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

(a) I forgot to write down my name and student ID number. TRUE / FALSE

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

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

(d) In a Java program only one object may have a main method. TRUE / FALSE

(e) An array index cannot be negative. TRUE / FALSE

(f) In a 2D array the second dimension is encoded with 1D arrays. TRUE / FALSE

(g) A method can have two variable length parameter lists. TRUE / FALSE

(h) Java methods can accept 2D arrays as arguments. TRUE / FALSE

(i) The following statement is: (!(a || b) != (!a && !b)) TRUE / FALSE

(j) The following statement is: (!a && b) == (!a || !b)) TRUE / FALSE
2. Short Answer Questions (5 x 2p each = 10p)

(a) What is a private method?

(b) What is defined by this line of Java code: `float[][] n = new float[5][];`

(c) What is the difference between these two statements: `for(;;);` and `while(false);`

(d) What is the difference between a case statement and a switch statement?

(e) What is the difference between an int array and an array of Strings?
3. Code Snippets (3 x 5p each = 15p)

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

(a) Print all 26 letters of the alphabet (lowercase) separated by commas.

(b) Print the odd numbers between -52 and 40 separated by commas.

(c) Given a number n print the value of n factorial (n! = 1 * 2 * ... * n).
4. Rewriting Code (2 x 7.5p each = 15p)

(a) Rewrite the following code using for loops

```java
int count1 = 1;
int iteration = 1;
while(count1 <= 10) {
    int count2 = 1;
    while(count2 <= 20) {
        System.out.println("Iteration" + iteration++);
        count2++;
    }
    count1++;
}
```

(b) Rewrite the following switch statement using only if and else statements.

```java
switch(n) {
    case 0: case 1: case 2:
        System.out.println("A");
        break;
    case 3: case 4:
        System.out.println("B");
        break;
    case 7: case 8: case 9:
        System.out.println("C");
        break;
    default:
        System.out.println("D");
}
```
5. What is the Output? (2 x 7.5p each = 15p)

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

(a) int n=2;
    for(int a=-n; a<=n; a++) {
        for(int b=-n; b<=n; b++)
            if(Math.abs(a) + Math.abs(b) <= n)
                System.out.print("#");
            else
                System.out.print(" ");
        System.out.println();
    }

(b) for(int a=-1; a<=1; a++) {
        for(int b=-1; b<=1; b++)
            if(Math.abs(a) <= Math.abs(b))
                System.out.print("#");
            else
                System.out.print(" ");
        System.out.println();
    }
6. Programming Projects (TOTAL 75p, but each has a different weight)

(a) **Numbers (15p)** Write a complete Java program which prompts the user for a nonnegative value \( n \). The program should then print the following output:

\[
\begin{align*}
1 & \ 2 \ 3 \ \ldots \ n-1 \ \ n \\
1 & \ 2 \ 3 \ \ldots \ n-1 \\
\ldots \\
1 & \ 2 \ 3 \\
1 & \ 2 \\
1
\end{align*}
\]
(b) Daily Calendar (15p)

Write a complete Java program which uses for loops to print a daily calendar of the form given below.

9:00 a.m.
9:15 a.m.
9:30 a.m.
9:45 a.m.
10:00 a.m.
10:15 a.m.
10:30 a.m.
10:45 a.m.
...
5:00 p.m.
5:15 p.m.
5:30 p.m.
5:45 p.m.
6:00 p.m.
A sequence of numbers is monotonically increasing if the values in the sequence are sorted in order. For example, 1, 2, 2, 4, 6 is a monotonic sequence but 1, 4, 3, 5, 7 is not because 4 is greater than 3. Write a complete Java program which tests if a sequence of numbers is monotonically increasing. You can assume that the sequence is stored in an int array (e.g., `int[] seq = {1, 4, 3, 5, 7};`).
(d) Random Permutation (15p)

Write a complete Java program which takes an integer array and produces a random permutation of the array. In other words, the program randomly reshuffles the entries of the array (similar to shuffling a deck of cards). The resulting array must be stored in the memory allocated for the original array (i.e., the permutation is done in place).
(e) Tic-Tac-Toe (15p)

Write a complete Java program which inspects the final configuration of a Tic-Tac-Toe board and announces the winner or declares a tie. The program must also print the location of the winning triple (e.g., row 1-3, column 1-3, main diagonal, or minor diagonal). The board is stored in a 2D char array of the form:

```java
char[][] board ={
    {'x', 'o', 'x'},
    {'x', 'o', 'o'},
    {'x', 'x', 'o'};
```

Sample output: Player x wins. See column 1.
That’s it. Good Luck!

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