

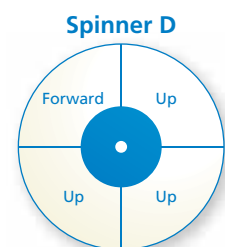
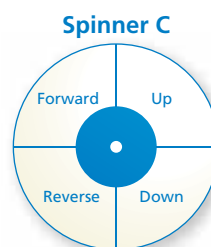
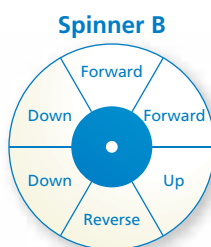
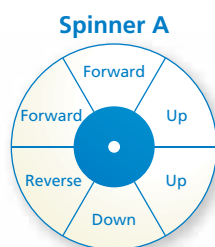
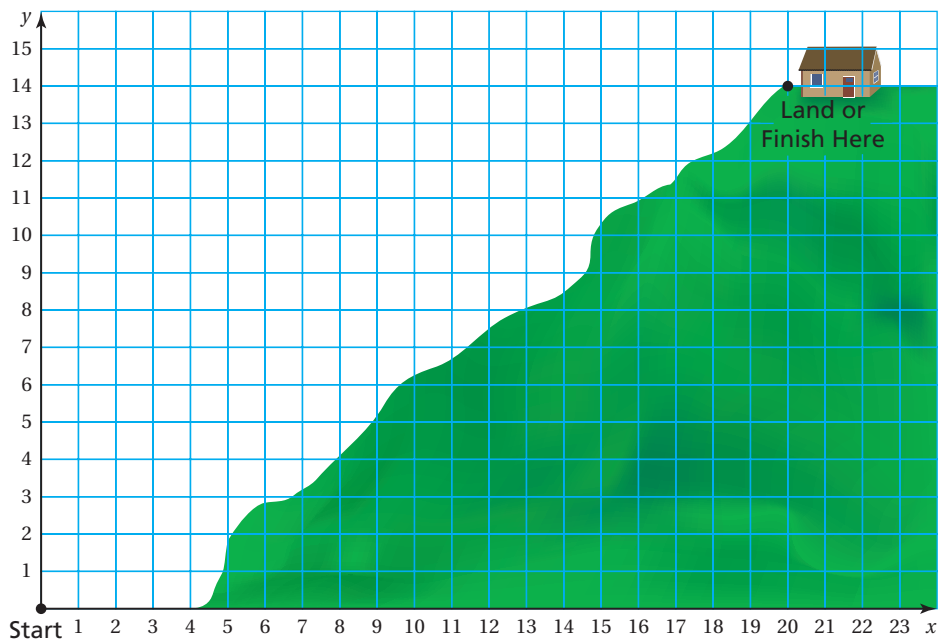
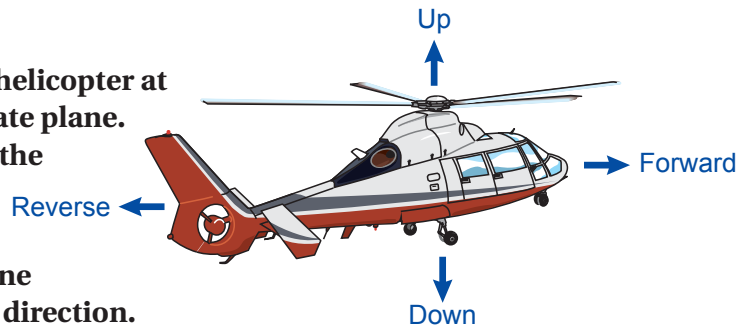
# 9.1 Introduction to Probability

**Essential Question** How can you predict the results of spinning a spinner?

## 1 ACTIVITY: Helicopter Flight

Play with a partner.

- You begin flying the helicopter at  $(0, 0)$  on the coordinate plane. Your goal is to reach the cabin at  $(20, 14)$ .
- Spin any one of the spinners. Move one unit in the indicated direction.
- If the helicopter encounters any obstacles, you must start over.
- Record the number of moves it takes to land exactly on  $(20, 14)$ .
- After you have played once, it is your partner's turn to play.
- The player who finishes in the fewest moves wins.



2

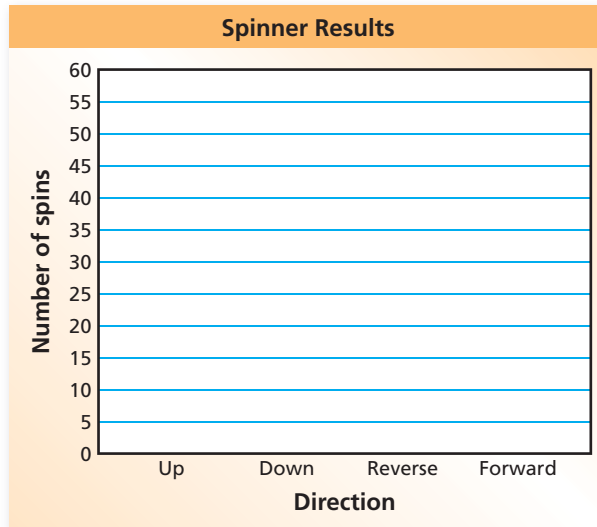
**ACTIVITY: Analyzing the Spinners**

Work with a partner.

- a. How are the spinners in Activity 1 alike? How are they different?
- b. Which spinner will advance the helicopter to the finish fastest? Why?
- c. If you want to move up, which spinner should you spin? Why?
- d. Spin each spinner 50 times and record the results.

Spinner A	Spinner B	Spinner C	Spinner D
Up	Up	Up	Up
Down	Down	Down	Down
Reverse	Reverse	Reverse	Reverse
Forward	Forward	Forward	Forward

- e. Organize the results from part (d) in a bar graph for each spinner.



- f. After analyzing the results, would you change your strategy in the helicopter flight game? Explain why or why not.

**What Is Your Answer?**

- 3. **IN YOUR OWN WORDS** How can you predict the results of spinning a spinner?



Use what you learned about probability and spinners to complete Exercises 4 and 5 on page 388.

### Key Vocabulary

experiment, p. 386  
outcomes, p. 386  
event, p. 386  
probability, p. 387


## Key Ideas

### Outcomes and Events


An **experiment** is an activity with varying results. The possible results of an experiment are called **outcomes**. A collection of one or more outcomes is an **event**. The outcomes of a specific event are called *favorable outcomes*.

For example, randomly selecting a marble from a group of marbles is an experiment. Each marble in the group is an outcome. Selecting a green marble from the group is an event.

*Possible outcomes*



*Event: Choosing a green marble*  
*Number of favorable outcomes: 2*



An arrow points from the group of six marbles to the two green marbles, indicating the selection of favorable outcomes.

## EXAMPLE 1 Identifying Outcomes



You roll the number cube.

a. What are the possible outcomes?

The six possible outcomes are rolling a 1, 2, 3, 4, 5, and 6.

b. What are the favorable outcomes of rolling an even number?

even	not even
2, 4, 6	1, 3, 5

 The favorable outcomes of the event are rolling a 2, 4, and 6.

c. What are the favorable outcomes of rolling a number greater than 5?

greater than 5	not greater than 5
6	1, 2, 3, 4, 5

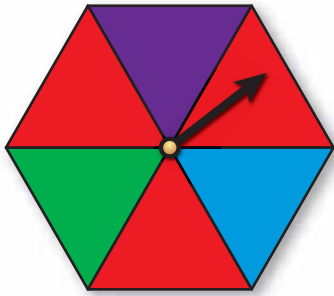
 The favorable outcome of the event is rolling a 6.

### On Your Own

 Now You're Ready  
Exercises 6–12

- You randomly choose a letter from a hat that contains the letters A through K. (a) What are the possible outcomes? (b) What are the favorable outcomes of choosing a vowel?

## EXAMPLE 2 Counting Outcomes



You spin the spinner.

a. How many possible outcomes are there?

The spinner has 6 sections. So, there are 6 possible outcomes.

b. In how many ways can spinning red occur?

The spinner has 3 red sections. So, spinning red can occur in 3 ways.

c. In how many ways can spinning *not* purple occur? What are the favorable outcomes of spinning *not* purple?

The spinner has 5 sections that are *not* purple. So, spinning *not* purple can occur in 5 ways.

purple	<i>not</i> purple
purple	red, red, red, green, blue

The favorable outcomes of the event are red, red, red, green, and blue.

Now You're Ready  
Exercises 13–18

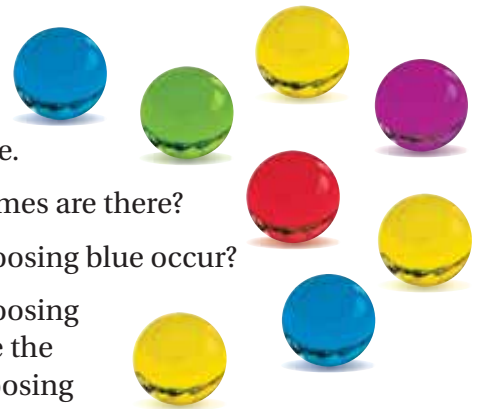
### On Your Own

2. You randomly choose a marble.

a. How many possible outcomes are there?

b. In how many ways can choosing blue occur?

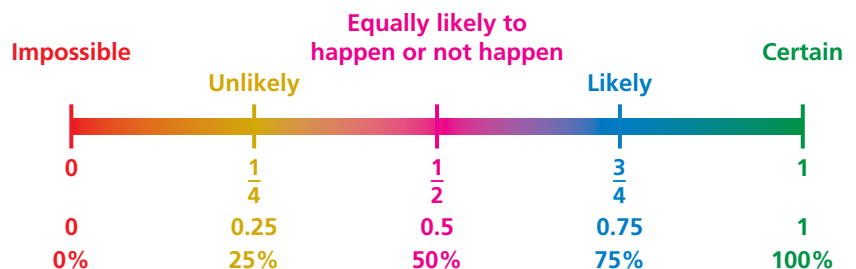
c. In how many ways can choosing *not* yellow occur? What are the favorable outcomes of choosing *not* yellow?



### Key Idea

#### Probability

The **probability** of an event is a number that measures the likelihood that the event will occur. Probabilities are between 0 and 1, including 0 and 1. The diagram relates likelihoods (above the diagram) and probabilities (below the diagram).



#### Study Tip

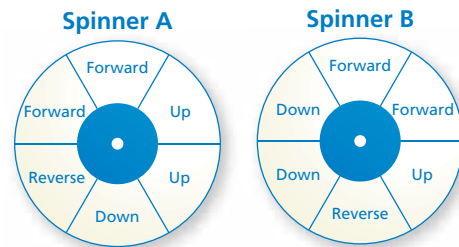
Probabilities can be written as fractions, decimals, or percents.

## Vocabulary and Concept Check

- VOCABULARY** Is rolling an even number on a number cube an *outcome* or an *event*? Explain.
- REASONING** Can the probability of an event be 1.5? Explain.
- OPEN-ENDED** Give a real-life example of an event that is impossible. Give a real-life example of an event that is certain.

## Practice and Problem Solving

Use the spinners shown.



- You want to move down. Which spinner should you spin? Explain.
- You want to move forward. Does it matter which spinner you spin? Explain.

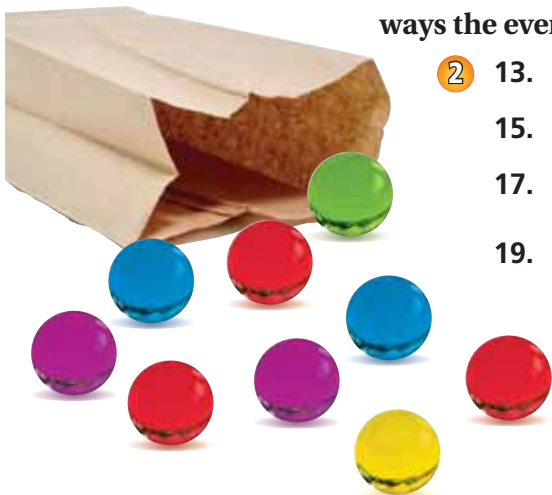
- What are the possible outcomes of randomly choosing one of the tiles shown below?



You randomly choose one of the tiles shown above. Find the favorable outcomes of the event.

- Choosing a 6
- Choosing an odd number
- Choosing a number greater than 5
- Choosing an odd number less than 5
- Choosing a number less than 3
- Choosing a number divisible by 3

You randomly choose one marble from the bag. (a) Find the number of ways the event can occur. (b) Find the favorable outcomes of the event.



- Choosing blue
- Choosing green
- Choosing purple
- Choosing yellow
- Choosing *not* red
- Choosing *not* blue
- ERROR ANALYSIS** Describe and correct the error in finding the number of ways that choosing *not* purple can occur.

**X**

purple	not purple
purple	red, blue, green, yellow

Choosing *not* purple can occur in 4 ways.

20. **COINS** You have 10 coins in your pocket. Five are Susan B. Anthony Dollars, two are Golden Dollars, and three are Presidential Dollars. You randomly choose a coin. In how many ways can choosing *not* a Presidential Dollar occur?



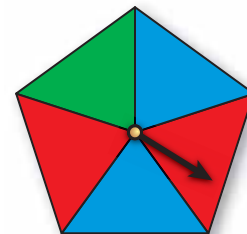
Susan B. Anthony Dollar

Golden Dollar



Presidential Dollar

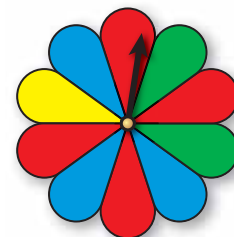
Spinner A



Tell whether the statement is *true* or *false*. If it is false, change the italicized word to make the statement true.

21. There are *three* possible outcomes of spinning Spinner A.  
 22. Spinning *red* can occur in four ways on Spinner B.  
 23. Spinning blue and spinning *green* are equally likely on Spinner A.  
 24. It is *impossible* to spin purple on Spinner B, so it is certain to spin not purple on spinner B.  
 25. **LIKELIHOOD** There are more red sections on Spinner B than on Spinner A. Does this mean that you are more likely to spin red on Spinner B? Explain.

Spinner B



26. **MUSIC** A bargain bin contains classical and rock CDs. There are 60 CDs in the bin. You are equally likely to randomly choose a classical CD or a rock CD from the bin. How many of the CDs are classical CDs?  
 27. **Reasoning** You randomly choose one of the cards. Then, you randomly choose a second card. Describe how the number of possible outcomes changes after the first card is chosen.



## Fair Game Review What you learned in previous grades & lessons

Multiply.

28.  $\frac{1}{2} \times 2$

29.  $\frac{5}{6} \times 36$

30.  $-\frac{4}{5} \times 25$

31.  $\frac{1}{8} \times (-28)$

32. **MULTIPLE CHOICE** You are making half of a recipe that requires  $\frac{3}{4}$  cup of sugar. How much sugar should you use?

(A)  $\frac{3}{8}$  cup

(B)  $\frac{5}{8}$  cup

(C)  $\frac{5}{4}$  cups

(D)  $\frac{3}{2}$  cups