

Math 6 - Act. 25: Coin Tossing

Summary

This experiment is designed to help students see that the probability is not the same as reality. However, they should discover that as we do the experiment more times, the results resemble the probability more closely.

Materials

For each student:

- A penny
- Experiment chart
- Pencils
- Calculator

Background for Teachers

Most of us would guess that the probability of flipping heads on a coin are one out of two, or $1/2$. The students can readily understand this. However in practice, the result of flipping a coin ten times will not always come up 5 heads and 5 tails. This experiment is designed to help students see that the probability is not the same as reality. As we do the experiment more times, however, the results resemble the probability more closely.

Benford's law shows that there is a high probability that either heads or tails will come up six or more times in a row when the coin is tossed 200 times. Most fakers will not know this and will not put such an event in their fake results.

Intended Learning Outcomes

3. Reason mathematically.

Instructional Procedures

Invitation to Learn

Introduce money probability problems.

Instructional Procedures

Place students in cooperative learning groups and pass out materials.

Say: "Suppose you ask a friend to flip a coin 200 times and record the outcome. When you are given the results, you want to know whether your friend really flipped the coin all those times or just faked it." 1000 Play Thinks: Puzzles, Paradoxes, Illusions & Game by Ivan Maseovich (Workman Publishing)

Agree that each player on the team will toss the coin 10 times. Another student will record the results on the enclosed bar graph and post around the room. Color heads red and tails green. Choose one person to roll the dice 50 times. Stop them after each 50 tosses and calculate the most times heads or tails came up in a row. Also calculate how many total times heads and tails came up. Use the chart to do this.

Have each person on the team roll 50 times, recording the results as you go. Stop after each 50 rolls and evaluate the results. At the end of 200 throws, have the group calculate the most times heads or tails came up in a row, as well as the total number of times heads and tails came up. Initiate a discussion about how you would know whether the friend had actually thrown the dice 200 times. Ask the group:

How many times did head or tails come up 10 times in a row? 9 times in a row, etc.

What is the balance between heads and tails like?

After how many throws did you notice that heads and tails were about even?

Have each group devise a way to tell if the friend had actually thrown the dice 200 times.

Curriculum Integration

Girls and boys are born about equally. How does this experiment relate to the proportion to girls and boys? What are your chances of having either a girl or a boy? How many children would you need to have to ensure equal numbers of boys and girls?

Extensions

Possible Extensions

How many possible outcomes are there when you toss two coins? What are the chances of getting either a heads or a tails when throwing the dice?

Question: Lauren has 12 coins in her pocket. The probability of her pulling out a penny is $\frac{1}{2}$. How many pennies are in her pocket?

Homework & Family Connection

Give students an extra sheet to try this with their parents. Offer extra credit in math if they do it and bring it signed by their parents.

Assessment Plan

Jenny claims to have tossed her penny 300 times. The greatest number of either heads or tails in a row is 3. Do you think Jenny actually tossed her coins? Why or why not?

Authors

[Utah LessonPlans](#)