

Name:

ID Number:

COMP102: Test 2: Part B

13 Sept, 2006

Instructions

- Time allowed: **30 minutes** .
- There are 30 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.
- There is some Java documentation at the end of the test paper.
- Test 2 (this part plus the previous part) will contribute 20% of your final grade, if it helps your grade.
- Non-electronic translation dictionaries and calculators without a full set of alphabet keys are permitted.

Questions

Marks

1. Understanding Programs

[18]

2. Debugging Conditionals

[12]

3. Challenge (Optional)

[2 bonus]

Total:

Question 1. Understanding Programs

[18 marks]

(a) [3 marks] What will the following fragment of Java print out?

```
double a = 1.23;
double b = a * 2;
System.out.println(a + " = " + b);

if ( b > 2 ){
    a = b + 1.0;
    b = a;
}
else{
    b = a - 5.0;
    a = b;
}
System.out.printf("a = %.1f; b = %.1f\n", a, b);
```

(b) [4 marks] Consider the following drawShape method. Assume that canvas is a field containing a DrawingCanvas object.

```
public void drawShape(int n){
    this.canvas.setForeground(Color.red);
    if (n >= 4 && n == 5)
        this.canvas.setForeground(Color.green);
    if (n == 2 || n > 7)
        this.canvas.setForeground(Color.blue);
    this.canvas.fillRect(10,10,100,100);
}
```

(i) [2 marks] What colour rectangle will be drawn if drawShape(5) is called?

(ii) [2 marks] What colour rectangle will be drawn if drawShape(8) is called?

(Question 1 continued on next page)

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(Question 1 continued)

(c) [4 marks] What will the following fragment of Java print?

```
int k = 1;
while (k < 20){
    k = k * 2;
    System.out.println("k is " + k);
}
```

(d) [7 marks] Suppose the file "text.txt" contains the text:

After 5 days and 6 nights of 2 long essays every 3 hours, sleep

What will the following fragment of Java print?

```
try{
    Scanner ss = new Scanner (new File ("text.txt"));
    String w1 = ss.next();
    while ( ss.hasNextInt( ) ){
        int n = ss.nextInt ();
        String w2 = ss.next( );
        System.out.printf ("%s : %d\n", w2, n);
        w1 = ss.next( );
    }
    ss.close( );
    System.out.println ("done");
}
catch(Exception e){System.out.println("Error while scanning");}
```

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Question 2. Debugging Conditionals

[12 marks]

The following minmax method is intended to return the maximum or the minimum of three integers. The first parameter (choice) is a string that determines whether the method returns the maximum or the minimum; the other parameters (a, b, and c) are the three integers.

The method contains errors.

```
public int minmax(String choice, int a, int b, int c){
    if ( choice.equals("max") ){
        if ( a > b || a > c)
            return a;
        else if ( b > c)
            return b;
        else if ( c > b)
            return c;
    }
    if ( choice.equals("min") ){
        if ( a < b) {
            if ( a < c)
                return a;
            else
                return c;
        }
        else if ( b < a){
            if ( a < c)
                return b;
            else
                return c;
        }
    }
    return Integer.MIN_VALUE; // ( Integer .MIN_VALUE is -2137483648)
}
```

(Question 2 continued on next page)

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(Question 2 continued)

(a) [8 marks] For each of the following calls to `minmax`, state what value the method will return:

```
minmax("max", 4, 5, 6) ⇒
```

```
minmax("max", 5, 6, 4) ⇒
```

```
minmax("min", 6, 4, 5) ⇒
```

```
minmax("min", 6, 6, 4) ⇒
```

(b) [4 marks] Show two further calls to `minmax` using arguments from $\{4, 5, 6\}$, one that returns the correct answer and one that returns an incorrect answer.

Correct:

Incorrect:

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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. Challenge

[0 marks]

(Optional, but may be worth 2 bonus marks).

Consider the following large method:

```
public int large(int row, int col){  
    if (row == 0)  
        return col+1;  
    if (col == 0)  
        return large(row-1, 1);  
    int temp = large(row, col-1);  
    return large(row-1, temp);  
}
```

What will large(2,7) return? Show your working

What will large(4,1) return? Show your working

Brief and partial documentation of some classes and methods

PrintStream class:

```
public PrintStream (File f); // Note, System.out is a PrintStream object
public void close (); // Constructor, for printing to a file
public void print (String s); // Close the file (if it is wrapping a File object)
public void print (int i); // Prints s with no newline
public void print (double d); // Prints i with no newline
public void println (); // Prints d with no newline
public void println (String s); // Prints a newline
public void println (int i); // Prints s followed by newline
public void println (double d); // Prints i followed by newline
public void printf (String format, ...); // Prints d followed by newline
// Prints the format string, inserting the remaining
// arguments at the %'s in the format string:
// %s for Strings.
// %d for ints, (%3d: use at least 3 characters),
// %.2f for 2dp doubles,
// (%6.2f: at least 6 characters and 2dp),
// Use \n for newline
```

Scanner class:

```
public Scanner (InputStream i); // Constructor. Note: System.in is an InputStream
public Scanner (File f); // Constructor, for reading from a file
public Scanner (String s); // Constructor, for reading from a string
public boolean hasNext(); // Returns true if there is more to read
public boolean hasNextInt(); // Returns true if the next token is an integer
public boolean hasNextDouble(); // Returns true if the next token is a number
public String next(); // Returns the next token (chars up to a space/line)
public String nextLine(); // Returns the next line
public int nextInt(); // Returns the integer value of the next token
// (throws exception if next token is not an integer)
public double nextDouble(); // Returns the double value of the next token
// (throws exception if next token is not a number)
public void close(); // Closes the file (if it is wrapping a File object)
```

File class:

```
public File (String fname); // Constructor. Creates a File object attached to the
// file with the name fname
```

Integer class:

```
public static final int MAX_VALUE; // The largest possible int:  $2^{(31-1)}$ 
public static final int MIN_VALUE; // The smallest possible int:  $-2^{(31)}$ 
```

Double class:

```
public static final double MAX_VALUE; // The largest possible double: just under  $2^{(1024)}$ 
public static final double MIN_VALUE; // The smallest possible positive nonzero double
public static final double POSITIVE_INFINITY; // positive infinity (greater than any number)
public static final double NEGATIVE_INFINITY; // negative infinity (less than any number)
public static final double NaN; // The Double that is Not a Number ("undefined")
```

(Continued on next page)

String class:

```
public int length (); // Returns the length (number of characters) of the string
public boolean equals(String s); // String has same characters as s
public boolean equalsIgnoreCase(String s); // String has same characters as s, ignoring their case
public boolean startsWith(String s); // First part of string matches s
public boolean contains(String s); // s matches some part of the string
public String substring(int j, int k) // Returns substring from index j to index k-1
public int indexOf(String s); // Returns -1 if it does not contain s anywhere
// otherwise, returns the index of where s first matches
```

Math class:

```
public static double sqrt(double x); // Returns the square root of x
public static double min(double x, double y); // Returns the smaller of x and y
public static double max(double x, double y); // Returns the larger of x and y
public static double abs(double x); // Returns the absolute value of x
public static int min(int x, int y); // Returns the smaller of x and y
public static int max(int x, int y); // Returns the larger of x and y
public static int abs(int x); // Returns the absolute value of x
```

DrawingCanvas class:

```
public void clear (); // Clears the drawing canvas
public void setForeground(Color c); // Change the colour for later commands
public void drawLine(int x, int y, int u, int v); // Draws line from cd{(x, y) to cd{(u, v)
public void drawRect(int x, int y, int wd, int ht); // Draws outline of rectangle
public void fillRect (int x, int y, int wd, int ht); // Draws solid rectangle
public void clearRect(int x, int y, int wd, int ht); // Draws clear rectangle
public void drawOval(int x, int y, int wd, int ht); // Draws outline of oval
public void fillOval (int x, int y, int wd, int ht); // Draws solid oval
```

Color class:

```
public Color(int red, int green, int blue); // Make a colour; arguments must be 0..255
Color.gray, Color.blue, Color.red, // Some of the predefined colours
Color.green, Color.black, Color.white
```