



## Problem 1 – Rolling Heads

There are several ways random integers can be used to simulate a coin toss. One possible option is to use even numbers for heads and odd numbers for tails. What is another option?

From the home screen, press **MATH**, arrow over to **PRB**, and choose **randInt**(. Type **0, 1**. Press **ENTER** repeatedly.

```
randInt(0,1)■
```

1. What does the command do?
2. How can it be used to simulate tossing a coin?
3. Perform **randInt(0, 1, 5)**. What does the third number in the list do?

Using 0 for heads and 1 for tails, simulate tossing a coin one time. Record the number of heads in the table below. Repeat for 5, 10, 15, 20, 25, and 30 trials. Record the number, and percent, of heads in each experiment.

For larger numbers of trials, you will have to use the right arrow key to see some of the results.

	1	5	10	15	20	25	30
<b>Number</b>							
<b>Percent</b>							

4. What happens as the number of trials increases?

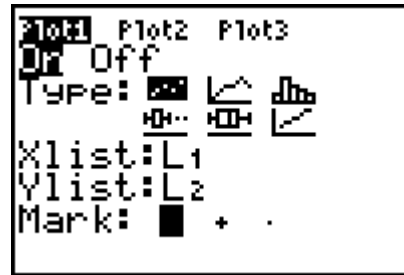
Press **STAT**, choose **EDIT**, and enter the number of trials in **L1** and the percent of heads, as a decimal, in **L2**.

Note: Everyone will have different values in List 2.

L1	L2	L3	1
1	-----	-----	
5			
10			
15			
20			
25			
30			
L1(?)=30			

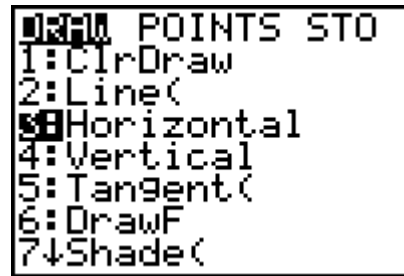
# Probability Simulations

Press **2nd** [STAT PLOT], turn **Plot1** on, choose scatter plot for the graph type, **L1** for XList, and **L2** for YList.



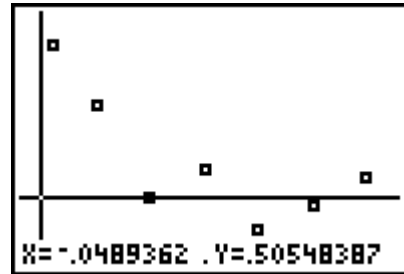
Press **GRAPH**. To see all the points, press **ZOOM** and choose **ZoomStat**.

Draw a horizontal line at the theoretical probability of getting heads when tossing a coin. To draw the line, press **2nd** [DRAW] and select **Horizontal**. Use the arrow keys to move the line up and down.



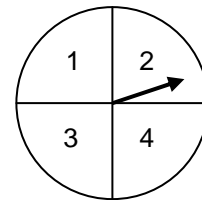
5. What appears to be true about the points in relationship to the line?

If your teacher instructs you to, find experimental probabilities for larger numbers of trials. Update your graph as needed.



## Problem 2 – Spinning a “2”

Use the **randInt** command to simulate spinning the spinner 1, 5, 10, 15, 20, 25, and 30 times. Use the chart below to record the number and percent of times it lands on “2.”



	1	5	10	15	20	25	30		
<b>Number</b>									
<b>Percent</b>									

Make a scatter plot of the number of trials and percent of “2”s.

6. Does your data follow the Law of Large Numbers? Explain.

If your teacher instructs you to, find experimental probabilities for larger numbers of trials. Update your graph as needed.

**Problem 3 – Exactly Two Girls**

Recall that even and odd numbers can be used to distinguish results in simulations. In using a range of numbers from  $-9$  to  $9$ , there are 9 even numbers and 10 odd numbers. The easiest fix for this to disregard results that have a 0.

```
randInt(-9,9,2)
(4 -3)
(-5 -7)
(-7 -6)
(7 2)
(-2 9)
```

Enter **randInt(-9, 9, 2)** and press **ENTER** five times.

- How can this be a simulation of observing five families with two children each and recording if each child is a boy or a girl?

Simulate observing 10 families with exactly five children each. Disregard rows with any zeros. If you disregard a row, press **ENTER** again so that you have 10 “families” without zeros.

To organize your results, put an X in the box when the family has exactly two girls.

Family	1	2	3	4	5	6	7	8	9	10

- What percent of families have exactly 2 girls?
- What is the experimental probability of having exactly two girls from five births?
- Combine results from other students. Predict the theoretical probability of having exactly two girls from five births.

**Problem 4 – Extension**

- Use simulation to predict, on average, the number of times one needs to flip a coin before they get two heads in a row. Explain how you performed your simulation.