Unit 8, Lesson 1

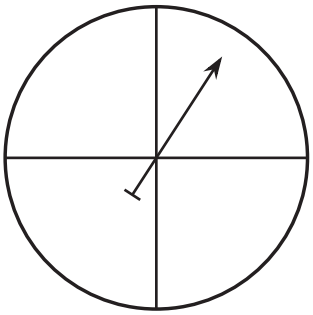
Up to Chance

Let's explore chance.

1.1 Which Three Go Together: Spinners

Which three go together? Why do they go together?

A



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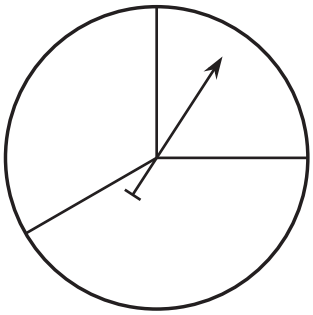

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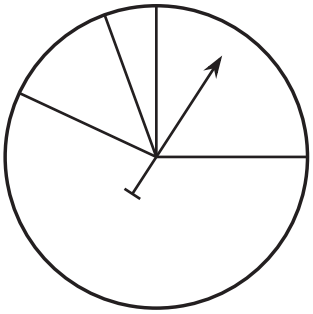

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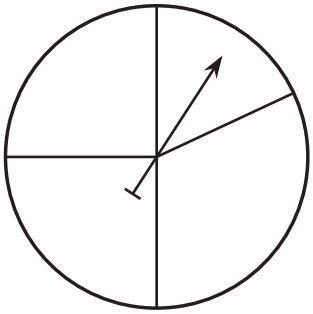


1.2 You're Saying There's a Chance?

In Elena's Spanish class, they have a quiz every two weeks.

- For the first quiz of the year, Elena takes time to study and understands the material very well. The quiz involves 20 multiple choice questions with possible answers A, B, C, or D. Elena tries her best to answer the questions correctly.
- For the second quiz of the year, Elena has been absent a lot and does not understand the material at all. The quiz involves 20 multiple choice questions with possible answers A, B, C, or D. Elena fills in the answer sheet without even looking at the questions.
- For the third quiz of the year, Elena is still lost in the class and has not come in for any help. The quiz involves 20 true or false questions. Again, Elena fills in the answer sheet without even looking at the questions.

1. Based on the description, rank the quizzes in order from worst expected grade to best.

2. For each of the 3 quizzes, explain why you think chance played a large or small role in determining Elena's score.

3. For the second and third quizzes, Elena did not look at the questions. Explain why you think she might do better on one than the other.

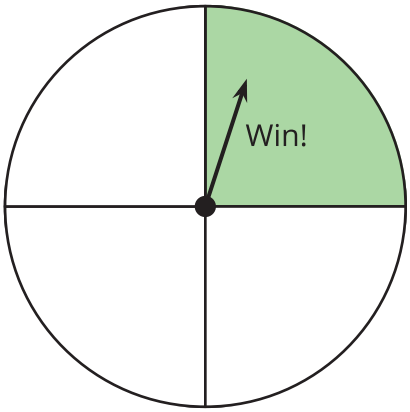
4. What percentage of the questions do you think Elena will get right on each quiz? Explain your reasoning.

5. For the second quiz, the teacher made a mistake, and each of the questions had two correct answers. The teacher accepted either of the correct answers for full credit. What percentage of the questions do you think Elena will get right on the second quiz with the new scoring? Explain your reasoning.

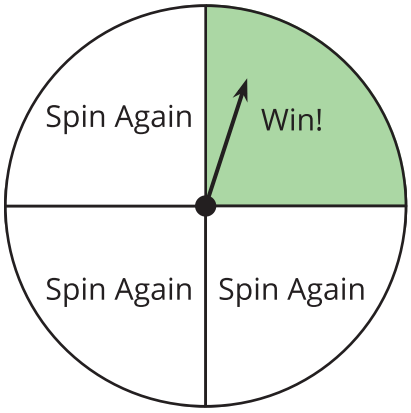
1.3 A Fair Game

Han, Clare, Mai, and Kiran are inventing a game for the county fair. Players will spin a spinner and if it points to the section labeled Win!, then the player will win a prize.

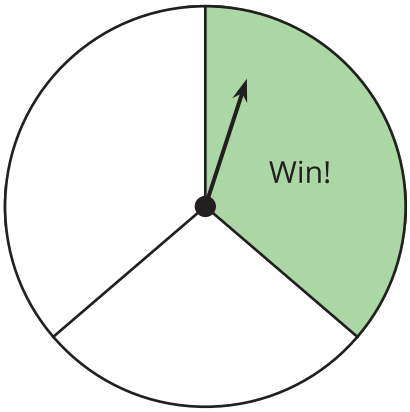
Han says, "I think this spinner is a good one. What do you think?"



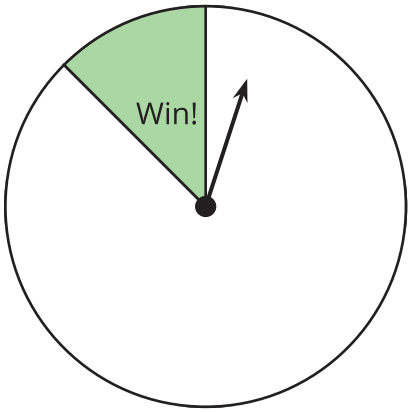
Clare says, "I like Han's spinner, but I think people should be able to spin one more time if they don't win the first time."



Mai says, "What if we just make 3 sections like this?"



Kiran says, "I think it might make more sense if we just do two sections like this."



1. Put the proposals in order of the **probability** that a player will win using that method from least to greatest. Explain your reasoning. Share your explanation with a partner.

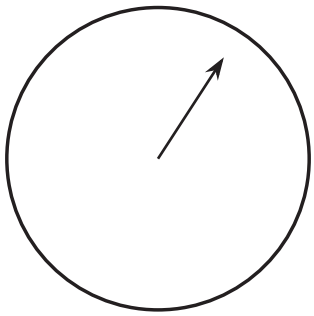
2. Each student writes a computer program to play the game using the method they suggested. The computer runs the program for a short time and reports the number of wins and losses. Use the results to estimate the probability of winning using each method.
   - Han's method: 2,513 wins; 7,516 losses.
   - Clare's method: 876 wins; 1,127 losses.
   - Mai's method: 2,026 wins; 3,984 losses.
   - Kiran's method: 322 wins; 3,621 losses.

3. By talking to professionals, they figure out that a good probability for winning is about $\frac{1}{5}$ since it will let enough people win to draw in customers, but not cost them too much for prizes. Which method fits this best?

4. Before they settled on a spinner game, they considered other things at their booth. Which of these suggestions would be considered **chance experiments**?
   - A watermelon-eating contest. The fastest to eat a wedge of watermelon wins the prize.
   - Two cubes that each have one face labeled "Win!" and the other faces blank. If both cubes land with the "Win!" side facing up, the player wins a prize.
   - A ball is placed under one of five cups. The cups are shuffled around under a cover so the player cannot see how they are moved. The player chooses one of the cups and wins a prize if it has the ball under it.
   - Players push a button that starts lighting up different regions on a board. The game is rigged so that every fifth person wins.

Are you ready for more?

1. Draw a spinner with 3 or more sections that are not all the same size.



2. Your spinner is spun 1,000 times. Estimate the number of times you would expect the spinner to land on each section. Explain your reasoning.

3. A different spinner with only two sections is spun 1,000 times. It landed on one section 136 times and the other section 864 times. Draw a spinner that is likely to produce similar results if spun 1,000 times. Explain your reasoning.

Lesson 1 Summary

Few things are certain in life, but we can look more closely at uncertain processes, called **chance experiments**, to get a better idea of the likelihood of a particular thing happening. Lots of times, it is possible to recognize several different results that may happen. These results are called **outcomes**. The collection of all possible outcomes is called the **sample space**. An **event** is a group of outcomes from the sample space.

For example, flipping a coin is a chance experiment that has possible outcomes of landing with heads facing up or tails facing up. Sometimes, one outcome is more likely than another. For example, in a desert, it is more likely to be sunny than it is to rain.

To put a number to this likelihood is to find or estimate its **probability**. The probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. It is estimated that it rains about 27 days per year in the desert of Mojave, California. This means that the probability of a random day in a non-leap year having rain in that area is about $\frac{27}{365}$, or 7.4%.