

## Random Number Examples

---

### 1. Color-changing square

```
/*
 * File: ColorChangingSquare.java
 * -----
 * This program puts up a square in the center of the window
 * and randomly changes its color every second.
 */

import acm.graphics.*;
import acm.program.*;
import acm.util.*;

public class ColorChangingSquare extends GraphicsProgram {

    public void run() {
        GRect square = new GRect(SQUARE_SIZE, SQUARE_SIZE);
        square.setFilled(true);
        add(square, (getWidth() - SQUARE_SIZE) / 2,
              (getHeight() - SQUARE_SIZE) / 2);
        while (true) {
            square.setColor(rgen.nextColor());
            pause(PAUSE_TIME);
        }
    }

    /* Constants */
    private static final double SQUARE_SIZE = 100;
    private static final double PAUSE_TIME = 1000;

    /* Create an instance variable for the random number generator */
    private RandomGenerator rgen = RandomGenerator.getInstance();
}
```

## 2. Pi approximation

```
/*
 * File: PiApproximation.java
 * -----
 * This program computes an approximation of the mathematical constant pi
 * by simulating a dart board, as described in the handout. The general
 * technique is called Monte Carlo integration.
 */

import acm.program.*;
import acm.util.*;

public class PiApproximation extends ConsoleProgram {

    public void run() {
        int inside = 0;
        for (int i = 0; i < NDARTS; i++) {
            double x = rgen.nextDouble(-1.0, +1.0);
            double y = rgen.nextDouble(-1.0, +1.0);
            if (x * x + y * y < 1.0) inside++;
        }
        double pi = 4.0 * inside / NDARTS;
        println("Pi is approximately " + pi);
    }

    /* Constants */
    private static final int NDARTS = 10000;

    /* Create an instance variable for the random number generator */
    private RandomGenerator rgen = RandomGenerator.getInstance();
}

```