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).**

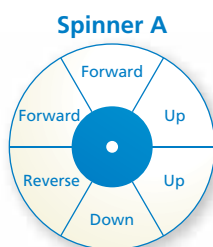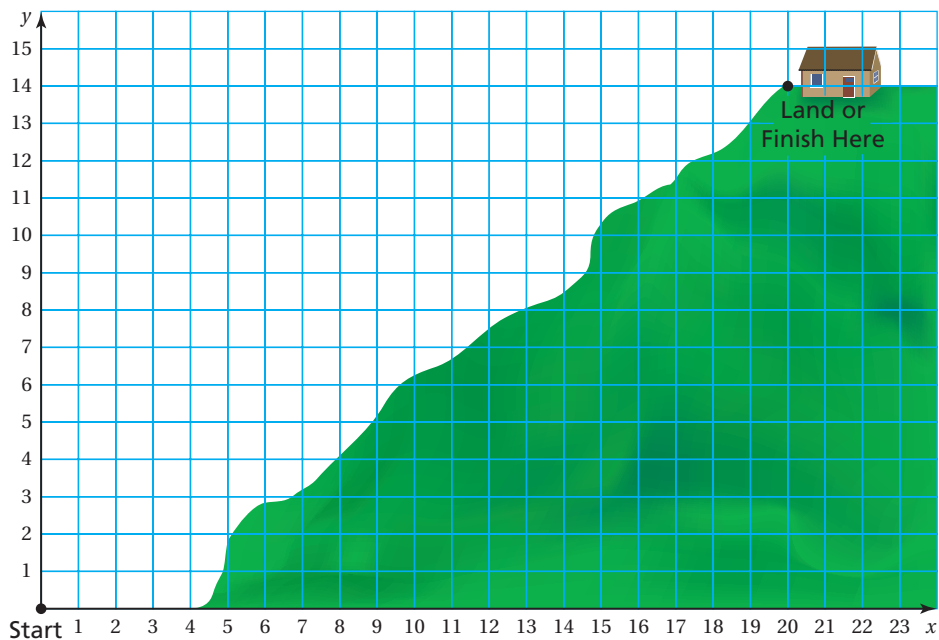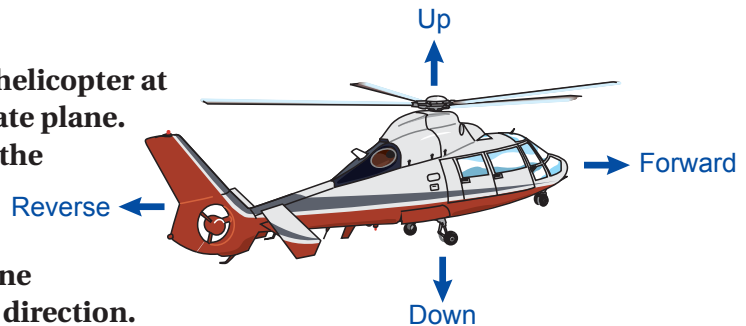- **Spin any one of the spinners. Move one unit in the indicated direction.**

Up

Reverse ← → Forward

Down

- **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.**

Land or Finish Here

Start

Spinner A

Forward
Forward — Up
Reverse — Up
Down

Spinner B

Forward
Down — Forward
Down — Up
Reverse

Spinner C

Forward — Up
Reverse — Down

Spinner D

Forward — Up
Up — Up
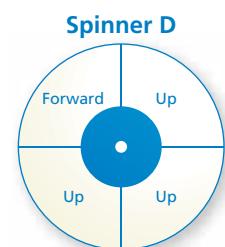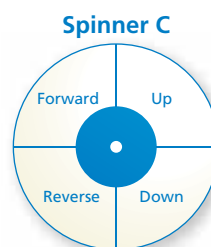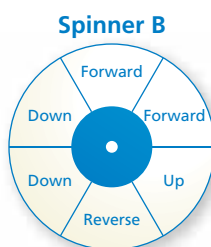
ACTIVITY: Analyzing the Spinners

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.
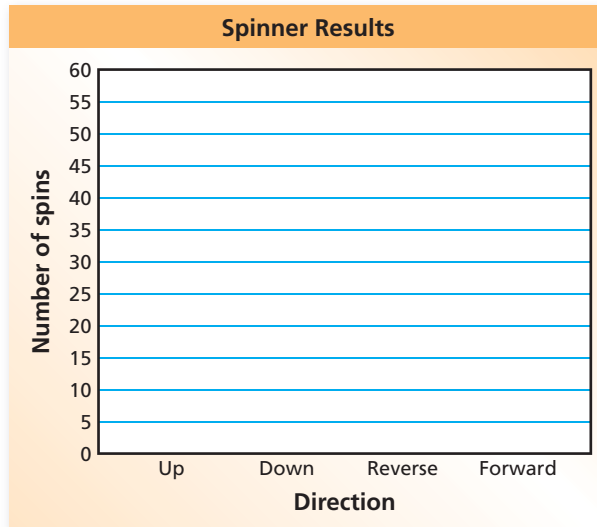
Spinner Results

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?

Practice 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

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

1. 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?

🔊 **Multi-Language Glossary at BigIdeasMath√com.**

EXAMPLE **2**   **Counting Outcomes**
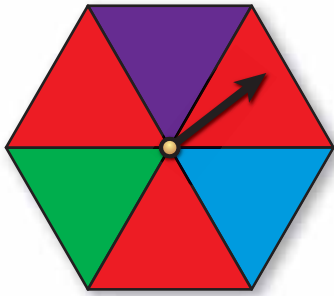
You spin the spinner.

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	*not* purple
purple	red, red, red, green, blue

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

On Your Own

Now You're Ready
Exercises 13–18

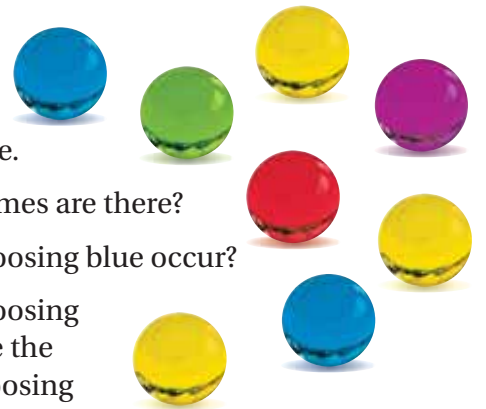**2.** You randomly choose a marble.

   a. How many possible outcomes are there?

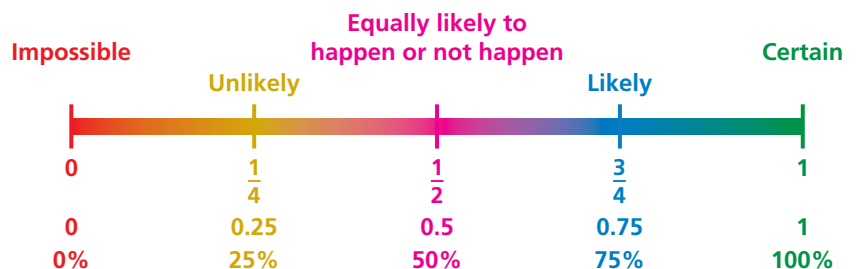   **b.** In how many ways can choosing blue occur?

   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.

	Equally likely to		
		happen or not happen	
Impossible			**Certain**
	Unlikely		**Likely**
0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
0	0.25	0.5	0.75	1
0%	25%	50%	75%	100%

✓ Vocabulary and Concept Check

1. **VOCABULARY** Is rolling an even number on a number cube an *outcome* or an *event*? Explain.

2. **REASONING** Can the probability of an event be 1.5? Explain.

3. **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.

Spinner A — Forward, Forward, Up, Reverse, Up, Down

Spinner B — Forward, Down, Forward, Down, Up, Reverse
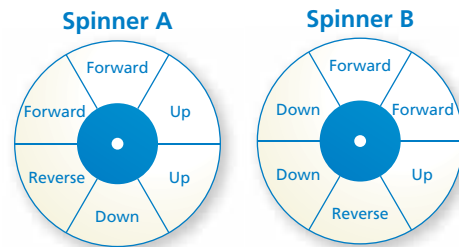
4. You want to move down. Which spinner should you spin? Explain.

5. You want to move forward. Does it matter which spinner you spin? Explain.

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

1 2 3 4 5 6 7 8 9

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

7. Choosing a 6

8. Choosing an odd number

9. Choosing a number greater than 5

10. Choosing an odd number less than 5

11. Choosing a number less than 3

12. 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.
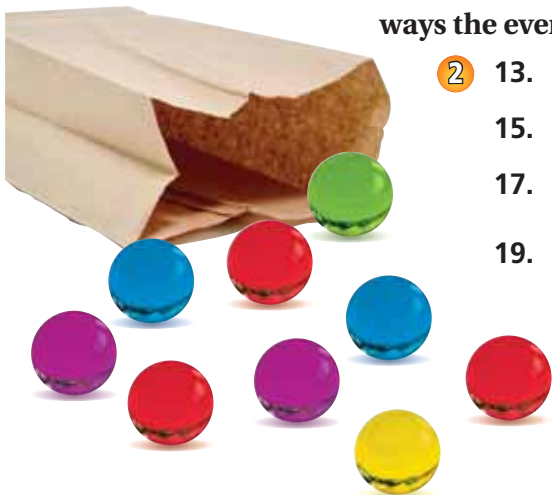
13. Choosing blue

14. Choosing green

15. Choosing purple

16. Choosing yellow

17. Choosing *not* red

18. Choosing *not* blue

19. **ERROR ANALYSIS** Describe and correct the error in finding the number of ways that choosing *not* purple can occur.

purple	*not* purple
purple	red, blue, green, yellow

✗ Choosing *not* purple can occur in 4 ways.

Color Distinguishment Help at BigIdeasMath√com.

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?
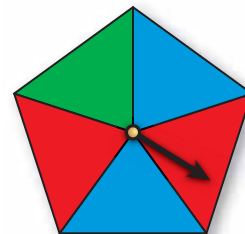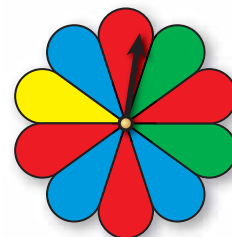
Golden Dollar

Susan B. Anthony 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.

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.

Dancer

Fireman

Baker

Pirate

Bellhop

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. $\dfrac{1}{2} \times 2$

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

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

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

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

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

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

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

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