

The Candy Color Caper

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Overview

Topic: Probability, Graphing. This lesson will introduce students to the concept of probability. They will also practice calculating the probability of an event occurring and then graph the results.

Time Allotment

1 - 90 minute class period

Subject Matter

Math
Technology

Learning Objectives

Students will be able to:

- Define probability.
- Identify the comparison used to calculate probability.
- Determine the probability of a single event occurring.
- Determine the outcome of an event that is least likely to occur, most likely to occur, unlikely, or certain.
- Construct a bar graph to represent all possible outcomes of a single event.

(This lesson addresses Va. SOL Math 4.18, 4.19, 5.16, 5.17, 6.18; and Technology standards for grades 5 and 8.)

Media Components

Math Vantage: #15, Chances Are
Microsoft Excel

Materials

For each set of 4 students:

- 1 individual size bag of Skittles
- a calculator
- one 8 1/2" x 14" sheet of card stock or other sturdy paper
- a small roll of double stick tape
- a pair of scissors

For each student:

- one "I Deserve to Win Sweepstakes" strip for prize drawing (attached)
- one Car Data Sheet (attached)

Materials the teacher will need for the Introductory Activity:

- a decorated box or container to hold entry forms for the prize drawing
- a small prize
- "I Deserve to Win Sweepstakes" (attached) cut into individual strips
- poster board displaying examples of sweepstakes, contests, or games of chance



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Materials the teacher will need for the Learning Activity:

- 1 gallon glass jar filled with Skittles

Materials needed for the Culminating Activity:

- Microsoft Excel OR a sheet of poster board with an X and Y axis drawn on it

Introductory Activity

Say, “Congratulations! You are the Grand Prize Winner. Where have you heard those words?” (*accept answers*) Say, “Yes, they are usually associated with a sweepstakes, contest, or game of chance. You may see them on tv, or at local businesses, or receive them in the mail. Here are some examples that I’ve collected.” The teacher should show the class the poster board and discuss the contests. Examples can be found in magazines, fast food restaurants, local business promotions, raffles, lottery tickets, etc. Say, “The contest rules and prizes may vary, but all of these examples involve taking a chance. Have you ever taken a chance in a sweepstakes? What happened?” (*accept answers*) Say, “If you haven’t had good luck with sweepstakes in the past, maybe this will be your lucky day! Today, you have the opportunity to be the grand prize winner in the “I Deserve to Win Sweepstakes.” All you have to do to enter this sweepstakes is complete an official entry form, then drop it in the grand prize drawing box. No purchase necessary! Let’s complete the entry forms.” The teacher should distribute the entry forms (Attached), and then collect them in the box. After the entry forms have been collected say, “Raise your hand if you think you have a good chance of winning. What do you think your chance of winning will be?” (*accept answers*) Actually, you are going to be using math to calculate your chance of winning. You will use what you learn today about ratios, converting fractions into decimals, and converting decimals into percentages. At the end of class, when we’ve finished all of the calculations, we’ll hold the grand prize drawing.”

Learning Activity

1. Focus for Media Interaction: Say, “In this video clip from *Math Vantage: #15*, Chances Are, Ellen will talk about the chances of a particular event happening. Listen for the mathematical term she uses for the chance of something happening. **START** the video just after the Math Vantage logo appears and Ellen starts to say, “We all use terms such as probably...” **PAUSE** the video after the lightning strike when the narrator says, “Have a good day.” Say, “What is another word for the chance of something happening?” (*probability*) The teacher should write the following on the board: “Probability is the numerical way of describing how often something may occur.”

2. Focus: Say, “To calculate probability, we compare 2 things. Listen for those two things.” **RESUME** the video. **STOP** the video after Ellen says “But how do you know how many outcomes are possible?” Say, “What two things are compared to calculate probability?” (*# of particular outcomes and # of possible outcomes*) The teacher should write on the board: “Probability = # of particular outcomes/# of possible outcomes.”

3. Focus: Say, “Let’s go back and look at the comparison used to calculate the probability of a flight being on time. Listen for the 2 things that are compared.” **REWIND** the video to the segment that shows 85/100. **PLAY** the video until the coin flips across the screen. Ask, “What was compared?” (*85 flights on time out of a total of 100 flights*) Say, “So the probability of a flight being on time is 85/100.” The teacher should write 85/100 on the board. Ask, “How can this fraction be converted to a percentage?” (*divide the numerator by the denominator, then convert this decimal to a percentage*) If students are unable to answer, then demonstrate on the board.

4. Say, “Now let’s go back to my question about your chances of winning the grand prize drawing. What 2 things do we need to compare to calculate your probability of winning? (*# of times my name was entered compared to the total number of names entered*) The teacher should write on the board: $1/XX$ (XX = total number of names entered) or $\frac{?}{?}\%$. Say, “How would your probability change if you wrote your name on 2 entry forms?” (*2/XX or $\frac{?}{?}\%$*) I did not enter my name in this drawing. What is the probabil-

ity that I will win? ($0/XX$ or 0%) A probability that equals 0 is called an unlikely probability.”

Culminating Activities

Culminating Activity 1

1. Say, “Let’s use what we’ve just learned about calculating probability to solve a problem.” Hold up a glass jar filled with Skittles. Ask, “If I choose a piece of candy from this jar, what color do you think it will be?” (*accept answers*) How could we figure out the probability of choosing a particular color? (*accept answers – someone may suggest dumping out the candy and counting it*) Instead of counting all the candies in this jar, let’s count the candy in a single package.”

2. Divide the class into 5 groups. Give each group an individual package of Skittles, an 8 ½” X 14” sheet of card stock or sturdy paper, a roll of double stick tape, a pair of scissors, and a calculator. Say, “Here are your instructions: Each group should open their package of candy. No eating please! Separate the candy into groups according to color. Use your sheet of card stock, the double stick tape, and the candy to create a graph. The horizontal axis on your graph should be labeled with colors, and the vertical axis should be labeled with numbers. Once you have completed the graph, calculate the probability for each color and list this at the bottom of your graph. Express the probability as a fraction and as a percentage. Are there any questions?” Give students time to create the graphs and calculate the probabilities. Circulate among the groups asking questions about how they calculated the probability for each color.

3. Say, “Let’s hear your results.” Ask each group to name the color with the highest probability of being chosen. (expect different answers from each group) Ask, “What do you notice about these results? Were they the same for each group?” (*no*) How can we use your results to determine the probability of selecting a particular color from the jar?” (*combine all of the results*) We will combine all of your results to create a class graph.”

Culminating Activity 2

In this activity, students will create a class graph. This activity can be done using a Microsoft Excel spreadsheet or by using the chalkboard/whiteboard or a large sheet of poster board. If Excel is used, students could work in groups in a computer lab to create spreadsheets and graphs OR they can be created as a class activity using a large TV or projection system.

1. Say, “To create a spreadsheet for a class graph:”

- a. Open Excel
- b. Type Red in cell 1-B, press tab
- c. Type Green in cell 1-C, press tab
- d. Type Blue in cell 1-D, press tab
- e. Type Orange in cell 1-E, press tab
- f. Type Yellow in cell 1-F, press tab
- g. Type Brown in cell 1-G, press tab
- h. On the menu bar, select File
- i. Select Save As
- j. Click the down arrow beside the Save in: box, and select Desktop
- k. In the File Name: field type Skittles Count
- l. Click the Save button

2. Say, “Use your spreadsheet to help create the class graph. Open the Skittles Count Spreadsheet you saved on your computer’s desktop. Here is your assignment: Group 1 will find the total number of red candies in the class, Group 2 will find the total number of green candies in the class, Group 3 will find the total number of purple candies in the class, Group 4 will find the total number of orange candies in the class, and Group 5 will find the total number of yellow candies in the class. Once you have the total number for your color, have a representative from your group write the color and the total number on the blackboard. Then input the data for each color into your spreadsheet.” (If you use the chalkboard or poster board, students will draw a bar on the graph to represent their color.) Allow time for students to compile results and fill in the spreadsheet.

3. Say, “Once all of the data has been recorded in the spreadsheet, follow these instructions for creating a graph in Excel.

- a. Open the Excel spreadsheet containing the candy data.

- b. Left click on the chart icon.
- c. To create a bar graph with columns, left click on column in the chart type field.
- d. Select the clustered column graph by left clicking on the first graph picture, then click the Next button.
- e. Excel will use the data from the open spreadsheet as its data source. Click the Next button on the chart Source Data screen.
- f. Type a title for the chart in the chart title box, then press the Tab key.
- g. Type Colors in the category (x) axis box then press the Tab key.
- h. Type # of Candies in the value (Y) axis box then press the Tab key.
- i. Left click on the Legend tab.
- j. The show legend box is checked. Left click on this box to remove the check. (This will remove the Series 1 legend from the graph.) Then click the Next button.
- k. Left click on the radio button (circle) in front of the As New Sheet. (This will create the chart on a new sheet instead of adding it to the spreadsheet.) Click the Finish button.”

4. After the graph has been completed, ask “According to our graph, which color showed up the most often?” (*accept answers*) “Which color showed up the least often?” (*accept answers*) “Based on the results of our graph, which color has the highest probability of being drawn?” (*accept answers*) Say, “Let’s see what happens.” Ask a student to draw a candy. Identify the color chosen. If the color chosen was not the color with the highest probability, ask, “Why didn’t we draw a (color) candy? What would have to happen before we could be sure a (color) candy is drawn?” (*all of the candies would have to be the same color*) Say, “If all of the candies were the same color, the probability of selecting that color would be 1 or certain.”

5. Say, “Now it’s time for our grand prize drawing. Let’s see what you’ve learned. If I didn’t write my name on one of these slips of paper, what is the probability that I’ll win?”(0) “What do we call an event with a probability of 0?” (*unlikely*) On the other hand, suppose I dumped out all of your names and replaced them with my name. Then what would be

my probability of winning?” (1) “An event with a probability of 1 is called what?” (*certain*) The teacher should draw a name. Say, “The winner is…” Award the prize.

Assessment

1. Say, “Have you noticed the great variety of paint colors available for cars today? Did you know that the first automobiles produced were available only in black? Now today, if 20 cars are parked in a parking lot and one leaves, what is the probability of that car being black? (*Accept answers.*) You are going to be collecting color data from a sample group to answer this question. Your assignment is to record the color of 20 automobiles. You could collect this data while waiting at the bus stop, while watching cars travel on the street in front of your home, or by observing the cars in a parking lot. You will use the “Car Data Sheet” (attached) to record your observations.

2. Distribute the “Car Data Sheet” to all students. Say, “Use the data you collect to complete the comparison and percentage columns, and to answer the questions at the bottom. Finally, use the data you collected to create an Excel spreadsheet and a bar graph representing the probability of each car color.” Refer to Culminating Activity 2 - #1 for spreadsheet instructions, and Culminating Activity 2 - #3 for bar graph instructions.

3. Assess student performance using the “Grading Rubric” (attached).

Cross-Curricular Extensions

Language Arts: Write stories about unlikely events.

Art: Create a probability gameboard.

Science:

- Students studying weather can learn about how forecasters predict the probability of hurricanes, tornadoes, and earthquakes.

- We inherit traits, such as eye color, from our parents. Students can calculate the probable eye color of a child born to a brown-eyed mother and a blue-eyed father.

Community Connections

1. Visit a local TV station to see how the weather forecast is done, or have the weatherman from the local station visit your class to talk about predicting the weather.
2. Invite a representative from the state lottery to visit your class to talk about their job, how lottery proceeds are used in our state, and the chances of an individual winning the lottery.

Additional Resources

Video

The Eddie Files File Box 4, The Dessert Derby

Internet Resources

- Mrs. Glosser's Math Goodies™
http://www.mathgoodies.com/lessons/vol6/certain_impossible.html
This site provides probability examples and sample exercises.
- The Futures Channel
<http://www.thefutureschannel.com>
This great site contains several creative lesson plans from Kay Toliver's classroom.
- Interactive Mathematics Miscellany and Puzzles
<http://www.cut-the-knot.com/games.html>
This site contains a number of math puzzles.

About the Author

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Cathy Fox is an Educational Services Specialist with the Community Idea Stations at WHTJ in Charlottesville. In her current role, Cathy provides training and educational resources to educators, childcare providers, and parents in Albemarle, Fluvanna, Louisa, Nelson, and Orange counties – as well as the city of Charlottesville. Prior to joining the WHTJ staff, Cathy conducted computer and business training for insurance professionals. She is a former 5th grade teacher, and holds a B.S. degree in Elementary Education from James Madison University. Cathy's leisure activities include quilting, reading, and singing in her church choir.