



Classroom Activity: Student Guide: Coin Toss-up

If you toss a coin, there is a fifty-fifty chance it will land tails-side up. But what if you toss it five times: can you predict how often you'll get one tails and four heads versus three tails and two heads? In this activity, use a coin and some graph paper to explore how the accuracy of predictions is influenced by sample size.

Useful Vocabulary

- **Probability:** A number that describes how likely an event is to happen.
- **Independence:** Two events, A and B, are independent from each other if, when A happens, it does not affect the probability of B happening.
- **Random process:** A process, like flipping a coin several times, where there can be several different possible results, and the different results may or may not be equally likely.
- **Histogram:** A graph that shows the distribution of data.

Materials

To do this activity you will need:

- A coin (one you choose as the best for flipping)
- Data tables (below)
- Pencil (1)
- Graph paper (2 sheets)

Directions

1. Practice flipping the coin you choose. Try to flip it the same way each time. You will use this coin for the duration of the experiment.
2. Flip the coin five times and record if it's heads or tails in line 1 of Table 1. For example, a result in this series of heads, tails, heads, tails, and tails could be written as HTHTT.

Coin Flip Series #	Results	Coin Flip Series #	Results
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

Table 1. Coin flip data

3. Repeat step 2 nine more times so that lines 1 through 10 of the table record the results of each series of five coin flips.
4. After you finish flipping the coin, notice that there are six combinations possible when flipping a coin. You can have: five heads; four heads and one tails; three heads and two tails; two heads and three tails; one heads and four tails; and five tails.
5. Count how many you have of each combination, and record the information in the table below under the first column.

Combination	Count for Series #1-10	Count for Series #11-20	Total Count (Series #1-20)
5 Heads			
4 Heads, 1 Tails			
3 Heads, 2 Tails			
2 Heads, 3 Tails			
1 Heads, 4 Tails			
5 Tails			

Table 2. Count data for each combination of heads and tails

- Using a sheet of graph paper, make a bar graph of the data from this table. Label the x-axis *Combination*, and the y-axis *Count*. This kind of graph is called a histogram.
- What does the graph look like? Which combination had the highest count?
- Now flip the coin five times again, repeating for ten additional series (#11 through #20), recording the heads/tails data in lines 11 through 20 of Table 1. Count how many you have of each combination, and record those numbers in Table 2 under the second column.
- In Table 2, add the numbers for each combination from the first series column and the second series column, then put the sum in the third column (Total Count), for a total of 20 series.
- Using a sheet of graph paper, make a bar graph of the data from the third column in Table 2. Label the x-axis *Combination*, and the y-axis *Count*. What is the graph shaped like?
- Do you see a difference between the histogram with ten series and the histogram with 20 series? What does this tell you about making predictions based on a small number of series?

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