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COMP102: Test

15 September, 2003

Instructions

- Time allowed: **2 hours**.
- Answer **all** the questions.
- There are 120 marks in total.
- Write your answers in the boxes in this test paper and hand in all sheets.
- Use extra pages if necessary and write the question number clearly.
- If you think a question is unclear, ask for clarification.
- This test will contribute 25% to your final grade.
- Numeric keypad calculators and non-electronic dictionaries are permitted.

Questions	Marks	
1. Understanding Java	[22]	
2. Understanding simple programs	[30]	
3. Programs with conditionals and loops	[25]	
4. Programs with objects	[18]	
5. Programs with arrays	[25]	
	TOTAL:	

Question 1. Understanding Java [22 marks]

Consider the following Java program:

```
import javax.swing.*;

public class PlayerInfo {
    public static void main( String[] args ) {
        String message;

        Player p1 = new Player( "Andrew" );
        Player p2 = new Player( "Sharon" );

        message = p1.getScore();
        JOptionPane.showMessageDialog( null, message );

        message = p2.getScore();
        JOptionPane.showMessageDialog( null, message );
    }
}

class Player {
    private String playerName;
    private String teamName;
    private int    score;

    public Player( String name ) {
        playerName = name;
        enterScore();
    }

    private void enterScore() {
        String input = JOptionPane.showInputDialog
            ("Enter Team name and score for " + playerName );
        int indexOfSpace  = input.indexOf   ( " " );
        teamName          = input.substring ( 0, indexOfSpace  );
        String sScore     = input.substring ( indexOfSpace + 1 );
        score             = Integer.parseInt( sScore.trim()    );
    }

    public String getScore() {
        String message;
        if( score >= 50 ) {
            message = playerName + " great score";
        } else if( score >= 25 ) {
            message = playerName + " good score";
        } else {
            message = playerName + " poor score";
        }
        return message;
    }
}
```

(a) [4 marks] Write down the names of the classes declared in the program.

PlayerInfo, Player

(b) [4 marks] Write down the names of the methods (including constructors) declared in the program.

main, Player, enterScore, getScore

(c) [3 marks] Write down the names of the `String` methods called in the program. (`String` methods are the methods declared in the `String` class)

indexOf, substring, trim

(d) [4 marks] Write down the names of the **instance variables** (data fields) declared in the program.

playerName, teamName, score

(e) [4 marks] Write down the names of the **local variables** and **parameters** for each of the methods declared in the program.

message, args, p1, p2, input, sScore, indexOfSpace, message, Parameter: name

(f) [3 marks] Write down the names of all the data types used in the program.

Player, String, int

Question 2. Understanding simple programs [30 marks]

For each of the following programs, show the output produced when the program is run.

(a) [7 marks]

```
import javax.swing.*;

public class Test1 {
    public static void main( String[] args ) {
        String s = "Program with Java";
        System.out.println( s.charAt   ( 0 ) );
        System.out.println( s.substring( 3, 6 ) );
        System.out.println( s.substring( 8 ) );
        System.out.println( s.indexOf  ( " " ) );
        System.out.println( s.indexOf  ( " ", 8 ) );
        System.out.println( s.length() );
        System.out.println( s.substring( s.length() - 1 ));
    }
}
```

```
P
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with Java
7
12
17
a
```

(b) [4 marks]

```
import javax.swing.*;

public class Test2 {
    public static void main( String[] args ) {
        int low  = 15;
        int high = 27;
        if( low >= 0 && low <= high )
            System.out.println( low );
        else
            System.out.println( high );
        System.out.println( "Done." );
    }
}
```

```
15
Done.
```

(c) [5 marks]

```
import javax.swing.*;

public class Test3 {
    public static void main( String[] args ) {
        int n = 10;
        while( n > 2 ) {
            n = n - 2;
            System.out.print( n + " " );
        }
        System.out.println( n );
    }
}
```

```
8 6 4 2 2
```

(d) [8 marks]

```
import javax.swing.*;

public class Test4 {
    public static void main( String[] args ) {
        int limit = 3;
        int k     = 1;
        for( int i = 0; i <= limit; i++ ) {
            for( int j = 0; j <= limit; j++ ) {
                System.out.print( k + " " );
                k++;
            }
            System.out.print( "\n" );
        }
    }
}
```

```
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
```

(e) [6 marks]

```
import javax.swing.*;

public class Test5 {
    public static void main( String[] args ) {
        int a = 1;
        int b = 1;
        int c = 0;
        boolean x = true;
        boolean y = false;

        if ( a > b && x ) {
            System.out.println( "Red" );
        }
        if ( x && a < b ) {
            System.out.println( "Green" );
        }
        if ( y || c == b ) {
            System.out.println( "Yellow" );
        }
        if ( y || x ) {
            System.out.println( "White" );
        }
        System.out.println( "Done." );
    }
}
```

```
White
Done.
```

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 3. Programs with conditionals and loops [25 marks]

(a) [15 marks] Fruit weighing

Punnets of strawberries are weighed and need to be classified into three categories **light** if the weight is less than or equal to 500 grams, **medium** if the weight is between 500 and 600 grams and **heavy** if the weight is over 600 grams.

Write a program which uses a `JOptionPane.showInputDialog` to repeatedly read in the weights of strawberry punnets until the user presses the `cancel` button, and then prints out the number of punnets in each of the three categories. For example, with the input `700,300,500,600,900,200` the print-out might look like this:

```
Light  punnets: 3
Medium punnets: 1
Heavy  punnets: 2
```

```
import javax.swing.*;

public class PunnetWeights {

  public static void main(String args[]) {









  }
}
```

```java
import javax.swing.*;

public class PunnetWeights {
    public static void main( String[] args ) {
        int light  = 0;
        int medium = 0;
        int heavy  = 0;
        while( true ) {
            String sw = JOptionPane.showInputDialog( "Enter weight" );
            if( sw == null ) {
                break;
            }
            sw = sw.trim();
            if( sw.length() == 0 ) {
                continue;
            }
            int sn = Integer.parseInt( sw );
            if( sn <= 500 ) {
                light ++;
            } else if( sn > 500 && sn <= 600 ) {
                medium ++;
            } else {
                heavy ++;
            }
        }
        System.out.println( "There were " + light  + " light  punnets" );
        System.out.println( "There were " + medium + " medium punnets" );
        System.out.println( "There were " + heavy  + " heavy  punnets" );
    }
}
```

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(b) [10 marks] Counting punctuation

Write a program to read a line of text, using an input dialog box, and print the number of full stops (**.**), commas (**,**) and semicolons (**;**) in the input. For example, if the input is "`Hello, this is my program; It is a good one.`", the program should print out:

```
The number of punctuation characters is:  3
```

```
import javax.swing.*;

public class CountPunctuation {

  public static void main(String args[]) {









  }
}
```

```java
import javax.swing.*;

public class CountPunctuation {
    public static void main( String[] args ) {
        String input = JOptionPane.showInputDialog( "Enter a line of text"
);
        int    puncCount = 0;

        for( int i = 0; i < input.length(); i++ ) {
            switch( input.charAt( i ) ) {
            case '.':       case ';':       case ',':
                puncCount ++;
            }
        }
        System.out.println( "The number of punctuation characters is: " +
                            puncCount );
    }
}
```

Question 4. Programs with objects [18 marks]

Consider the following program:

```
import javax.swing.*;

public class Results {
    public static void main( String[] args ) {
        Score asco = new Score( "Andrew", 123456 );
        asco.addMarks( 30, 60 );
        System.out.println( asco.getScore() );
        asco.addMarks( 10, 40 );
        System.out.println( asco.getScore() );

        Score msco = new Score( "Mark", 111222 );
        msco.addMarks( 25, 60 );
        System.out.println( msco.toString() );
        msco.addMarks( 30, 40 );
        System.out.println( msco.toString() );
    }
}

class Score {
    private String name;
    private int    id;
    private int    result;
    private int    outOf;

    public Score( String n, int id ) {
        name = n;
        this.id = id;
    }

    public void addMarks( int howMany, int max ) {
        this.result = this.result + howMany;
        this.outOf  = this.outOf  + max;
    }

    public String getScore() {
        return( result + " out of " + outOf );
    }

    public String toString() {
        return( name + "'s score is " + getScore() );
    }
}
```

(a) [6 marks]
What output will this program produce?

```
30 out of 60
40 out of 100
Mark's score is 25 out of 60
Mark's score is 55 out of 100
```

(b) [8 marks]
Rewrite `addMarks` to print an error and return if the parameter `howMany` is greater than the parameter `outOf`, and to print an error message and return if the new total '`outOf`' would be greater than `100`.

```
public void addMarks( int howMany, int max ) {
    if( howMany > max ) {
        System.err.println( "score is too big" );
        return;
    }
    if( max + outOf > 100 ) {
        System.err.println( "total is too big" );
        return;
    }
    this.result = this.result + howMany;
    this.outOf  = this.outOf  + max;
}
```

(c) [4 marks]

Write a `getPercent()` method for the `Score` class which returns a `double` representing the percentage score. For example, if the score is "30 out of 60", the method should return 50.

```
public double getPercent() {
    return rsult / outOf * 100;
}
```

Question 5. Programs with arrays [25 marks]

We have a class consisting of an instance variable (data field) `vals` and two methods: `print1()` and `print2()`.

The instance variable (data field) is declared and created as an array with 6 numbers:

```
private int[] vals = {  42, 39, 56, 13, 19, 24 };
```

(a) [8 marks] What will the following method print out?

```
public void print1() {
    int k = 2;

    System.out.println( vals[0] );
    System.out.println( vals[5] );

    System.out.println( vals[ 3 * k - 1 ] );

    System.out.println( vals[2] * 3 + k   );

    for( int i = 0; i <= vals.length/2; i++ ) {
        System.out.println( vals[i] );
    }
}
```

```
42
24
24
170
42
39
56
13
```

(b) [6 marks] What will the following method print out?

```
public void print2() {
    int c = 0;
    for( int i=0; i < vals.length-1; i++ ) {
        if( vals[i] > vals[i+1] ) {
            System.out.println( vals[i] );
            c++;
        }
    }
    System.out.println( "c is " + c );
}
```

```
42
56
c is 2
```

(c) [11 marks] Write a method `hasTriples` (to be added to the class) to detect whether there are any numbers in the array which are exactly three times the size of any other number in the array. The method should return `true` if at least one number is three times the size of any other number in the array.

For example, if the numbers `39` and `13` are in the array, the method would return `true`.

```
public boolean hasTriples() {
    for( int i = 0; i < vals.length; i++ ) {
        for( int j = 0; j < vals.length; j++ ) {
            if( vals[i] * 3 == vals[j] ) {
                return true;
            }
        }
    }
    return false;
}
```

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