Name: . . . .

ID Number: . . . .

COMP102: Test 2: Part B
Model Solutions

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:

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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);
```

```
1.23 = 2.46
a = 3.5;    b = 3.5
```

(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?

```
green
[n satisfies both of the conditions of the first if]
```

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

```
blue
[n satisfies the first condition of the first if, but not
the second, and therefore the if fails.
n doesn't satisfy the first condition of the second if, but
satisfies the second.  Since the condition is an ''or'',
the condition is satisfied and the color is changed to
blue]
```

(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);
}
```

```
  k is 2
  k is 4
  k is 8
  k is 16
  k is 32
[Note that when k is 16, the loop is repeated, but k is
then doubled to 32 inside the loop, before k is printed
out.]
```

(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");}
```

```
  days :  5
  nights:  6
  long:  2
  done
[The ``ss.hasNextInt()'' condition is false when the
scanner gets to ``every'' so the loop exits.]
```

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 minium; 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)

(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) ⇒    6

minmax("max", 5, 6, 4) ⇒    5

minmax("min", 6, 4, 5) ⇒    5

minmax("min", 6, 6, 4) ⇒    -2147483648
```

(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:    any one of:
minmax("max", 4, 6, 5), minmax("min", 4, 5, 6),
minmax("max", 6, 4, 5), minmax("min", 4, 6, 5),
minmax("max", 6, 5, 4), minmax("min", 5, 4, 6),
minmax("max", 4, 4, 6), minmax("min", 5, 6, 4),
minmax("max", 6, 6, 4), minmax("min", 6, 5, 4),
minmax("max", 4, 6, 4), minmax("min", 4, 6, 4),
minmax("max", 6, 4, 6), minmax("min", 4, 6, 6),
minmax("max", 6, 4, 4), minmax("min", 6, 4, 4)
minmax("max", 6, 4, 4)

Incorrect:    any of
minmax("max", 4, 6, 6), minmax("min", 4, 4, 6),
minmax("max", 5, 5, 5), minmax("min", 6, 4, 6),
minmax("max", 5, 4, 6), minmax("min", 5, 5, 5)
```

minmax("max",x,y,z) is incorrect if
$y < x < z$ or $z < x < y$ or $x \le y = z$
minmax("min",x,y,z) is incorrect if
$x = y$ or $y < z \le x$

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Question 3. Challenge   [0 marks]

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

Consider the following large method:

```java
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

```
  Run it and see!
```

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

```
  Run it and see!  (it's over 64,000)
```

****