```
import java.text.DecimalFormat;
import java.text.NumberFormat;
import java.util.Scanner;

public class NeedleApp {

	public static void main(String[] args) {
		double probability = 0;
		NumberFormat format1 = new DecimalFormat("#0.00000");

		Scanner sc1 = new Scanner(System.in);
		System.out.print("\nEnter # of trials: ");
		int numTrials = sc1.nextInt();
		System.out.print("\n");

		Needle needle1 = new Needle(numTrials);
		probability = needle1.simulate();

		System.out.println("\nFinal Probability  = " + format1.format(probability));
		sc1.close();
	}
}
```

```
import java.text.DecimalFormat;
import java.text.NumberFormat;

public class Needle {

	int numTrials = 0;
	int flag = 0;
	double probability = 0;

	public Needle(int trials) { // constructor
		this.numTrials = trials;
	}

	NumberFormat format1 = new DecimalFormat("#0.0000");

	public double simulate() {
		for (int i = 1; i < (numTrials + 1); i++) {
			double yL = 2 * Math.random();
			double ySin = Math.sin(Math.random() * Math.PI);
			double yH = yL + ySin;
			if (yH >= 2.0) {
				flag++;
				probability = (double) flag / (double) i;
				System.out.println("i = " + i + "\tyL = " + format1.format(yL)
						+ "\tySin = " + format1.format(ySin) + "\tyH = "
						+ format1.format(yH) + "\tflag = " + flag + "\tProb = "
						+ format1.format(probability));
			}
		}
		return probability;
	}
}
```

```
Enter # of trials: 10000

i = 1  yL = 1.2663  ySin = 0.9679yH = 2.2342  flag = 1     Prob = 1.0000
i = 4  yL = 1.3297  ySin = 0.8702yH = 2.1999  flag = 2     Prob = 0.5000
i = 6  yL = 1.8189  ySin = 0.9873yH = 2.8062  flag = 3     Prob = 0.5000
i = 7  yL = 1.8987  ySin = 0.9215yH = 2.8202  flag = 4     Prob = 0.5714
i = 8  yL = 1.5911  ySin = 0.8680yH = 2.4591  flag = 5     Prob = 0.6250
i = 10 yL = 1.1168  ySin = 0.9972yH = 2.1140  flag = 6     Prob = 0.6000
i = 14 yL = 1.7144  ySin = 0.9521yH = 2.6666  flag = 7     Prob = 0.5000
i = 15 yL = 1.4629  ySin = 0.7858yH = 2.2487  flag = 8     Prob = 0.5333
i = 17 yL = 1.6802  ySin = 0.9301yH = 2.6102  flag = 9     Prob = 0.5294
i = 19 yL = 1.7784  ySin = 0.6972yH = 2.4756  flag = 10    Prob = 0.5263
i = 21 yL = 1.3334  ySin = 0.9991yH = 2.3325  flag = 11    Prob = 0.5238
i = 22 yL = 1.7368  ySin = 0.9965yH = 2.7333  flag = 12    Prob = 0.5455
i = 23 yL = 1.5722  ySin = 0.9411yH = 2.5133  flag = 13    Prob = 0.5652
i = 30 yL = 1.9662  ySin = 0.8220yH = 2.7882  flag = 14    Prob = 0.4667
i = 33 yL = 1.9111  ySin = 0.8019yH = 2.7130  flag = 15    Prob = 0.4545
       .
       .
       .
i = 9962     yL = 1.3221  ySin = 0.7953yH = 2.1174  flag = 3131  Prob = 0.3143
i = 9965     yL = 1.4400  ySin = 0.9751yH = 2.4152  flag = 3132  Prob = 0.3143
i = 9968     yL = 1.7358  ySin = 0.9998yH = 2.7356  flag = 3133  Prob = 0.3143
i = 9969     yL = 1.3434  ySin = 0.6984yH = 2.0418  flag = 3134  Prob = 0.3144
i = 9973     yL = 1.5650  ySin = 0.9187yH = 2.4837  flag = 3135  Prob = 0.3143
i = 9977     yL = 1.3955  ySin = 0.9336yH = 2.3291  flag = 3136  Prob = 0.3143
i = 9982     yL = 1.8215  ySin = 0.9756yH = 2.7971  flag = 3137  Prob = 0.3143
i = 9987     yL = 1.2503  ySin = 0.9610yH = 2.2113  flag = 3138  Prob = 0.3142
i = 9990     yL = 1.6889  ySin = 0.5283yH = 2.2172  flag = 3139  Prob = 0.3142
i = 9996     yL = 1.4908  ySin = 0.6971yH = 2.1879  flag = 3140  Prob = 0.3141
i = 9999     yL = 1.7469  ySin = 0.9637yH = 2.7106  flag = 3141  Prob = 0.3141

Final Probability = 0.31413
```