CS175 Exercise from the Textbook 2nd July 2020
https://introcs.cs.princeton.edu/java/13flow/

1. Write a program AllEqual.java that takes three integer command-line arguments and prints `equal` if all three are equal, and `not equal` otherwise.

```
public class AllEqual {
    public static void main(String[] args) {
        int a = Integer.parseInt(args[0]);
        int b = Integer.parseInt(args[1]);
        int c = Integer.parseInt(args[2]);

        if (a == b && a == c) {
            System.out.println("all equal");
        }
        else {
            System.out.println("not all equal");
        }

    }
}
```

2. Write a program RollLoadedDie.java that prints the result of rolling a loaded die such that the probability of getting a 1, 2, 3, 4, or 5 is 1/8 and the probability of getting a 6 is 3/8.

```
public class RollLoadedDie {
    public static void main(String[] args) {

        // double in the range [0.0, 1.0)
        double r = Math.random();

        // integer in the range 1 to 6 with desired probabilities
        int roll;
        if      (r < 1.0/8.0) roll = 1;
        else if (r < 2.0/8.0) roll = 2;
        else if (r < 3.0/8.0) roll = 3;
        else if (r < 4.0/8.0) roll = 4;
        else if (r < 5.0/8.0) roll = 5;
        else                  roll = 6;

        // print result
        System.out.println(roll);
    }
}
```

3. Write a program FunctionGrowth.java that prints a table of the values of $\ln n$, n, $n \ln n$, n^2, n^3, and 2^n for n = 16, 32, 64, ..., 2048. Use tabs (`'\t'` characters) to line up columns.

```
public class FunctionGrowth {

    public static void main(String[] args) {
        System.out.println("log n \tn \tn log n\tn^2 \tn^3");
        for (long i = 2; i <= 2048; i *= 2) {
            System.out.print((int) Math.log(i));
            System.out.print('\t');             // tab character
            System.out.print(i);
            System.out.print('\t');
            System.out.print((int) (i * Math.log(i)));
            System.out.print('\t');
            System.out.print(i * i);
            System.out.print('\t');
            System.out.print(i * i * i);
            System.out.println();
        }
    }
}
```

4. Write a program that takes three integer command-line arguments a, b, and c and print the number of distinct values (1, 2, or 3) among a, b, and c.

5. Write a program that takes five integer command-line arguments and prints the *average*.

6. Write a program that takes five integer command-line arguments and prints the *median* (the third largest one).

7. Write a program BowTie.java that takes a command-line argument N and prints a (2N + 1)-by-(2N + 1) bowtie like the one below. Use two `for` loops and one `if-else` statement.

```
public class BowTie {

   public static void main(String[] args) {
      int n = Integer.parseInt(args[0]);

      for (int i = -n; i <= n; i++) {
         for (int j = -n; j <= n; j++) {
            if (i*i <= j*j) System.out.print("* ");
            else            System.out.print(". ");
         }
         System.out.println();
      }
   }
}
```

8. Write a program Heart.java that takes a command-line argument N and prints a heart.

```
public class Heart {

   public static void main(String[] args) {
      int n = Integer.parseInt(args[0]);
      for (int i = -3*n/2; i <= n; i++) {
         for (int j = -3*n/2; j <= 3*n/2; j++) {

            // inside either diamond or two circles
            if ((Math.abs(i) + Math.abs(j) < n)
               || ((-n/2-i) * (-n/2-i) + ( n/2-j) * ( n/2-j) <= n*n/2)
               || ((-n/2-i) * (-n/2-i) + (-n/2-j) * (-n/2-j) <= n*n/2)) {
               System.out.print("* ");
            }
            else {
               System.out.print(". ");
            }
         }
         System.out.println();
      }
   }
}
```