ComS 207: Programming I
Midterm 2, Tue. Oct 24, 2006

Student Name:
Student ID Number:
Recitation Section:

1. **True/False Questions (10 x 1p each = 10p)**

   (a) This is an infinite loop: while(b && !true) k++;   TRUE / FALSE

   (b) This is an infinite loop: for(int i=0; i<3; ++i) i--;   TRUE / FALSE

   (c) This is an infinite loop: for(int i=0; i< 100; j++) i++;   TRUE / FALSE

   (d) This is an infinite loop: do{ i=5; } while(--i!=3);   TRUE / FALSE

   (e) In a Java program more than one object may have a main method.   TRUE / FALSE

   (f) An array index cannot be a float or a double.   TRUE / FALSE

   (g) In a 3D array the third dimension must be the smallest.   TRUE / FALSE

   (h) A class constructor can't have a variable length parameter list. TRUE / FALSE

   (i) Java methods can return only primitive types (int, double, etc). TRUE / FALSE

   (j) The following statement is: (((5<6) && a) || !a)   TRUE / FALSE

2. **Short Answer Questions (5 x 2p each = 10p)**

(a) What is defined by this line of Java code: double[][] a = new double[3][];

(b) What is a static method?

(c) What is the difference between these two statements: ;   and {;}

(d) What is a break point?

(e) What is the difference between break and continue?

3. **Code Snippets (3 x 5p each = 15p)**

Write a code snippet (3-6 lines max) that produces the result specified below.

    (a)   Print only the negative numbers stored in the 1D integer array a.
The output should be in the following format: -2, -6, -1, -5, ...

    (b)   Print the numbers between 1 and 1000 that are evenly divisible by both 3 and 5.
The output numbers should be separated by commas as shown above.

    (c)   Calculate and print the sum of the square roots of the numbers between
65 and 85 (inclusive) and 102 and 119 (exclusive).

4. **Rewriting Code (4 x 5p each = 20p)**

   (a) Rewrite the following while loop as a do loop.

```
int k= 128;
while(k > 0) {
    k /= 2;
    System.out.println("The value of k is " + k);
}
```

   (b) Rewrite the following code using a switch statement.

```
int number=2;
int low=0, high=0;
if((number >=0) && (number < 3))
   low++;
else if((number > 7) && (number < 10))
    high++;
else
   System.out.println("Invalid Input");
```

(c) Rewrite the following for loop as a do loop.

```
for(int j=2, number=-1; number <5; j++, number--) {
    System.out.println("number= " + number);
    number+=j;
}
```

(d) Rewrite the following code using nested for loops.

```
boolean done=false;
int k=20;
do{
    while(true) {
        k--;
        if(k==0)    {done=true; break;}
        if(k%2==0)  { break; }
    }
    System.out.println(k);
}while(!done);
```

5. What is the Output? (2 x 5p each = 10p)

For each of the following code snippets write down what will be printed on the screen.

(a)
```
for(int a=0; a<5; a++)
{
    for(int b=0; b<a*a; b+=a)
        if(b!=2*a)
            System.out.print("#");
        else
    System.out.println("#\n#");
}
```

(b)
```
int[]  a={0, 1, 2, 3, 4, 5, 6, 5, 4, 3, 2, 1, 0};
char[] c={'h', 'a', 'l', 'l', 'o', 'w', 'e', 'e', 'n'};
for(int i=a[9]*2+1; a[i]!= 3; i=(i+5)%13) {
        System.out.print(c[a[i]] + " ");
}
```

6. **Programming Projects (TOTAL 65p, but each has a different weight)**

   (a) Fibonacci Sequence (15p)

   Write a complete Java program that calculates and prints the first 30 numbers of the Fibonacci Sequence: 1, 1, 2, 3, 5, 8, 13, 21, . . .

   The sequence is defined as follows. Elements one and two are both 1. The third element is equal to the sum of the previous two $(2 = 1{+}1)$. The fourth element is equal to the sum of the second and the third elements $(3 = 1{+}2)$. And in general, $F_n = F_{n-2} + F_{n-1}$.

(b) Morse Code (15p)

Write a complete Java program which reads one-digit integers from the keyboard and prints their corresponding Morse codes. You can assume that the user will always enter one one-digit integer per line. The program must end when the user enters -1. The international Morse codes for the ten integers are:

```
1    .  _  _  _  _
2    .  .  _  _  _
3    .  .  .  _  _
4    .  .  .  .  _
5    .  .  .  .  .
6    _  .  .  .  .
7    _  _  .  .  .
8    _  _  _  .  .
9    _  _  _  _  .
0    _  _  _  _  _
```

(c) Most Frequent Number (15p)

Write a complete Java program that generates 100 random numbers in the range -25 to 25 (inclusive) and counts how many times each of the numbers has been generated. The program must then print: 1) the number of occurrences for each of the numbers; 2) the most frequently generated number and its corresponding number of occurrences.

(d) Sudoku Tester (25p)

Write a Java program that tests if the solution of a sudoku puzzle is correct. You can assume that the solution is already stored in a 2D integer array named S as shown below. The solution of a sudoku puzzle is correct if all numbers from 1 to 9 occur without repetition on: 1) all nine rows; 2) all 9 columns; and 3) all nine 3x3 squares.

NOTE: You will get 15 points if your program can check and verify only the first two conditions (rows and columns). You will get extra 10 points if your program can also verify the 3x3 squares as well.

```
int[][] S=
 {{1,9,3,   2,8,7,   6,4,5},
  {7,2,6,   4,9,5,   8,3,1},
  {8,5,4,   1,3,6,   7,9,2},

  {3,8,2,   5,7,9,   4,1,6},
  {4,7,9,   8,6,1,   2,5,3},
  {6,1,5,   3,4,2,   9,7,8},

  {9,3,8,   6,5,4,   1,2,7},
  {5,4,1,   7,2,8,   3,6,9},
  {2,6,7,   9,1,3,   5,8,4}};
```

That's it. Good Luck!

Question	Max	Score
True/False	10	
Short Answer	10	
Code Snippets	15	
Rewriting Code	20	
What is the Output	10	
Fibonacci Sequence	15	
Morse Code	15	
Most Frequent Number	15	
Sudoku Tester	25	
TOTAL:	135	