Probability in Games

Purpose

Students will show all possible outcomes for compound events in an organized way, find the theoretical probability of each outcome, and then use the data to estimate the probability of future events.

Materials

For the teacher: overhead projector; transparent spinner; red, yellow, and blue overhead markers; spinner that is divided into one-half and two-fourths; spinner that has 6 evenly divided spaces; 15 marbles with more of some colors than others; bag; game board; pair of number cubes; 4-5 game pieces
For each pair of students: blank spinner; red, yellow, green, black, and blue crayons or markers; paper; pencil
For each group of students: copy of Black Line Master (BLM) *Probability in Games*, paper, pencil

Activity

A. Pre-Activity Preparation

Set up centers for experimentation.

1. In the first center, place a spinner that is divided into one-half colored blue, and the other one-half divided into three equal parts, each a different color (red, yellow, green).
2. In the second center, place a spinner that has six evenly divided spaces.
3. In the third center, place a total of 15 marbles with more of one color marbles than others so the theoretical probability depends on the number of marbles of each color. List on a paper in the center the number of each color.
4. In the fourth center place a pair of number cubes.

B. Introduction

1. Tell students that they are going to have practice in determining theoretical and experimental probability by looking at all possible outcomes for an event.
2. Model on the overhead for the students how to color their blank spinner – $\frac{1}{4}$ red, $\frac{1}{4}$ yellow, and $\frac{1}{2}$ blue.
3. Direct students to work in pairs to color their blank spinner.

(continued)

INCORPORATING TECHNOLOGY

Direct students to use Web sites, such as Ken White's Coin Flipping Page, shazam.econ.ubc.ca/flip/, or Iron Games Dice Server, www.irony.com, to work with theoretical and experimental probability with a larger sample size.

Standards Links
6.6.1, 6.6.2

Activity (continued)

4. Discuss the theoretical probability of the spinner landing on each color. [Students should respond that 25% or $\frac{1}{4}$ of the spins should land on red, 25% or $\frac{1}{4}$ on yellow, and 50% or $\frac{1}{2}$ on blue.]
5. Have pairs spin the spinner 20 times and record experimental probability. Ask: "How close were the relative frequencies to the theoretical probability?"

C. Center Activities

1. Introduce each center to the class.
2. Divide the students into four groups so that they can rotate from center to center. (If there are too many students, you may want to divide them into 8 groups and have two of each center.)
3. Have students make a statement of their predictions of the relative frequencies after 20 spins based on the theoretical probability of landing on each color in centers 1 and 2. Ask students to write their predictions on the BLM *Probability in Games.*
4. Have students make a statement of their prediction of the relative frequencies based on the theoretical probability of picking each color in center 3. Ask students to write their prediction on the BLM.
5. Have students make a statement of their predictions of the relative frequencies based on the theoretical probability of rolling each sum from 2 to 12 on the number cubes in center 4.
6. After making a statement on the theoretical probability in each center, the students should perform 20 trials in each center and record the experimental probability.
7. Students then write a statement about the difference between the relative frequency predictions and experimental probability in each center.

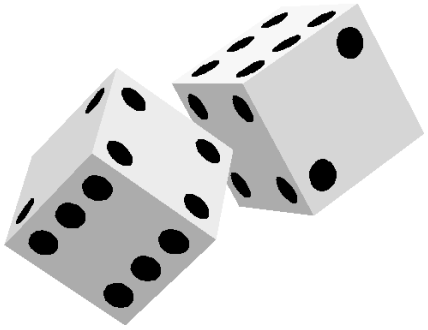
Classroom Assessment

Basic Concepts and Processes

During the activity and when reviewing the BLM, discuss the following questions with your students to gauge their understanding of the Standard Indicators:


What is the theoretical probability of the experiment you are about to perform?


How did you determine the theoretical probability?



Names: _____
Center # _____

Probability in Games

Predict the relative frequencies of the results of the experiment in this center after 20 trials.

Trials

#1____ #2____ #3____ #4____ #5____ #6____ #7____ #8 ____ #9____ #10____

#11____ #12____ #13____ #14____ #15____ #16____ #17____ #18____ #19____ #20____

Tally your results and compare them to the relative frequency predictions you made.

Make a statement about the difference between the relative frequencies and the theoretical probability of this experiment. What are some factors that could affect the results?

If there is time, repeat this experiment to see if the results are closer to your relative frequency predictions.

Probability in Games

Teacher Directions

Distribute one copy of the BLM *Probability in Games* to each group. Have students use a different sheet in each center to record theoretical probability and experimental probability and to make a statement about the differences.

Answer Key

In center 1, the theoretical probability is 50% or $\frac{1}{2}$ blue and $\frac{1}{6}$ for each of the other colors. The prediction for relative frequency in 20 spins should be: 10 spins blue and about 3 spins each for the other colors.

In center 2, the theoretical probability is $\frac{1}{6}$ for each color. The prediction for relative frequency in 20 spins should be about 3 spins per color.

In center 3, the theoretical probability of each color marble is the number of that color over 15.

In center 4, 7 should be rolled most often.