Procedural Programming in Java

Q 1: Answer each of the following questions:

i) What are the primitive data types in Java?

ii) What are the differences between primitive data types in Java and primitive data types in C/C++?

iii) What is the size of each primitive data types in Java?

Q2: What is the output from each of the following programs?

```
class Q2_1 {
    public static void main(String[] args){
        outer:
        for (int i = 0; i < 3; i++){
            for (int j = 0; j < 2; j++){
                if (i == j) continue outer;
                System.out.println("i=" + i + "j=" + j);
            }
        }
    }
}

class Q2_2 {
    public static void main(String[] args){
        System.out.println("" + (5 >> 2));
        System.out.println("" + (-5 >> 2));
        System.out.println("" + (0xffffffffL >>> 30));
        System.out.println("" + (2 & 5));
        System.out.println("" + (2 > 5 ? "bt" : "lt"));
    }
}

class Q2_3 {
    public static void main(String[] args){
        int s = 0;
        int i = 7;

        for (;;){
            s += i;
            if (i <=5 ) break;
            i--;
        }
        System.out.println("s=" + s);
    }
}
```

```
class Q2_4 {
    public static void main(String[] args){
        Point p = new Point();
        int a[] = {1,2};

        p.x = 1; p.y = 2;
        f(p,a);

        System.out.println("p.x=" + p.x);
        System.out.println("p.y=" + p.y);
        System.out.println("a[0]=" + a[0]);
        System.out.println("a[1]=" + a[1]);
    }

    static void f(Point p, int[] a){
        p.x = 3; p.y = 4;
        a[0] = 3; a[1] = 4;
    }
}

class Point {
    int x, y;
}
```

Q3: Write each of the following functions as a static method in Java.

1. `static int gcd(int x, int y)`: Return the greatest common divisor of `x` and `y`.

2. `static int sumEven(int[] a)`: Return the sum of the even integers in array `a`.

3. `static boolean sorted(int[] a)`:Test if array `a` is sorted in ascending order.

4. `static int[] copy(int[] a)`: Return a copy of array `a`.

5. `static int[] eliminateDuplicates(int[] a)`: Return a copy of array a without duplicates. For example, for a = `[1,2,1,2,2,3]`, the returned array is `[1,2,3]`.

6. `static char tic_tac_teo(char[][] grid)`: Given a 3x3 grid configuration represented as a two-dimensional array, where each entry is `'X'` or `'O'`, return `'X'` if the configuration is a win for `'X'`, `'O'` if the configuration is a win for `'O'`, and `'D'` if the configuration is a draw.

7. `static long bin_str_to_int(String binStr)`: Convert an unsigned binary string to a decimal integer. For example, for `binStr = "11010"`, the returned integer is `26`.

8. `public static double[][] addMatrix(double[][] a, double[][] b)`: Return the sum of two matrices. You can assume that the two matrices have compatible dimensions.

9. `public static boolean checkNQueensSolution(boolean[][] board)`:The N-queens problem is a classic puzzle in Computer Science, in which the objective is to place N queens on an NxN grid board such that no two queens attack each other, meaning that no two queens are placed on the same row, same column, or same diagonal. The function `checkNQueensSolution` returns `true` if the solution represented by `board` is valid and `false` otherwise. The argument `board` is a two dimensional Boolean array, where an entry is `true` if there is a queen there, and `false` otherwise.