Continue

The mathematical purpose of this activity is for students to collect data and think about the relationship between relative frequency and probability. Each group should draw at least 15 names from the bag. If the groups are smaller, more rounds may be needed. Arrange students into groups of 3 or 4. Tell students that it is important for the activity that they not examine the contents of the bag they are given at any time. Distribute paper bags with slips of paper containing the names from the blackline master. Bag 1: Clare x3, Mai x5, Jada x7 Bag 2: Andre x1, Diego x6, Elena x8 Bag 3: Noah x10, Elena x3, Priya x2 Bag 4: Clare x10, Mai x3, Jada x2 Bag 5: Andre x9, Diego x4, Elena x2 You may have more than one of each bag depending on the number of groups. Collect the bags after the students have collected data. Action and Expression: Internalize Executive Functions. Provide students with a graphic organizer. For example, include a table that can be used to record data and a space for each synthesis question. Supports accessibility for: Language; Organization Your teacher will give your group a bag containing slips of paper with names on them. It is important not to open the bag to read the slips at any time. It is important to record your group's data in writing. Every time a student in the class is notably helpful, a teacher puts their name on a slip of paper and puts it into a bag. If the same student is helpful more than once, their name can be entered multiple times. At the end of the month, the teacher draws several names for prizes. Follow these steps to collect data about the names in the bag: Shake the bag, then draw out only 1 slip of paper. Read the name you drew out loud so that everyone in the group can record the name. Return the slip of paper to the bag and pass the bag to the next person in the group. Repeat these steps until each person in the group has had a chance to draw at least 3 names. For access, consult one of our IM Certified Partners. The goal of this discussion is to make sure that students understand the relationship between relative frequencies and probability. Here are some questions for discussion. “Which name did you draw most frequently?” (Sample response: Jada) “What was the relative frequency of the name you drew most frequently?” (Sample response: In our group, we picked 15 times and got Jada 9 times. The relative frequency was 0.6) “Estimate the probability of drawing the name you drew most frequently?” (Sample response: 0.6) The mathematical goal of this activity is for students to estimate the probability of a chance event by collecting data on the chance process that produces it and predict the estimate relative frequency given the probability. Students remain in the same group as the warm-up activity and use the data they collected in the warm-up activity to answer the questions. Use the data your group collected in the warm-up to answer the questions. Based on the data you collected, estimate the probability of drawing each of these names from your bag. Explain or show your reasoning. Clare Lin Priya Elena Jada Han Andre Diego Noah There are 15 slips of paper in the bag. What names do you think are written on the slips? Explain your reasoning. If you are allowed to keep going around the group, drawing names and replacing them until you had 100 names drawn, how do you think that affects your understanding of what is in the bag? The next month, the bag contains 15 slips as well. Lin’s name is included 5 times, Clare’s name 4 times, Han’s name 3 times, Diego’s name 2 times, and Jada’s name 1 time. The teacher draws names one at a time, replacing them each time. What might the teacher’s list of names drawn look like if she draws 10 times? Is this the only list of names drawn that is possible? Explain your reasoning. For access, consult one of our IM Certified Partners. Some students may have difficulty understanding why the data they collect from 15 draws from the bag does not match exactly to the contents of the bag. Prompt students to look at the contents of Bag 1 (Clare x3, Mai x5, Jada x7) and to think about a situation where Clare's name is drawn on the first 3 draws. Emphasize to students that the slip of paper with Clare's name on it is returned to the bag after each draw so it is possible that Clare's name can be drawn a fourth time. If her name is drawn a fourth time, then it is not possible for Mai to be drawn 5 times and Jada to be drawn 7 times because only 11 draws remain. The purpose of this discussion is for students to use their investigation of a chance process to estimate the relative frequency given the estimated probability. Tell the students that the bags were: Bag 1: Clare x3, Mai x5, Jada x7 Bag 2: Andre x1, Diego x6, Elena x8 Bag 3: Noah x10, Elena x3, Priya x2 Bag 4: Clare x10, Mai x3, Jada x2 Bag 5: Andre x9, Diego x4, Elena x2 Ask the groups to guess which bag they drew from and explain their reasoning. Tell students that a convention for writing probability of an event is to write P(event). For example, P(drawing Clare’s name from the bag) would represent the probability of drawing Clare’s name from the bag. When the meaning is clear, it can be shortened to P(Clare). So, for bag 1, P(Clare) = $\frac{3}{15}$ or $\frac{1}{5}$ or 0.2. Here are some questions for discussion. “Are you sure which bag you have?” (I am sure it was bag 1 because Jada was our highest probability and she only appears in bag 1 and bag 4. If it was bag 4, I would have expected Clare to be the most frequent.) “Would drawing slips out of the bag 100 times make you more sure of which bag you have?” (It would make me more confident that I have bag 1, but I was fairly convinced already.) “Do you think your list of 10 names from question 4 matches the list of 10 names created by the other people in your group? Explain your reasoning.” (I do not think it will match because we are not sure which names the teacher will draw, but I would expect that Mai or Clare would be chosen the most frequently.) “For question 4, is it possible for the teacher to draw Jada’s name twice if she only draws ten times?” (Yes, it is possible, but not probable.) Speaking, Representing: MLR8 Discussion Supports. Give students additional time to make sure that everyone in their group can explain their estimates of the relative frequency given the estimated probabilities in the activity synthesis. Invite groups to rehearse what they will say when they share with the whole class. Rehearsing provides students with additional opportunities to speak and clarify their thinking, and will improve the quality of explanations shared during the whole-class discussion. Design Principle(s): Support sense-making; Cultivate conversation The mathematical purpose of this activity is to describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes. In this activity students take turns with a partner creating words that satisfy given characteristics based on probabilities. As students trade roles explaining their thinking and listening, they have opportunities to explain their reasoning and critique the reasoning of others (MP3). Arrange students in groups of 2. Tell students that vowels include the letters A, E, I, O, and U. Consonants are all the other letters (the first four consonants are B, C, D, and F). Demonstrate how to use probabilities with words. Write the word MATH on the board and ask students about the probability of picking the letter M when selecting a letter from the word at random, then explain their reasoning. ($\frac{1}{4}$ since there are 4 letters that each have an equal chance of being chosen and one of them is the letter M.) Ask students for the probability of selecting a consonant from the word when selecting one at random. ($\frac{3}{4}$ since M, T, and H are all consonants so 3 of the 4 options are consonants.) Ask students to think of a word (pizza) that has the following probabilities when selecting a letter from the word at random. probability of selecting an A is 0.2. probability of selecting a vowel is $\frac{2}{5}$ probability of selecting a Z is 0.4. Tell students that for each question, one partner finds a word that meets the given criterion and explains why they think it meets the criterion. The partner's job is to listen and make sure they agree. If they don't agree, the partners discuss until they come to an agreement. For the next question, the students swap roles. If necessary, demonstrate this protocol before students start working. Conversing: MLR8 Discussion Supports. Use this routine when students share and justify words that match the probabilities given. Display the following sentence frames for all to see: “_____ works because . . .”, and “I noticed _____, so a word is . . . .” Encourage students to challenge each other when they disagree. This will help students clarify their reasoning about probabilities. Design Principle(s): Support sense-making; Maximize meta-awareness Representation: Internalize Comprehension. Begin the activity with a concrete list of words that meets the criteria. For example, eat, mass, says, shy, tag, too, top, toss, tote, tree, and zap. Ask students to take turns matching a word with a question. Supports accessibility for: Conceptual processing Take turns with your partner coming up with words that have the probabilities given when selecting a letter at random from the word. Each person should try to come up with one word for each situation. $P(\text{vowel}) = \frac{1}{3}$. $P(\text{consonant}) = \frac{2}{3}$. $P(\text{vowel}) = \frac{2}{3}$. $P(\text{consonant}) = \frac{1}{3}$. $P(\text{vowel}) = 0.5$. $P(\text{T}) = \frac{1}{4}$. $P(\text{S}) = 0.5$. $P(\text{vowel}) = 0.25$. Think of a word and give your partner at least 2 clues about the word using probability of certain letters or types of letter. For access, consult one of our IM Certified Partners. Each of the whole numbers from 1 to 25 is written on a slip of paper and placed in a bag. Calculate each probability. $P(\text{prime})$ $P(\text{divisible by 3 but not 2})$ $P(\text{multiple of 5})$ $P(\text{greater than 20})$ $P(\text{multiple of 12 and less than 20})$ Use this situation to create two of your own probability questions that give a probability of $\frac{1}{25}$ as the answer. Use this situation to create two of your own probability questions that give a probability of $\frac{3}{25}$ as the answer. For access, consult one of our IM Certified Partners. Some students may have difficulty creating their own word to meet the given criteria. For students who need help, consider providing a page from a newspaper or book to help think of ideas. Prompt students to think about what probability tells them about how many total letters are in the word, how many of the letters are consonants, and how many of the letters are vowels. Emphasize that there are many words that can meet the given criteria. The goal for this discussion is for students to become familiar with using probability to describe chance events. It also provides an opportunity to informally assess how students think about probabilities where “or” or “not” is used. Display the word KANGAROOS for all to see. Here are some questions for discussion. “If a letter is selected at random, what is the probability that it is a vowel?” ($\frac{4}{9}$) “If a letter is selected at random, what is the probability that it is a consonant?” ($\frac{5}{9}$) “If a letter is selected at random, what is the probability that it is an S?” ($\frac{1}{9}$) “If a letter is selected at random, what is the probability that it is an A?” ($\frac{2}{9}$) “If a letter is selected at random, what is the probability that it is an S or an A?” ($\frac{3}{9}$) “If a letter is selected at random, what is the probability that it is not a K?” ($\frac{8}{9}$) If time permits, ask… “Whose partner came up with some great clues for problem 5?” (Sample response: My partner came up with two great clues. $P(\text{vowel}) = \frac{1}{4}$. $P(\text{J}) = \frac{1}{4}$) “What are some words that satisfy the given probabilities?” (Sample responses: just, jump, jack, jars) “For the first question, why is FLOWER a valid word?” (It has 6 letters with 2 vowels and 4 consonants. Since $\frac{2}{6} = \frac{1}{3}$ and $\frac{4}{6} = \frac{2}{3}$, the probabilities are the same.) Draw and replace cut-up slips from the paper bag containing the letters PIZZAPIZZA. Record them as you choose them. Do this 15 times. Here are some questions for discussion. “What do you think is in the bag?” (The letters in the word PIZZA) “Based on the 15 draws, what is the relative frequency of the letter Z?” (The number of Zs drawn divided by 15.) Display the contents of the bag. “If a letter is selected at random, what is the probability that it is the letter Z?” ($\frac{4}{10}$) “If letters were drawn and replaced 100 times instead of 15 times, how many times would you expect the letter Z to be drawn? (I would expect it to be drawn about 40 times but probably not exactly 40 times.) “The bag contains the letters in the word PIZZA twice. If it only contained the letters for the word PIZZA once, would you expect the frequency of the letter Z to change if letters were drawn and replaced 100 times? Explain your reasoning.” (It would still be about forty times because the ratio of the number of the letter Z to the total number of letters is the same when you only use the letters in the word PIZZA once.) CCSS Standards Building On Addressing For access, consult one of our IM Certified Partners. Some probabilities are estimated by doing an experiment, or sometimes simulating the experiment many times and collecting data about how often outcomes come up. For example, a radio show holds a contest in which callers are entered for a chance to win a ticket to a concert in town. The probability of each caller winning is estimated by considering previous similar contests and comparing the number of callers to the number of ticket winners. If a previous contest had 327 callers and 5 ticket winners, then the probability of winning a ticket can be written: $P(\text{winning a ticket}) = \frac{5}{327}$ or $P(\text{winning a ticket}) \approx 0.015$ Which means that each caller has about a 1.5% chance of winning a ticket to the concert. Other probabilities can be determined by recognizing the expected relative likelihood of outcomes among all possible outcomes. For example, we know that the probability of rolling a 2 on a standard number cube is $\frac{1}{6}$ since there are 6 equally likely outcomes in the sample space for each roll and the event of rolling a 2 is one of those outcomes. This can be written as $P(\text{rolling a 2}) = \frac{1}{6}$. Click here for Answers experimental probability Alternatively contact us viaWhatsApp, Phone Call, or Email Essential Question: How can you recognize possible associations and trends between two categories of categorical data? Notes HW Module 8.2 PAGE 294-298: 3PT-EXS. 1-4, 8-10 2PT-EXS. 16-17, 21-22 1PT-EXS. 24, LPT Review: 7.1 – #13-14 pg 248 7.2 - #6 pg 255 7.3 - #8 pg 263 HW - Key Video #1: Two - Way Relative Frequency Tables Video #2: Conditional Relative Frequencies Video #3: Finding Possible Associations