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10. Trials: Single Coin Toss

Context

Sports

Math Topic

Probability distributions

Overview

There is no better way to understand probability than to do simple experiments. Perhaps the easiest way to generate random events is to toss a coin.

Use Activity 11 if you wish to study the binomial model on which these trials are based.

Objectives

Students will be able to:

- conduct and record the results of experimental trials.
- make a graph to analyze the results.

Materials

- Calculator
- One copy of the Activity 10 handout for each pair of students
- One coin for each pair of students
- Graph paper

Teaching Notes

Students should pair off. Within each pair, one student will toss or spin the coin to produce good random trials. The other will record the results. Students should switch jobs halfway through the trials. It is recom-

mended that the person tossing the coin catch it rather than let it bounce on the floor.

Students will record 20 trials of 10 tosses each. The exact sequence of heads and tails in each trial should be written on the sheet. For each trial, the students should count and record the number of times the outcome was heads.

The students can then complete a histogram showing the frequency with which heads occurred 0 times, 1 time, 2 times, etc., up to 10 times in the trials.

If you decide to do Activity 11, make sure that students save their data from this activity.

Answers

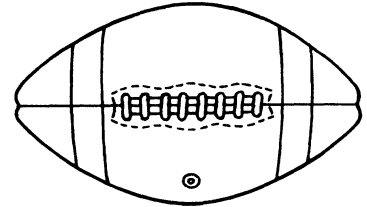
1. and 2. Results will vary. The theoretical distribution of probability is

0H, 0.001	6H, 0.205
1H, 0.010	7H, 0.117
2H, 0.044	8H, 0.044
3H, 0.117	9H, 0.010
4H, 0.205	10H, 0.001
5H, 0.246	

For 20 iterations of the 10 flips, occurrences of 0H, 1H, 9H, and 10H will be rare, with total probability under 5 percent that any of these will happen. However, many students will experience one or perhaps two of these rare events within their 20 iterations. The rest of the theoretical distribution is 2H, 1 occurrence; 3H, 2 occurrences; 4H, 4 occurrences; 5H, 5 occurrences; 6H, 4 occurrences; 7H, 2 occurrences; 8H, 1 occurrence.

10. Trials: Single Coin Toss

You know there is a 50–50 chance that your team will win the coin toss at the beginning of a football game. But what is your team’s probability of coming out ahead (or behind) in winning the toss during the course of a 10-game season? Find out in this simulation.



1. One partner will toss or spin a coin to produce good random trials. The other will record the results on this sheet. Switch jobs halfway through the trials. It is recommended that the person tossing the coin catch it rather than let it bounce on the floor. Record 20 trials of 10 tosses each. The exact sequence of heads and tails should be written on the sheet under “Outcomes.” For each trial, record the number of times the outcome was heads out of the 10 tosses.

Trial	Outcomes	No. of Heads	Trial	Outcomes	No. of Heads
1			11		
2			12		
3			13		
4			14		
5			15		
6			16		
7			17		
8			18		
9			19		
10			20		

2. After all data are obtained, make a histogram on sheet of graph paper showing the frequency with which heads occurred 0 times, 1 time, 2 times, etc., up to 10 times in the trials.