

Understanding: Probability and Odds: Teacher's Guide

Grade Level: 6-8

Curriculum Focus: Mathematics

Lesson Duration: Two class periods

Program Description

Chances are you don't know probability as well as you think. Most people don't, which is why casinos are big business. And what are the odds of an airplane crashing? This video takes an entertaining look at how mathematics and human reasoning, or the lack thereof, affect our risk-taking.

Onscreen Questions

Before watching the video

- How do the odds of something happening—or the amount of luck you think you have—influence your decisions?
- As you watch, note how people often misinterpret the risk and probability of a situation.
- In what ways can mathematics be used to make educated decisions and predict outcomes.

After watching the video

- There are always sequences of events that lead to a certain outcome. Discuss the difference between the probability of something happening and the odds of something happening.
 - Why are some events more likely to occur than others?
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Lesson Plan

Student Objective

- Learn what probability is.
- Learn different ways to express probability numerically: as a ratio, a decimal, and a percentage.
- Learn how to solve problems based on probability.

Materials

- Paper
- Pens and pencils

Procedures

1. Begin the lesson by asking students to define probability, which is the likelihood or chance that a given event will occur. Probability is usually expressed as a ratio of the number of likely outcomes compared to the total number of outcomes possible. Ask students if they can give an example of probability.
2. To help students understand probability, work on the following problem as a class: On an airplane the rows are numbered from 1 to 30 with six seats in each row, three on each side of the aisle. Seats in each row are labeled A through F. Using this information, work together as a class to solve the problems below. (Answers are in parentheses.)
 - (1.) How many seats are in the airplane? (180)
 - (2.) What are your chances of sitting in row number 7? ($6/180$, or $1/30$)
 - (3.) What are your chances of sitting in a window seat? (With two window seats in each aisle, there's a total of 60 window seats. Your chances of sitting in a window seat would be $60/180$, or $1/3$.)
 - (4.) What are your chances of sitting in an "A" seat? (There are 30 "A" seats, so your chances are $30/180$, or $1/6$.)
 - (5.) What are your chances of sitting in an even-numbered row? (Of the 30 rows, 15 are even-numbered, so your chances are $15/30$, or $1/2$.)
3. To figure out each problem, students must set up a ratio between the total number of outcomes—in these problems either the total number of seats or rows—and the specific question asked. Tell students that they will write their answer as a fraction, decimal, and percentage. Example: The chance of sitting in seat 7A is $1/180$, .00555, or .555 percent. The ratio given as a percentage helps clarify if an event's probability is great or small.
4. Distribute the information below as a worksheet and tell students that they are going to work on several probability problems in class, expressing the answer as a fraction, decimal, and percentage. Students may work individually or with partners. (Answers are in parentheses.)
 - (1.) Your sock drawer is a mess. Twelve black socks and six red socks are mixed together. What are the chances that, without looking, you pick out a red sock? What are the chances of picking a black sock? (The total is 18 socks, and six of them are red ($6/18$, or $1/3$, or .33, or 33 percent). The probability of picking a red sock is $1/3$, or 33 percent. Because twelve of the socks are black ($12/18$, or $3/4$, or 75 percent), the probability of picking a black one is higher— $3/4$, or 75 percent, compared with $1/3$, or 33 percent.)
 - (2.) You are rolling a regular die. What is the probability of rolling a 3? (Of the total of six outcomes, 3 is one outcome. The probability is the ratio $1/6$, .1666, or 16.66 percent.)

- (3.) If you are rolling a regular die, what is the probability of rolling an even number? (Of the six possible outcomes, three outcomes could be an even number. The probability is $\frac{3}{6}$, $\frac{1}{2}$, .5, or 50 percent.)
- (4.) You are randomly choosing a card from a deck of 52 cards. What is the probability that the card you pick will be a king? (Of the 52 possible outcomes, four are kings. The probability is $\frac{4}{52}$, $\frac{1}{13}$, .076, or 7.6 percent.)
- (5.) You are visiting a kennel that has three German shepherds, four Labrador retrievers, two Chihuahuas, three poodles, and five West Highland terriers. When you arrive, the dogs are out taking a walk. What is the probability of seeing a German shepherd first? (Of a total of 17 dogs, three are German shepherds. The probability of seeing a German shepherd is $\frac{3}{17}$, .176, or 17.6 percent.)
- (6.) Two out of three students in Mr. Allen's class prefer buying lunch to bringing it. Twenty students prefer buying lunch. How many students are in Mr. Allen's class? (Students can set up the following problem: $\frac{20}{30}$, or $\frac{2}{3}$, of the total number of students (X) buy lunch (20). To express that mathematically, $\frac{2}{3}(X) = 20$. Solve for X , which equals 30, so there are 30 students in Mr. Allen's class.)

5. After students have completed the worksheet, go over their responses.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students demonstrate a strong understanding of probability based on their participation in class and their ability to complete the classroom activity.
- **2 points:** Students demonstrate a moderate understanding of probability based on their participation in class and their ability to complete the classroom activity.
- **1 point:** Students demonstrate a weak understanding of probability based on their participation in class and their ability to complete the classroom activity.

Vocabulary

factor

Definition: A circumstance or an influence that contributes to the production of a result

Context: Weather is an important factor to consider if you're planning a picnic.

outcome

Definition: Something that comes out of or follows an activity or process; consequence

Context: She flipped the coin ten times, and the outcome was five heads and five tails.

percent

Definition: One part in one hundred

Context: He passed the test by answering 85 percent of the questions correctly.



probability

Definition: The chance that a given event will occur

Context: High moisture and a dropping temperature led the meteorologist to conclude a high probability of snow.

random

Definition: Lacking or seeming to lack a regular plan, marked by an absence of bias

Context: The judges picked the winning number at random.

Academic Standards**Mid-continent Research for Education and Learning (McREL)**

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit link:

<http://www.mcrel.org/compendium/browse.asp>

This lesson plan addresses the following national standards:

- Mathematics – Understands and applies basic and advanced concepts of probability; Understands the general nature and uses of mathematics

The National Council of Teachers of Mathematics (NCTM)

The National Council of Teachers of Mathematics (NCTM) has developed national standards to provide guidelines for teaching mathematics. To view the standards online, go to

<http://standards.nctm.org/>.

This lesson plan addresses the following math standard:

- Data Analysis and Probability
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>

