Questions   **Marks**

1. Understanding Java   [35]   ☐

2. Simple classes and conditionals   [15]   ☐

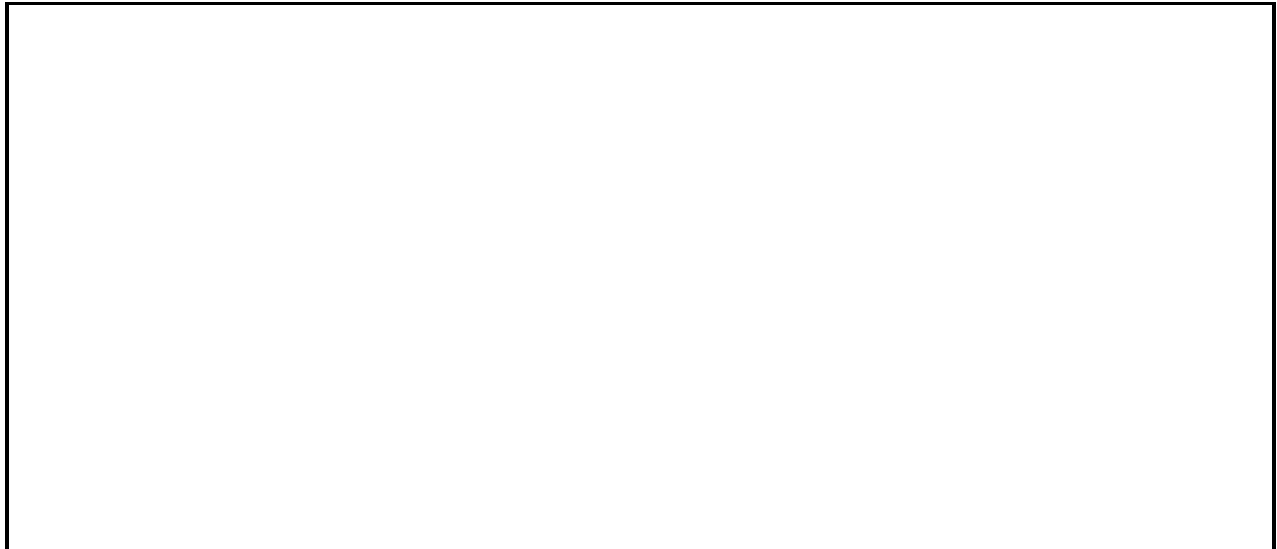3. Loops   [18]   ☐

4. Arrays   [14]   ☐

5. Arrays of objects   [18]   ☐

                                                           TOTAL: ☐

Question 1. Understanding Java

[35 marks]

For each of the following programs **(a) – (e)**, show the output produced when the program is run.
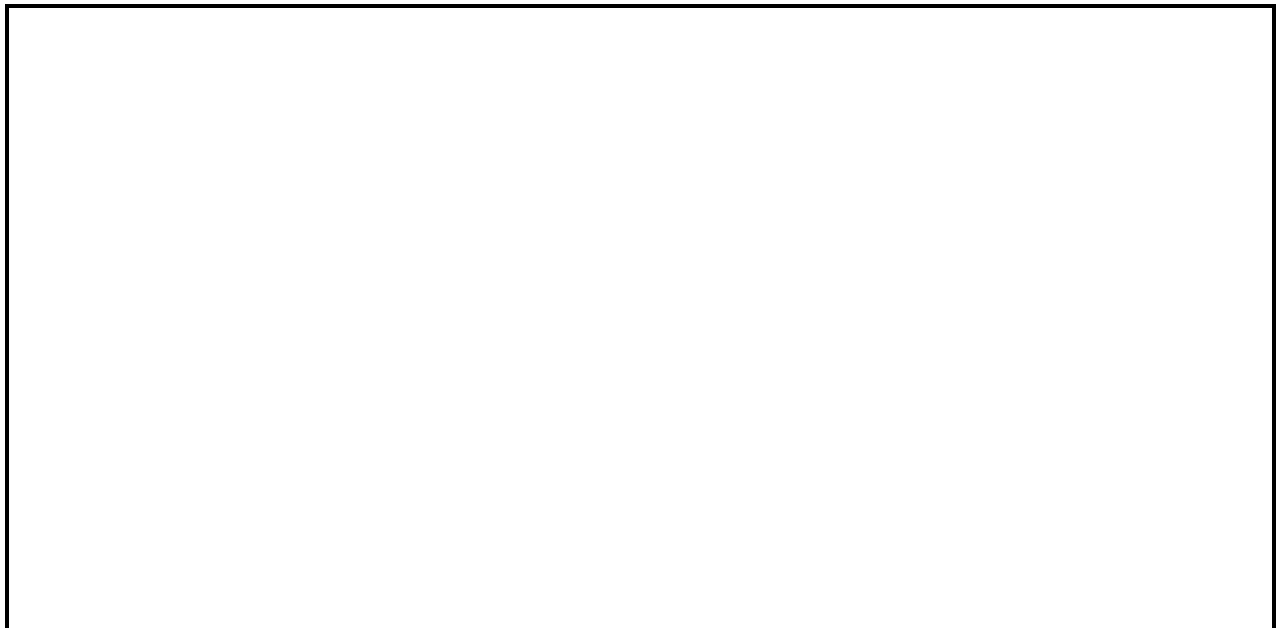
(a) [6 marks]

```
public class Test1 {
  public static void main(String[] args) {
    int x = 15;
    int y = 4;
    System.out.println("1: " + x + " " + y);
    System.out.println("2: " + (x + y));
    System.out.println("3: " + (2 * x - y));
    System.out.println("4: " + x / y);
    System.out.println("5: " + x / 2.0);
    System.out.println("6: " + Math.abs(y-x));
  }
}
```

(b) [6 marks]

```java
public class Test2 {
  public static void main(String[] args) {
    String s = "abracadabra";
    System.out.println( "1: " + s.length() );
    System.out.println( "2: " + s.charAt(4) );
    System.out.println( "3: " + s.substring(0, 4) );
    System.out.println( "4: " + s.substring(6) );
    System.out.println( "5: " + s.indexOf("r") );
    System.out.println( "6: " + s.indexOf("r", s.indexOf("r")+1) );
  }
}
```

(c) [6 marks]

```java
public class Test3 {
  public static void main(String[] args) {
    int b = 1;
    int c = 4;
    int v = 8;
    int n = 3;
    System.out.print("Options are:");
    if ( n == b )
      System.out.print(" bike");
    if ( n <= c )
      System.out.print(" car");
    if ( n <= v )
      System.out.print(" van");
    System.out.println(" bus");

    System.out.print("Best is:");
    if ( n == b )
      System.out.println(" bike");
    else if ( n <= c )
      System.out.println(" car");
    else if ( n <= v )
      System.out.println(" van");
    else
      System.out.println(" bus");
  }
}
```
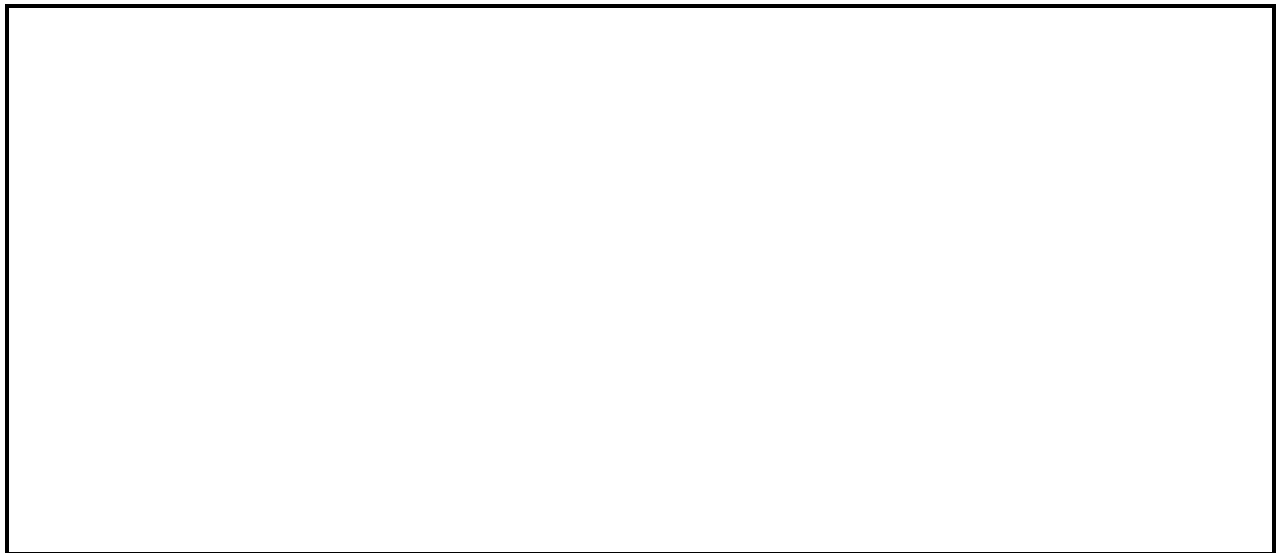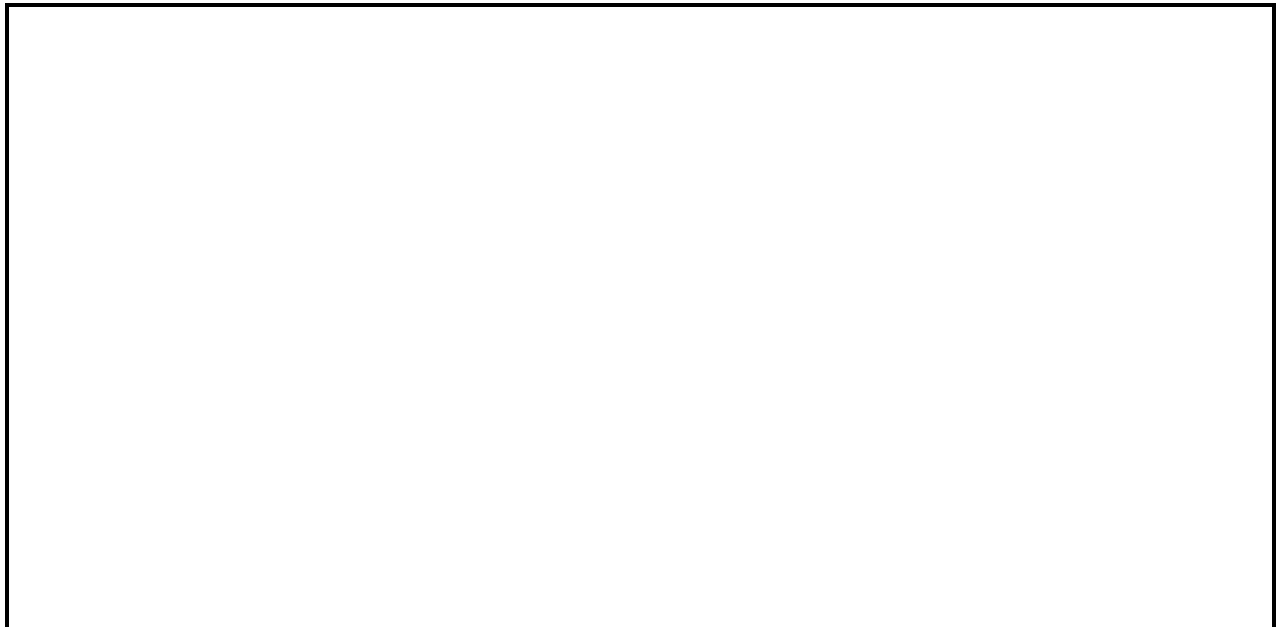
(d) [8 marks]

```java
public class Test4 {
  public static void main(String[] args) {
    int n = 5;
    for (int k = 1; k <= n; k++)
      System.out.print(k);
    System.out.println();
    for (int k = 2; k <= n; k++) {
      System.out.print(k);
      for (int j = 2; j <= k-1; j++)
          System.out.print("-");
      System.out.println(k);
    }
  }
}
```

(e) [9 marks]

```java
public class Test5 {
  public static void main(String[] args) {
    Line m = new Line();
    m.add("To");
    m.add("be");
    m.out();
    m.add("or");
    m.add("not");
    m.add("to");
    m.add("be;");
    m.out();
    m = new Line();
    m.add("That");
    m.add("is");
    m.add("the");
    m.add("question.");
    m.out();
    m.add("Not");
    m.add("this");
    m.add("one!");
  }
}

class Line {
  private String s = "";
  private int n = 0;
  public Line() {
  }
  public void add(String x) {
    s = s + x + " ";
    n = n+1;
  }
  public void out() {
    System.out.println(s);
    System.out.println(n);
  }
}
```
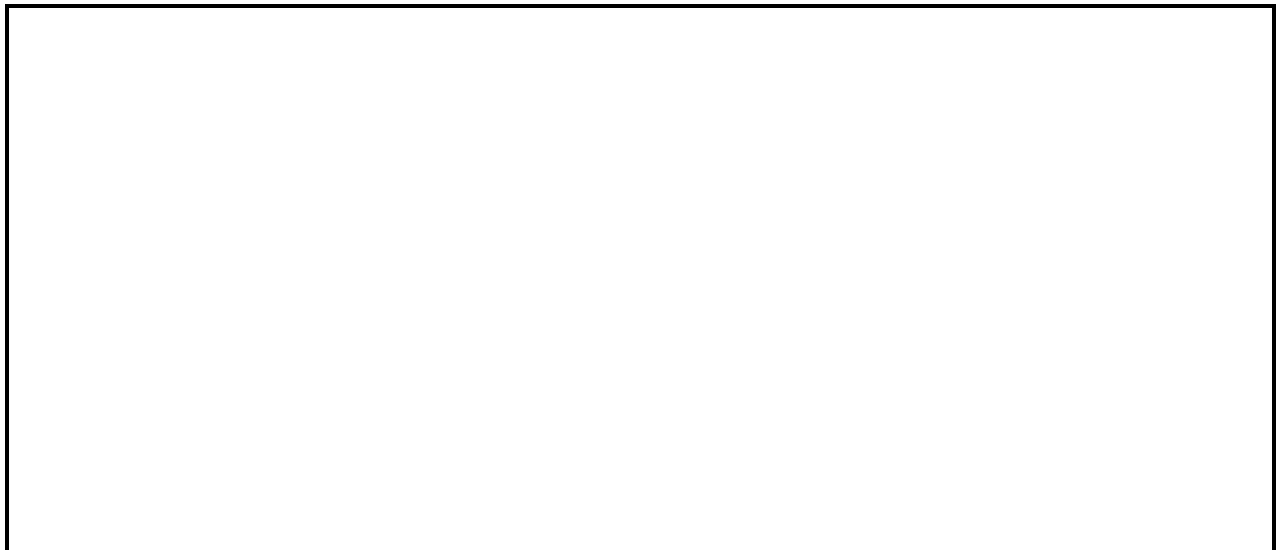
SPARE PAGE FOR EXTRA ANSWERS

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

Question 2. Simple Classes and Conditionals [15 marks]

A video shop hires video players at a standard rate of $10.50 per day, but sometimes offers special prices still at a fixed rate per day. You are required to write a program to compute the cost of hiring a video player for a given number of days.

The required program consists of two classes: `VideoHire` and `HireRecord`. The `VideoHire` class (shown below) has already been written. You are given an outline for `HireRecord` (shown on the facing page), which you are to complete.

The program is intended to read the name of the person hiring the video player, then ask whether this hire is at a special price. If the user presses cancel or return without typing anything, the standard rate of $10.50 per day is used, otherwise the user's input (assumed to be a valid number) is used as the daily rate. The program should then ask how many days the video player is being hired for, and print a message showing the hirer's name, the number of days, the rate and the total price.

For example, if John Smith hires a video players at the standard rate for 3 days, the output would be something like:

```
Hire charge for John Smith for 3 days at $10.5 per day = $31.5
```

Complete the program, by adding the code required for the `HireRecord` constructor, the `printInvoice` method, and any fields required in `HireRecord`.

Note that you should not change the `VideoHire` class.

You should print output using `System.out.print` or `System.out.println`.

```java
import javax.swing.*;
public class VideoHire {
  public static void main(String[] args) {
    String n = JOptionPane.showInputDialog("Enter hirer's name");
    String p = JOptionPane.showInputDialog(
      "Enter special price, or press return/cancel");
    HireRecord h = new HireRecord(s, p);
    String s = JOptionPane.showInputDialog("How many days?");
    int days = Integer.parseInt(s);
    h.printInvoice(days);
  }
}
```

```
class HireRecord {




    public HireRecord(String n, String p) {








    }

    public void printInvoice(int d) {









    }
}
```

Question 3. Loops
[18 marks]

You are required to write a program to read a positive integer n and print a "slanted diamond" shape of size n. The following examples show the required output when n is between 1 and 4:

```
n = 1               n = 2               n = 3               n = 4

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

From these examples, we can see that the required shape can be printed by printing two triangles:

- The top triangle has n lines. The first line consists of one asterisk, the second line consists of two asterisks, and so on, up to the last line which consists of n asterisks.

- The bottom triangle has n-1 lines. The first line consists of one space followed by n-1 asterisks, the second line consists of two spaces followed by n-2 asterisks, and so on, up to the last line which consists of n-1 spaces followed by one asterisk. Note that this triangle is empty when n is 1.

You are given an outline for the program, shown on the facing page.

Complete the following program so that it prints a slanted diamond as described above.

You should print output using System.out.print or System.out.println.

```java
import javax.swing.*;
public class PrintDiamond {
  public static void main(String args[]) {
    // Read the n as a string and turn it into an int
    // Assume that n is a positive integer
    String s = JOptionPane.showInputDialog("Enter size");
    int n = Integer.parseInt(s);
   // Print top triangle




















  // Print bottom triangle

















  }
}
```

Question 4. Arrays

[14 marks]

You are required to write a program that will read two lists of numbers and identify the positions at which they differ. For example, if the first list is

```
5, -1, 10, 1, 0, 8, 16
```

and the second list is

```
9, -1, 10, 0, 1, 8, -9
```

the output should be something like:

```
1 : 5, 9
4 : 1, 0
5 : 0, 1
7 : 16, -9
```

You are given an outline of the required program (shown on the facing page), which you are to complete. The program is intended to read an integer n, specifying the length of the two lists, create two arrays of size n, then read the numbers and store them in the arrays. It should then compare the values at corresponding positions in the two arrays, and where they differ, print the position in the list (counting from 1) and the values in the two lists at that position.

Complete the program, by adding code to create the required arrays and complete the bodies of the three loops.

You should assume that the value of n entered is a valid, non-negative integer, and that the other numbers read are valid integers.

You should print output using System.out.print or System.out.println.

```java
import javax.swing.*;
public class CompareLists {
  public static void main(String[] args) {
    // Read n
    String s = JOptionPane.showInputDialog("Enter n");
    int n = Integer.parseInt(s);
    // Create two arrays of size n




    // Read n integers and store them in the first array.
    for (int i = 0; i < n; i++) {
      String ns = JOptionPane.showInputDialog("Enter number for list 1");
      int x = Integer.parseInt(ns);




    }
    // Read n integers and store them in the second array.
    for (int i = 0; i < n; i++) {
      String ns = JOptionPane.showInputDialog("Enter number for list 2");
      int x = Integer.parseInt(ns);




    }
    // Compare the two lists, printing the position and values where they
    // differ
    for (int i = 0; i < n; i++) {









    }
  }
}
```

Question 5. Arrays of objects   [18 marks]

You are required to write a program that reads the name and mark of each student who sat a test, and then print the highest mark and the names of all students who got that mark. For example, if Alex, Bill and Chris all got the top score of 95, the output should be something like:

```
Top mark is 95
Scored by:
Alex
Bill
Chris
```

The required program consists of two classes: `TestResults` and `Student`. The `Student` class (shown below) has already been written — it is designed to read, store and access information about students and their marks. You are also given an outline for `TestResults` (shown on the facing page), which you are to complete.

The program is intended to read the number of students in the class, create an array of `Student`s of that size, then read the name and mark of each student and store them in the array. It should next search through the array to find the highest mark, and then print the names of all student who got the top mark.

Complete the definition of `TestResults` so that it behaves as described above.

Your program **must** use the `Student` class to read, store and access information about students and their marks.

You must not change the `Student` class.

You should print output using `System.out.print` or `System.out.println`.

```java
class Student {
  private String name;
  private int mark;
  public Student() {
    name = JOptionPane.showInputDialog("Enter student name");
    String s = JOptionPane.showInputDialog("Enter mark for " + name);
    mark = Integer.parseInt(s);
  }
  public String getName() {
    return name;
  }
  public int getMark() {
    return mark;
  }
}
```

```java
import javax.swing.*;
public class TestResults {
  public static void main(String[] args) {
    // Read n
    String s = JOptionPane.showInputDialog("How many students?");
    int n = Integer.parseInt(s);
    // Create an array of Students, of size n




    // Read student data and store it
    for (int i = 0; i < n; i++) {




    }

  // Find the highest mark
  int max;






  System.out.println("Top mark is " + max);
  System.out.println("Scored by:");
  // Print names of students with top mark






  }
}
```

SPARE PAGE FOR EXTRA ANSWERS

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