

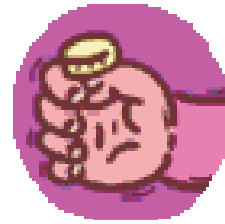
# Algebra/Geometry Institute Summer 2009

## Probability

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**School:** Cleveland School District  
Cleveland, MS

**Grade Level:** Grades 4 - 6



### 1 Teaching objective(s)

The students will –

- Gather, organize, and display data in an appropriate chart or graph.
- Calculate and apply basic probability.

### 2 Instructional Activities

Start the activity by posing a question to students: “*Have you ever heard of a ‘lucky’ coin?*” Students will have heard stories in which a lucky coin or object helped an individual get through a difficult time or over come an obstacle. In these situations, the coin is believed to bestow luck on an individual who holds it or carries it in a pocket. Some students may have heard the word lucky used for a coin that always lands heads (or tails). Discuss with the students that these coins are called **fair** – namely, coins that are weighted in such a way that they always land heads up. Explain that perhaps it is this predictability that makes people call them **lucky** coins.

Some students may associate **lucky** with **likely**. Discuss the difference between the terms.

- The dictionary defines the word **lucky** to mean favored by luck, or fortunate.
- Although the word **likely** has numerous meaning, the mathematical definition indicates that it is a measure of probability between one-half and one.

Explain to the students that they are going to toss some coins and investigate whether they come up heads or tails more often. U. S. coins are **fair** coins; that is, there is an equal probability of them landing heads or tails. This doesn’t mean that the sequence of heads and tails from tossing one fair coin will be H, T, H, T, H, T, ... There is a variability in the order of the outcomes.

Explain that the **probability of a certain outcome** is the ratio of the number of ways a certain outcome can occur to the number of possible outcomes. It is expressed with the following ratio

$$\text{probability}(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

### **Activity 1**

Students will work in pairs for the first part of the lesson. Each pair of students will be given a quarter, nickel, dime, and penny. Direct students to toss each coin ten times and keep a record of the number of heads and tails for each toss on a chart. They will use the data to calculate the probability of the coins landing on heads and the probability of the coins landing on tails. Ask students to share their results.

### **Activity 2**

While the students are tossing coins, place a chart that lists the four coins and the number of heads and tails for each on the board or overhead projector. When the student pairs finish recording their results of the coin tosses, have them enter their results for each coin toss on the class chart. Each student pair should record the number of heads and the number of tails obtained after tossing the penny, nickel, dime, and quarter ten times.

After the students have recorded their data on the classroom chart, take a minute and have the class members examine their results. Most likely there will be a great deal of variability in the number of heads and tails tossed. Ask students to compare the total number of heads and tails recorded for each coin.

Total the entries in the columns under each coin, starting with the penny. Use the data to find probabilities. Students will notice that the likelihood of heads and tails is close to, if not exactly, 50-50 for all the coins.

Explore with students that if you repeatedly toss a fair coin a large number of times, you have the occurrence that the number of heads tossed or the number of tails tossed will get closer and closer to one-half.

$$\text{probability}(H) = \frac{1}{2} = 50\% \quad \text{and} \quad \text{probability}(T) = \frac{1}{2} = 50\%$$

## **3 Materials and Resources**

- One penny, nickel, dime, and quarter for each pair of students
- Mats for deadening the sound of coin tosses
- Table to record data
- Overhead projector
- Transparencies & transparency markers
- Can a Coin Be Lucky? activity sheet

## Resources

Adapted from Chapin, Suzanne; Koziol, Alice; MacPherson, Jennifer; Rezba, Carol. Navigating through Data Analysis and Probability in Grades 3-5. Reston, VA; The National Council of Teachers of Mathematics, Inc., 2002. Pp 68-72

Heitschmidt, Corey. "Probability Explorations." National Council of Teachers of Mathematics. 10 June 2009.

[www.illuminations.nctm.org/lessondetail.aspx?ID=L790](http://www.illuminations.nctm.org/lessondetail.aspx?ID=L790)

## 4 Assessment

Students will be assessed by monitoring and observing group work. Students will be assessed for the understanding of probability from the "Can a Coin Be Lucky?" activity sheet.

Name \_\_\_\_\_

## Can a Coin Be Lucky?

To explore the probability of getting a head or tail in a coin toss, run an experiment of 10 trials (for each coin). In the table below, record how many heads or tails each coin lands on in your experiment. Write the total number of heads or tails you get in the 10 trials for each coin in the last row of the table.

	Penny		Nickel		Dime		Quarter	
Outcome	H	T	H	T	H	T	H	T
Tally								
Total								

1. How likely is it that we will get a head when tossing a penny, a nickel, a dime, or a quarter?
2. Does the size and weight of a fair coin have anything to do with whether it lands heads or tails?
3. Do any of these coins seem 'luckier' than others, or do they all have the same likelihood of landing heads up? Tails up?

## Probability of a Certain Outcome

$$\textit{probability}(\textit{event}) = \frac{\textit{number of favorable outcomes}}{\textit{number of possible outcomes}}$$

Transparency 2

Outcome	Penny		Nickel		Dime		Quarter	
	H	T	H	T	H	T	H	T
Group 1								
Group 2								
Group 3								
Group 4								
Group 5								
Group 6								
Group 7								
Group 8								
TOTALS								

Penny

Probability(H) =

Probability(T) =

Nickel

Probability(H) =

Probability(T) =

Dime

Probability(H) =

Probability(T) =

Quarter

Probability(H) =

Probability(T) =