Question 1

An $n \times n$ matrix is called a *positive Markov matrix* if each element is positive and the sum of the elements in each column is 1. Write a program `MarkovMatrix.java` that prompts the user to enter a 3×3 matrix of double values. Use a method with the following signature to test if the given matrix is a Markov matrix.

```
public static boolean isMarkovMatrix(double[][] matrix)
```

Your program is expected to function as shown in following examples:

```
$ javac MarkovMatrix.java
$ java MarkovMatrix
Enter Row 1: 0.15 0.875 0.375
Enter Row 2: 0.55 0.005 0.225
Enter Row 3: 0.30 0.12 0.4
Markov matrix given.
```

Question 2

Write a program `PointAndSphere2.java` that prompts user to enter respectively, coordinates of a point, coordinates of the center of a sphere and radius of the sphere. Your program would then determine the location of the point with respect to the sphere. The point should be an instance of class `Point` and the sphere should be an instance of class `Sphere`. Following is an example of an accepted output format.

```
$ javac Point.java Sphere.java PointAndSphere2.java
$ java PointAndSphere2
Coordinates of Point: 1 1 1
Coordinates of Sphere: 0 0 0
Radius of Sphere: 1.7
The point is outside the sphere.
```

Question 3

Write a program `MatrixFiller2.java` that prompts user for a number x between 1 to 9 and instantiates an $x \times x$ matrix from class `Matrix.java` whose elements are randomly generated from range 1 to x^2. Following is an expected sample run of your program.

```
$ javac Matrix.java MatrixFiller2.java
$ java MatrixFiller2
Size of Matrix: 4
 05 13 07 16
 12 02 10 01
 09 14 14 08
 02 05 01 14
```

Question 4

Write a class `Circle.java` from which we can instantiate a circle by giving its radius and use it as is shown in the following program.

```
1  import java.util.Scanner;
2  public class Circles {
3      public static void main(String[] args) {
4          Scanner input = new Scanner(System.in);
5          System.out.print("Enter radius: ");
6          double radius = input.nextDouble();
7          input.close();
8          Circle myCircle = new Circle(radius);
9          double area = myCircle.getArea();
10         double perimeter = myCircle.getCircumference();
11         System.out.printf("Area: %.2f, Perimeter: %.2f\n", area,
               perimeter);
12     }
```

```
13 }
```

Question 5

The code snippet given below is content of a file `Kitten.java` found in a public repository. Unfortunately, the program cannot be executed because the file `Cat.java` which defines the class `Cat` is missing. You are expected to develop the class `Cat` in a file `Cat.java` such that `Kitten.java` is successfully executed.

```
1  import java.util.Scanner;
2  public class Kitten {
3      public static void main(String[] args) {
4          Cat myCat = new Cat("Kitty");
5          double[] movement = promptMove(myCat);
6          myCat.move(movement[0], movement[1]);
7          myCat.showPosition();
8          myCat.showDistance();
9      }
10     public static double[] promptMove(Cat myCat) {
11         Scanner input = new Scanner(System.in);
12         char[] directions = {'X', 'Y'};
13         double[] movement = new double[directions.length];
14         for (int i = 0; i < directions.length; i++) {
15             System.out.printf("Distance to move in %c direction: ",
                   directions[i]);
16             movement[i] = input.nextDouble();
17         }
18         input.close();
19         return movement;
20     }
21 }
```

Following is a sample expected run of the program.

```
$ javac Cat.java Kitten.java
$ java Kitten
Distance to move in X direction: 3
Distance to move in Y direction: 4
Kitty is in (3.0, 4.0).
Kitty is 5.00 units away from (0, 0).
```