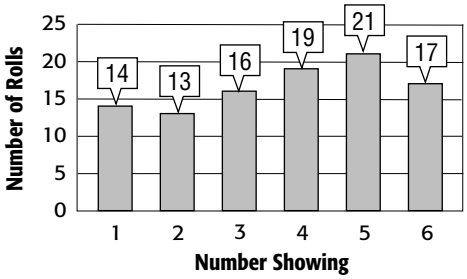
NAME _____ DATE _____ PERIOD _____

9-6 Study Guide and Intervention

Theoretical and Experimental Probability

Experimental probability is found using frequencies obtained in an experiment or game. **Theoretical probability** is the expected probability of an event occurring.

EXAMPLE 1 **The graph shows the results of an experiment in which a number cube was rolled 100 times. Find the experimental probability of rolling a 3 for this experiment.**



$$P(3) = \frac{\text{number of times 3 occurs}}{\text{number of possible outcomes}}$$

$$= \frac{16}{100} \text{ or } \frac{4}{25}$$

The experimental probability of rolling a 3 is $\frac{4}{25}$, which is close to its theoretical probability of $\frac{1}{6}$.

EXAMPLES

2 **In a telephone poll, 225 people were asked for whom they planned to vote in the race for mayor. What is the experimental probability of Juarez being elected?**

Candidate	Number of People
Juarez	75
Davis	67
Abramson	83

Of the 225 people polled, 75 planned to vote for Juarez.

So, the experimental probability is $\frac{75}{225}$ or $\frac{1}{3}$.

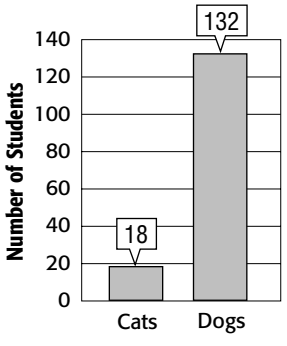
3 **Suppose 5,700 people vote in the election. How many can be expected to vote for Juarez?**

$\frac{1}{3} \cdot 5{,}700 = 1{,}900$

About 1,900 will vote for Juarez.

EXERCISES

For Exercises 1–3, use the graph of a survey of 150 students asked whether they prefer cats or dogs.



1. What is the probability of a student preferring dogs?

2. Suppose 100 students were surveyed. How many can be expected to prefer dogs?

3. Suppose 300 students were surveyed. How many can be expected to prefer cats?

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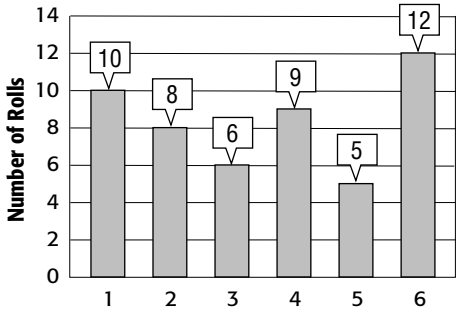
9-6 Practice: Skills

Theoretical and Experimental Probability

For Exercises 1–5, a number cube is rolled 50 times and the results are shown in the graph below.



1. Find the experimental probability of rolling a 2.

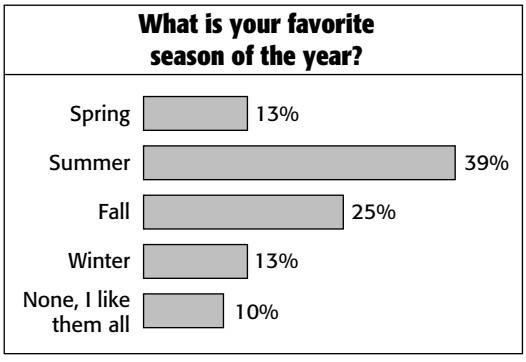
2. What is the theoretical probability of rolling a 2?

3. Find the experimental probability of *not* rolling a 2.

4. What is the theoretical probability of *not* rolling a 2?

5. Find the experimental probability of rolling a 1.

For Exercises 6–9, use the results of the survey at the right.



6. What is the probability that a person's favorite season is fall? Write the probability as a fraction.

7. Out of 300 people, how many would you expect to say that fall is their favorite season?

8. Out of 20 people, how many would you expect to say that they like all the seasons?

9. Out of 650 people, how many more would you expect to say that they like summer than say that they like winter?

Lesson 9–6

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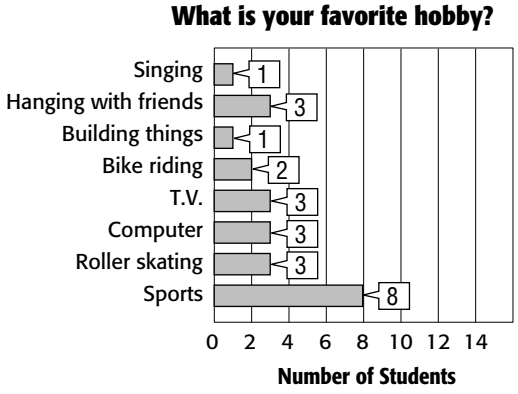
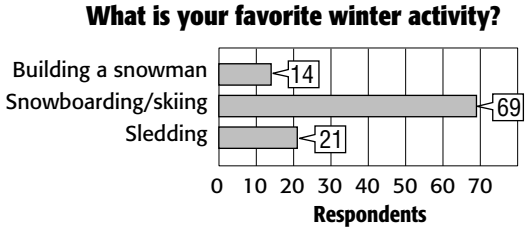
9-6 Practice: Word Problems

Theoretical and Experimental Probability

HOBBIES For Exercises 1–3, use the graph of a survey of 24 seventh grade students asked to name their favorite hobby.



TELEVISION For Exercises 5 and 6, use the graph of a survey with 104 responses in which respondents were asked about their favorite winter activities.



1. What is the probability that a student's favorite hobby is roller skating?	**2.** Suppose 200 seventh grade students were surveyed. How many can be expected to say that roller skating is their favorite hobby?
3. Suppose 60 seventh grade students were surveyed. How many can be expected to say that bike riding is their favorite hobby?	**4. MARBLES** A bag contains 5 blue, 4 red, 9 white, and 6 green marbles. If a marble is drawn at random and replaced 100 times, how many times would you expect to draw a green marble?
5. What is the probability that someone's favorite winter activity is building a snowman? Write the probability as a fraction.	**6.** If 500 people had responded, how many would have been expected to list sledding as their favorite winter activity? Round to the nearest whole person.

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9-6

Reading to Learn Mathematics

Theoretical and Experimental Probability

Pre-Activity

Complete the Mini Lab at the top of page 393 in your textbook. Write your answers below.

1. How many times did you roll a sum of 7? What is the probability of rolling a sum of 7?

2. How does your result compare to the results of other groups? Explain.

3. What is the expected probability of rolling a sum of 7?

4. How does your result compare to the expected probability of rolling a sum of 7? Explain any differences.

Reading the Lesson

5. Look up the word *experimental* in a dictionary. Write the meaning for the word as used in the lesson.

6. How does theoretical probability differ from experimental probability?

7. Complete the sentence: Experimental probability can be based on _____ and can be used to make predictions about future events.

Helping You Remember

8. Work with a partner. Design an experiment that you can use to express the experimental probability of an event. Compare your findings with those of others in your class.

Lesson 9–6

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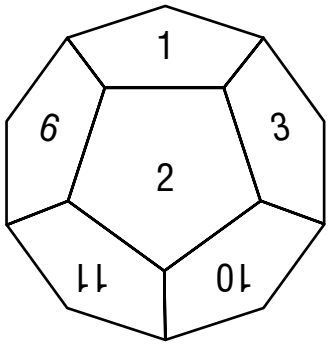
9-6 Enrichment

Rolling a Dodecahedron

A **dodecahedron** is a solid. It has twelve faces, and each face is a pentagon.



At the right, you see a dodecahedron whose faces are marked with the integers from 1 through 12. You can roll this dodecahedron just as you roll a number cube. With the dodecahedron, however, there are *twelve* equally likely outcomes.

Refer to the dodecahedron shown at the right. Find the probability of each event.

1. $P(5)$

2. $P(\text{odd})$

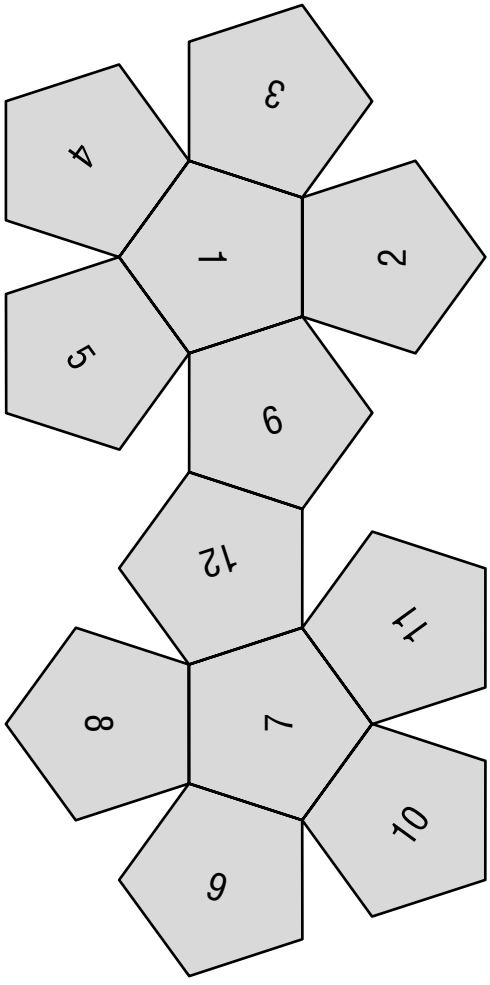
3. $P(\text{prime})$

4. $P(\text{divisible by } 5)$

5. $P(\text{less than } 4)$

6. $P(\text{fraction})$

You can make your own dodecahedron by cutting out the pattern at the right. Fold along each of the solid lines. Then use tape to join the faces together so that your dodecahedron looks like the one shown above.



7. Roll your dodecahedron 100 times. Record your results on a separate sheet of paper, using a table like this.

Outcome	Tally	Frequency
1		
2		

8. Use your results from Exercise 7. Find the experimental probability for each of the events described in Exercises 1–6.

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9-7 Study Guide and Intervention

Independent and Dependent Events

A **compound event** consists of two or more simple events. If the outcome of one event does not affect the outcome of a second event, the events are called **independent events**. The probability of two independent events can be found by multiplying the probability of the first event by the probability of the second event. If the outcome of one event affects the outcome of a second event, the events are called **dependent events**.

EXAMPLE 1 **A coin is tossed and a number cube is rolled. Find the probability of tossing tails and rolling a 5.**

$P(\text{tails}) = \frac{1}{2}$ $P(5) = \frac{1}{6}$

$P(\text{tails and } 5) = \frac{1}{2} \cdot \frac{1}{6}$ or $\frac{1}{12}$

So, the probability of tossing tails and rolling a 5 is $\frac{1}{12}$.

EXAMPLE 2 **MARBLES** **A bag contains 7 blue, 3 green, and 3 red marbles. If Agnes randomly draws two marbles from the bag, one after another, what is the probability of drawing a green and then a blue marble?**

$P(\text{green}) = \frac{3}{13}$ 13 marbles, 3 are green

$P(\text{blue}) = \frac{7}{12}$ 12 marbles after 1 green marble is removed, 7 are blue

$P(\text{green, then blue}) = \frac{3}{13} \cdot \frac{7}{12} = \frac{7}{52}$

So, the probability that Agnes will draw a green, then a blue marble is $\frac{7}{52}$.

EXERCISES

1. Find the probability of rolling a 2 and then an even number on two consecutive rolls of a number cube.

2. A penny and a dime are tossed. What is the probability that the penny lands on heads and the dime lands on tails?

3. Lazlo's sock drawer contains 8 blue and 5 black socks. If he randomly pulls out two socks, what is the probability that he picks two blue socks?

Lesson 9–7