

## HEADS OR TAILS? Teaching Guidelines

**Subject:** Mathematics

**Topics:** Statistics and Probability

**Grades:** 4 - 8

**Concepts:**

- Probability
- Sample

**Knowledge and Skills:**

- Can apply the strategy "look for a pattern"
- Understands the effect of sample size on the accuracy of measured probabilities
- Can represent numerical data in chart and graph form
- Understands the purpose and value of organizing information in charts

**Materials:** One coin for each student or team.

**Procedure:**

Students should do this activity in teams of four. (Other team sizes may be used, but the total number of new spins at each stage should be 80.)

1. Hand out the activity sheet. Tell students they are going to do an experiment. Discuss the instructions (through #5) and ensure that students understand that after each 80 spins (20 by each team member) they are to add up the total number of heads so far and calculate that as a percentage of the total number of spins so far.
2. Ask students to explain why they think they are supposed to use a chart to record their data, and discuss the value of charts in keeping experimental data organized.
3. Have each team carry out the experiment and fill out the chart. Circulate as they do so and help as needed.

4. Once the charts are filled out, ask each team to look at their charts and make observations about them. Accept these, and then ask each team to make a graph that shows the information in the chart.

Give as much guidance to making the graph as necessary, and no more. In all cases the “percent of heads” should be graphed on the vertical axis against “total number of spins” on the horizontal axis.

5. Once the graphs are made, ask students for their observations.
6. Students should observe that as the number of spins increases, the percent of heads usually gets closer to 50%. But there may be exceptions to this.
7. After students give their observations, ask them what they think will happen if the class adds up all of the spins and all of the “heads” and computes the percentage. Then do that.

In addition to giving students practice in making charts and graphs, and helping them to see the value of graphs in interpreting data, this experiment will informally familiarize them with an important idea of probability: when you say “the probability of a coin coming up heads is 50%”, this does not help you predict any particular spin, but only the percentage of heads out of a very large number of spins. The larger the number of spins, the more likely that the percentage will be close to 50%.



# Heads or Tails?

Do this experiment. Work in teams of four.

1. Each team member spins a coin 20 times, and counts the "heads". Find the percent of 80 spins that were heads.
2. Each team member spins a coin 20 more times, and counts the "heads". Calculate the percent of 160 spins that were heads.
3. Each team member spins a coin 20 more times, and counts the "heads". Calculate the percent of 240 spins that were heads.
4. Each team member spins a coin 20 more times, and counts the "heads". Calculate the percent of 320 spins that were heads.
5. Repeat until you have a total of 800 spins.
6. Put your data into this chart.

<i>Number of spins</i>	Total number of heads so far	Percent of heads
80		
160		
240		
320		
400		
480		
560		
640		
720		
800		