#9569

BILL NYE THE SCIENCE GUY:
PROBABILITY

DISNEY EDUCATIONAL PRODUCTIONS, 1996
Grade Levels: 5-8
24 minutes

DESCRIPTION

What is probability? What's the difference between probability and prediction? What is a bell curve? Simple experiments help explain the complicated concept of probability and related terms.

ACADEMIC STANDARDS

Subject Area: Math

★ Standard: Understands and applies basic and advanced concepts of probability

- Benchmark: Determines probability using simulations or experiments (See Instructional Goal #3.)

- Benchmark: Understands the relationship between the numerical expression of a probability (e.g. fraction, percentage, odds) and the events that produce these numbers (See Instructional Goal #2.)

- Benchmark: Understands how predictions are based on data and probabilities (e.g., the difference between prediction based on theoretical probability and experimental probability) (See Instructional Goal #2.)

INSTRUCTIONAL GOALS

1. To define probability and statistics.
2. To apply probability and statistics as they relate to science, games, business, and many aspects of daily life.
3. To show how equations are used to calculate probability and odds.

BACKGROUND INFORMATION

Probability is the numeric value (from 0 to 1) associated with the likelihood of an event occurring with some particular outcome. An event is the outcome of something happening; for example, a coin landing heads up after being flipped. The theoretical probability of an event may be calculated by dividing the number of favorable outcomes by the total number of possible outcomes. The empirical probability (or what actually happens on each coin flip) may be calculated by dividing the number of times the outcome of a repeated event is favorable by the number of times the event occurs. The greater the number of repetitions, the closer the empirical probability will be to the theoretical probability.

VOCABULARY

1. wizard
2. bell-shaped curve
3. chromosomes
4. lottery
5. replica
6. migration ecology
7. radio transmitter

BEFORE SHOWING

1. Discuss the difference between probability and odds. Demonstrate by finding the probability and the odds of rolling a two on a die.
2. Discuss the following:
   a. What are examples of situations where probability is used in everyday life?
   b. Is it possible to mathematically calculate the chances of something happening or is it just luck?
   c. What is an average?
   d. In what areas, other than math, is probability used?
3. Check the weather forecast on the Internet for information about probable weather in selected cities. Discuss the meaning of 70% chance of rain.

DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at the scenes showing the Wizard of Odds. Explain the phonetic similarity with the actual name.
3. Pause at the scene showing the coin labeled "In Odds We Trust". Explain the phonetic similarity with the actual phrase.
4. Pause at the section showing Bill looking for the red packing peanut in the container holding white packing peanuts. Discuss the appropriateness of the phrase "finding a needle in a haystack".
5. Pause at the section showing the stacking of the large dice. Point out the shape of the bell curve. Discuss other events that might produce a bell curve.

AFTER SHOWING

► Discussion Items and Questions

1. In what ways is probability part of daily life?
2. Why is probability important?
3. What increases the probability of something happening? (fewer combinations)
4. What decreases the probability of something happening? (more combinations)
5. In what way is determining an average helpful? (Makes it easier to predict an outcome.)
6. What does the shape of a bell curve demonstrate? (The distribution of results. The frequency at which events occur.)
7. The number seven is considered lucky by many people. How is luck really a mathematical probability when it comes to rolling the number seven with dice?
8. What is the difference between luck and probability?
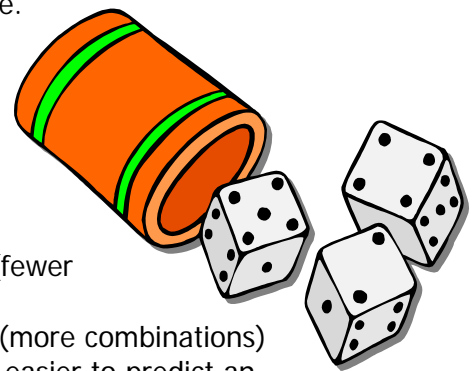
► Applications and Activities

1. Put marbles of various colors in paper bags. Work in pairs; take turns selecting one marble from the bag, noting the color on the tally sheet, and placing the marble back in the bag.
   a. One pair of students records 10 tallies, another pair does 25 tallies, and another pair does 50 tallies.
   b. Based on the tallies, guess how many marbles of each color are in the bag. Compare the accurateness of the three different tallies.

2. Take a survey to compare the number of right-handed students with left-handed students in the class.
   a. Calculate the ratio of right- to left-handedness.
   b. Calculate the percentage of the class that is left-handed.
   c. Nationally, the ratio of right- to left-handed students is 6:1 or 16% of the population. Compare the results of the survey with the national statistics.
   d. Survey other classrooms to collect additional information to increase the sample base.

3. Groups of two or more students get a package of multi-colored candies. Each group will predict and note outcomes to the following questions:
   a. What colors are in the package?
   b. How many candies are in the package?
   c. What will be the distribution of colors?
   d. Do all packages of this candy contain the same number of colors?

4. Create a chart listing all the possible combinations of dice: 1-1, 1-2, 1-3, up to 6-6. There are 36 possible combinations. Answer the following questions:
   a. How many combinations will add up to an even number? What is the probability of getting an even number?
   b. How many of the combinations will add up to an odd number? What is the probability of getting an odd number?
   c. How many combinations will result in an even number if multiplied? What is the probability of getting an even number?
   d. How many combinations will result in an odd number if multiplied? What is the probability of getting an odd number?

5. Research the state's lottery system to find out how many tickets were purchased for the last drawing. What is the probability of being a winner?

6. Obtain insurance statistics that help insurance companies determine premiums.
   a. Discuss how the probability theory is used.
   b. List important factors; life expectancy, age at which most car accidents occur, geographic location, etc.

7. Make a list of events that have a 100% chance of happening. Make a list of events that have a 0% chance of happening.

8. Place cards with the letters *A*, *L*, *G*, *E*, *B*, *R*, and *A* in a box. Take turns drawing three letters until the letters *L E G* are drawn in order. Calculate the probability of this happening.

9. Investigate contests held by fast-food restaurants or other businesses (peeling off stickers or collecting free toys). Calculate the probability of winning the grand prize or of collecting all the toys.

10. Obtain a Scrabble game and count the total number of tiles for each letter. Seven tiles are drawn at the beginning of the game. Find the probability of:

a. selecting an *O* on the first draw (2/25)
b. selecting an *N* on the first draw (3/50)
c. selecting another *E* if 5 tiles have been selected and two of them were *E*'s (2/19)

11. Obtain a standard deck of 52 cards. Make a list of possible events that can occur when a card is selected at random. Find the probability or odds of each. Examples include:
   a. What is the probability of selecting a red card?
   b. What are the odds of selecting a spade?
   c. What is the probability of selecting a face card?

12. Fill a jar with 30 pennies, 10 nickels, 15 dimes, and 20 quarters. If a coin is selected at random, what are the odds of:
   a. selecting a penny?
   b. selecting a quarter?
   c. selecting a dime?
   d. selecting a nickel?
   e. not selecting a dime?
   f. not selecting a penny?
   g. selecting a quarter or a nickel?

RELATED RESOURCES

CAPTIONED MEDIA PROGRAM

- Estimation: Going to the Dogs #3605

World Wide Web

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

- **PROBABILITY: THE STUDY OF CHANCE**

  Contains a lesson plan for grades 5-12 using the game "Rock, Scissors, Paper" available as either a PDF "Acrobat" file or an HTML text file.

http://explorer.scrtec.org/explorer/explorer-db/html/783750255-447DED81.html

- **ASK DR. MATH**

  http://mathforum.org/library/drmath/mathgrepform.html

  Includes special sections for elementary school, middle school, high school, and beyond. Typing in *probability* will lead to a listing of sites containing activities and applications. Site also includes a link to send math questions directly to Dr Math.

- **MATHEMATICS EDHELPERNET**

http://www.edhelpernet.com/cgi-bin/ednet.cgi

Contains a collection of math-related lesson plans, ideas, activities, and applications. Includes worksheets and spreadsheets for probability lessons.

- **MATH RECREATIONS**

http://thinks.com/math/index.htm

Contains links to brain games, puzzles, and other activities related to math. Contains a link to a ball drop demonstration of a normal curve.