TOPIC 10

LESSON 10.1a

Rolling, Rolling Rolling...

7.SP.5

Objective

Defining and Representing Probability

Warm-Up

Convert each fraction to a decimal and a percent.

1. $\frac{4}{5}$

2. $\frac{7}{100}$

3. $\frac{5}{12}$

4. $\frac{24}{25}$

GETTING STARTED

What Are the Chances?

Consider each statement.

1. The local weatherman broadcasted that there is a 40% chance of rain today.

a. In your own words, explain what the statement means.

b. Rewrite Question 1 using an equivalent fraction in place of the percent. Explain what it means.

2. For a multiple-choice question with four answer choices, the likelihood of guessing the correct answer is $\frac{1}{4}$.

a. In your own words, explain what the statement means.

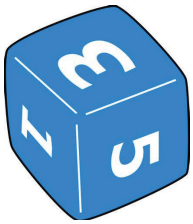
b. Rewrite Question 2 using an equivalent percent in place of the fraction. Explain what it means.

EXPLORE 1

Calculating Simple Probabilities

A six-sided number cube has one number, from 1 through 6, on each **face**. Number cubes are often used when playing board games.

1. Create a list of all the possible numbers that can appear on the top face if you roll a six-sided number cube.



The numbers on the faces of a six-sided number cube are the outcomes that can occur when rolling a six-sided number cube. An outcome is the result of a single trial of a probability experiment. An experiment is a situation involving chance that leads to results, or outcomes. A list of all possible outcomes of an experiment is called a sample space.

2. List the sample space for the experiment of rolling a six-sided number cube.

An **event** is one possible outcome or a group of possible outcomes for a given situation. A simple event is an event consisting of one outcome. For example, in the number cube experiment, an event could be rolling an even number. However, rolling a 5 is a simple event.

Probability is a measure of the likelihood that an event will occur. It is a way of assigning a numerical value to the chance that an event will occur. The probability of an event is often written as **P(event)**. For example, in the number cube experiment, the probability of rolling a 5 could be written as **P(5)**. The probability of rolling an even number could be written as **P(even)**.

There is a formula to determine the probability of an event.

$$\text{probability} = \frac{\text{number of times an event can occur}}{\text{number of possible outcomes}}$$

WORKED EXAMPLE

To determine the probability of rolling an odd number, or P(odd), follow these steps.

Step 1: First, list all the possible outcomes in the event.
The possible odd numbers that can be rolled are 1, 3, and 5.

Step 2: Add the number of outcomes.
There are 3 possible outcomes of rolling an odd number.

Step 3: Use the equation to determine the probability of rolling an odd number.

$$P(\text{odd}) = \frac{\text{number of times an odd can occur}}{\text{number of possible outcomes}} = \frac{\text{3 possible odd numbers}}{\text{6 possible numbers}}$$

The probability of rolling an odd number is $\frac{3}{6}$ or $\frac{1}{2}$

3. What is the probability of rolling a 4, or P(4)?
Explain your reasoning.

4. What is the probability of rolling a 6, or P(6)?
Explain your reasoning.

5. Determine the probability of rolling an even number.

a. Which outcome or outcomes make up the event of rolling an even number?

b. Calculate the probability of rolling an even number.

6. Determine the probability of rolling a number that is not even.

a. Which outcome or outcomes make up the event of rolling a number that is not even?

b. Calculate the probability of rolling a number that is not even.

7. Determine the probability of rolling a number greater than 4.

a. Which outcome or outcomes make up the event of rolling a number greater than 4?

b. Calculate the probability of rolling a number greater than 4.

8. Determine the probability of rolling a number that is not greater than 4.

a. Which outcome or outcomes make up the event of rolling a number that is not greater than 4?

b. Calculate the probability of rolling a number that is not greater than 4.

EXPLORE 2

Complementary Events

In the previous exploration, you calculated the probability of **complementary** events. Complementary events are events that together contain all of the outcomes in the sample space.

One way to notate the complement of an event A is not A. For instance, suppose that P(even) represents the probability of rolling an even number on a number cube. Then, **P(not even)** represents the probability of rolling a number that is not even on a number cube.

1. Consider the events from Exploration1, Questions 5 and 6—"rolling an even number" and "rolling a number that is not even." What do you notice about the sum of the probabilities of these two complementary events?

2. Consider the events from Exploration1, Questions 7 and 8—"rolling a number greater than 4" and "rolling a number that is not greater than 4." What do you notice about the sum of the probabilities of these two complementary events?

3. What is the sum of the probabilities of any two complementary events? Explain why your answer makes sense.

4. The probability of rolling a 5 or less on a number cube is P(5 or less) = $\frac{5}{6}$. Leah and Jasmine calculated P(not 5 or less). Their work is shown.

Leah

$$P(\text{not 5 or less}) = \frac{\text{number of possible outcomes}}{\text{total number of outcomes}} = \frac{1}{6}$$

Jasmine

$$P(\text{not 5 or less}) = 1 - P(5 \text{ or less}) = 1 - \frac{5}{6} = \frac{1}{6}$$

Explain the difference between Leah's strategy and Jasmine's strategy.

Name: _____ Date: _____ Class: _____

Homework HW

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Objective

Defining and Representing Probability

Practice

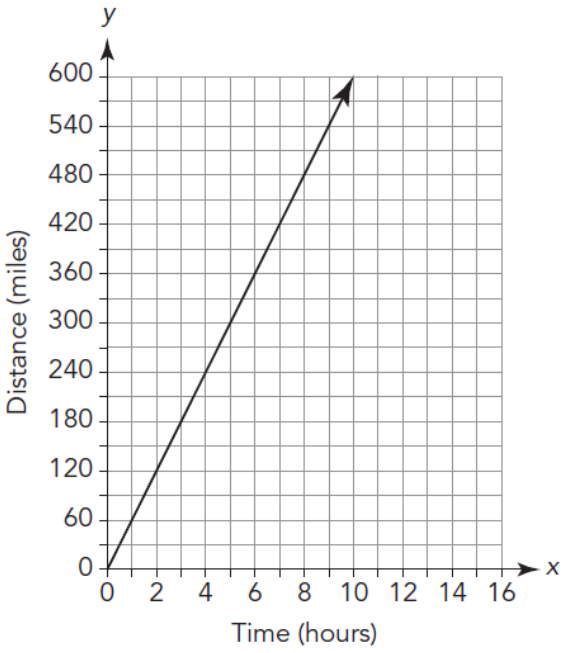
1. The weather forecast states that the probability it will rain tomorrow is 0.30. Is it impossible, unlikely, neither likely nor unlikely, likely, or guaranteed that it will rain tomorrow?

2. The probability of randomly selecting a yellow marble from a bag of marbles is 0. What conclusion can we draw?

3. The probability of randomly selecting a yellow marble from a bag of marbles is 1. What conclusion can we make?

Review

1. Cho is driving east from San Francisco along Route 80. The graph represents the relationship between the time that Cho has driven and the distance that she has driven.



a. How far does Cho drive in 5 hours?

b. How fast is Cho driving?

c. Write an equation to determine the number of hours that Cho drives for any number of hours. Be sure to define your variables.