

What Are the Chances?

Objectives

Students predict the probability of how many times a particular number will appear in a random sequence and record the results.

Grade 3-6 students observe how artists from the Pop-Art movement used line and color to define space.

Students initiate a grid of random shapes, randomly select colors to fill the shapes, and count the results.

Students compare their predictions with their results.

Grade 3-6 students express their data in mathematical terms and graph the results.

Multiple Intelligences

Logical-mathematical
Spatial

What Does It Mean?

Benday screening: silkscreen printing process using a pattern of dots to create images

Pop Art: art movement of the 1950s and 60s in which artists were inspired by images from mass media

National Standards

Visual Arts Standard #3

Chooses and evaluates a range of subject matter, symbols, and ideas

Mathematics Standards

Data Analysis and Probability

Understand and apply basic concepts of probability

Grades 5-6

Representation

Create and use representations to organize, record, and communicate mathematical ideas

Background Information

Want to win a lottery? Or predict the weather? The study of probability helps people figure out the likelihood of something happening. If you are using a spinner or rolling a number cube, you might want to know how likely you are to get a certain number.

If there are five different numbers on a spinner (1, 2, 3, 4, 5), you have a one in five chance of spinning any one of the numbers. The probability (or chance) of spinning any one of these 5 numbers can be expressed by a fraction (1/5) or a decimal (0.20), in a range from 0 to 1. Events that are very likely to happen would have a probability near 1, such as spinning a number (the pointer might land on a dividing line). Events that are unlikely to happen would have a probability near 0, such as the spinner stopping on a line. Probability can also be expressed by a percentage (such as a 20% chance of spinning a 4 when there are 5 numbers on the spinner).

When figuring out the probability of an event happening, it is important to first identify all of the outcomes that could possibly occur (the sample space). For example, when predicting the weather, consider the possibility of all different kinds of weather first. Then look at other factors to determine the likelihood of each type of weather event. When considering the probability of a weather event for a particular day, the National Weather Service looks at all other days in their historical database that have the same weather characteristics (such as temperature, pressure, humidity) and may determine, for example, that on 70% of similar days in the past, it rained.

Resources

Getting to Know the World's Greatest Artists: Roy Lichtenstein by Mike Venezia

Introduces students to Roy Lichtenstein's Pop Art and his use of flat colors and trademark Benday dots. Bright reproductions and easily understood text will inspire students of all ages.

Probably Pistachio by Stuart J. Murphy

Playful introduction to probability for all ages. Older students may enjoy calculating the probability of events in the book happening to them!

Uncle Andy's by Jamie Warhol

A warm, personal, child's eye view of Pop artist Andy Warhol on a visit to his New York City apartment. Children in grades 1-4 will learn about the creative process as they observe Warhol through the eyes of his young nephew.

Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

Mathematical terms

| | | |
|-------------|---------------|--------------|
| Certain | Likely | Outcome |
| Chance | Lines | Predict |
| Decimal | Diagonal | Percentage |
| Even chance | Intersecting | Probability |
| Event | Parallel | Random |
| Fraction | Perpendicular | Sequence |
| Graph | Occurrence | Sample space |
| Impossible | Odds | Unlikely |

Art terms

Benday screening
Cartoon
Color
Comic strip
Pattern
Pop Art
Popular culture
Primary colors
Space

Random number generators and container
Artist unknown
Private Collection.



Artwork by students from Oakhurst Elementary School Fort Worth, Texas. Teacher: Amanda Warner Grantz



Artwork by students from St. Theresa School, Hellertown, Pennsylvania.

Suggested Preparation and Discussion

| | K-2 | 3-4 | 5-6 |
|--|---|--|-----|
| | <p>Introduce the concept of probability by creating a spinner with numerals 1, 2, and 3 on it. Each child divides paper or a white board into three columns and writes a 1, 2, or 3 at the top of each column. Children take turns spinning. All children tally how many times each number is spun. Add the tally marks for each number. Talk about the results. Discuss the meaning of the word <i>random</i>. Explain that the chance of a number being spun is called the <i>probability</i>.</p> <p>Read <i>Probably Pistachio</i> to the class.</p> <p>Brainstorm familiar games that involve probability (such as BINGO).</p> | <p>Review the concept of probability. Students brainstorm examples of where probability is used in daily life (weather predictions, lottery results, batting averages).</p> <p>Look at work by Roy Lichtenstein, Piet Mondrian, and/or Joan Miro. Note how their compositions fill the space on a page. Show students how these artists use lines and color to define space.</p> <p>With students, develop and post a list of ways surface space can be divided using mathematical terms such as intersecting lines, circles, and triangles.</p> | |



What Are the Chances?

| | K-2 | 3-4 | 5-6 |
|---|---|---|-----|
| Crayola® Supplies | • Colored Pencils • Crayons • Markers | | |
| Other Materials | • Drawing paper • Random number selectors (such as number cubes or spinners) • Rulers • White paper | | |
| | • Colored counters (optional) | | |
| Process: Session 1 15-20 min. | Create color grids <ol style="list-style-type: none"> In small groups, students take turns folding drawing paper until it has several crisscrossing lines. Unfold the paper. Children trace over fold lines with a black marker to make a grid-like design of random shapes. Teams count the number of spaces in their designs. Suggest that students lightly mark each space as it is counted or place a colored counter in the space as they count it. | Create grids <ol style="list-style-type: none"> In small groups, students work together to create a grid by filling drawing paper with lines and shapes using colored pencils. Make sure sections are neither extremely large nor extremely small. Trace lines with a black marker. Count the number of spaces. | |
| Process: Session 2 20-30 min. | Predict and choose color codes <ol style="list-style-type: none"> To determine how to color each space of the design, students choose colors at random using a number cube and a color code. On a chart (see sample), teams choose a color code to match every possible outcome on the number cube (such as 1 = red, 2 = yellow). Teams predict how many times they think each number will be rolled, taking into account the total number of spaces on the grids. Children arrange colored counters to show their predictions for each number and after they have reached agreement, they record these predictions on the chart. | Predict probabilities <ol style="list-style-type: none"> To determine how to color each space of the design, students choose colors at random using a number generator (such as a number cube or spinner) and a color code. Each group chooses and/or creates a random number generator and then compiles a chart that lists the possible numbers that could be selected (see sample). Teams create their own color codes for every possible outcome (such as 1 = red, 2 = yellow). Teams work together to predict and record on the chart how often each number will be generated, given the total number of spaces on the grid. Students evaluate their predictions to discuss the probability of each number/color being rolled. Use terms with a range such as <i>impossible</i> - <i>unlikely</i> - <i>even chance</i> - <i>likely</i> - <i>certain</i> to express the probability of each prediction. | |
| | <ol style="list-style-type: none"> Students take turns generating random numbers. Write each number generated in a separate space in the color grid until all spaces are filled. When all sections are numbered, students count how many times each number was randomly chosen. How do the actual results compare with the team's original predictions? | | |
| Process: Session 3 20-30 min. | Add colors and patterns <ol style="list-style-type: none"> Color each space of the design according to their selected color codes. Use solid colors or patterns, but only one color in each space. Show work by Roy Lichtenstein as an example. | | |

| | K-2 | 3-4 | 5-6 | |
|---|--|---|--|--|
| Process: Session 4 15-20 min. | Reflect on results <ol style="list-style-type: none"> Talk about the results of randomly generating numbers and associated colors. Were any colors used more than the others? Did any colors appear significantly fewer times? Compare results among teams. | Express probabilities and graph results <ol style="list-style-type: none"> Students calculate the probability of each number being generated based on the actual data. | | |
| | | <ol style="list-style-type: none"> Students express results as fractions, with the numerator indicating how many times each number was rolled and the denominator indicating how many total rolls were made. Students graph the results of their experiments using the data in the chart. | <ol style="list-style-type: none"> Students express the actual results as decimals and percentages. Compare actual results to predictions. Draw conclusions. Use the information on the chart to graph the data using a computer. | |
| Assessment | <ul style="list-style-type: none"> Observe children at each step of the process, asking questions to assess understanding of probability. | <ul style="list-style-type: none"> Compare predictions, calculations, graphs, and artwork. Discuss observations. Use appropriate math vocabulary to describe designs. | | |
| | <ul style="list-style-type: none"> Review records of predictions and results for accuracy. Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned. | | | |
| Extensions | <p>For younger students, first create colorful spinners to explore the probability of an event occurring when there are 2, 3, 4, and 5 possible outcomes. Show students how to record the results in columns on the graph paper and then tally the results.</p> <p>Students with special needs may find it less confusing to use random color selectors (a spinner with colors) rather than random number selectors.</p> | <p>Challenge students to create their own probability games with Heads 'n Tails™ Colored Pencils. See Flip Coins for Fun: A Tossing Game on Crayola.com.</p> <p>Create individual Pop Art drawings in the styles of Lichtenstein and Warhol. Fill spaces with colors determined by chance.</p> | <p>Generate a list of questions, predict the probability of different answers, and then poll a group. See Slanted Surveys and Statistics on Crayola.com for a lesson plan to explore how statistics can be misleading.</p> <p>Encourage students with a strong interest in art history or research to study the works of artists associated with Pop Art. Share findings with the class. Discuss messages they feel the artists were trying to convey.</p> | |

Sample Chart Using a Six-Sided Random Number Generator

Number of spaces on the grid: _____

| Number | Color choice for the number | Predictions (How many times will the number be rolled?) | Probability (Grades 3-6) <i>impossible</i> - <i>unlikely</i> - <i>even chance</i> - <i>likely</i> - <i>certain</i> | Results (How many times WAS the number rolled?) | Actual probability (expressed as a fraction—grades 3-4; in decimals and percentages—grades 5-6) |
|--------|-----------------------------|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |

