1.1 Finding and Describing Patterns

Goal
Find patterns and use them to make predictions.

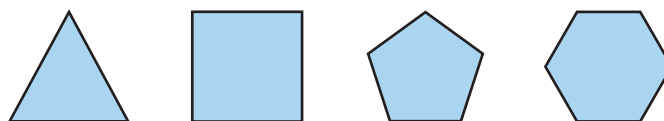## Key Words
- **pattern**
- **prediction**

In the bracelet shown at the right, the beads and knots follow a pattern. You can repeat the pattern to make the bracelet longer.

EXAMPLE 1 Describe a Visual Pattern

Describe a pattern in the figures.

Solution
The figures have 3 sides, 4 sides, 5 sides, and 6 sides.

ANSWER ▶ The number of sides increases by one.

EXAMPLE 2 Describe a Number Pattern

Describe a pattern in the numbers.

a. 3, 6, 9, 12, 15, 18, . . .

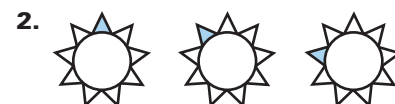**b.** 1, 4, 9, 16, 25, 36, . . .

Solution
a. Each number after the first is 3 more than the previous one.

b. The numbers are squares of consecutive numbers.

1	4	9	16	25	36
1^2	2^2	3^2	4^2	5^2	6^2

Checkpoint ✓ Describe a Visual or Number Pattern

Describe a pattern.

1.

2.

3. 4, 8, 12, 16, 20, 24, . . .

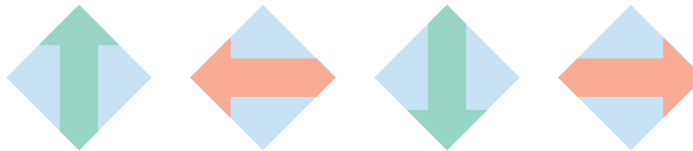**4.** 35, 30, 25, 20, 15, 10, . . .

EXAMPLE 3 **Make a Prediction**

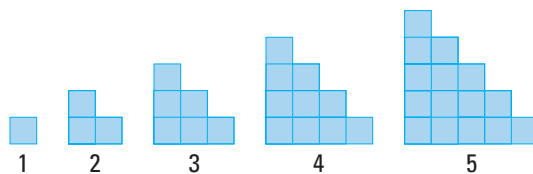Sketch the next figure you expect in the pattern.
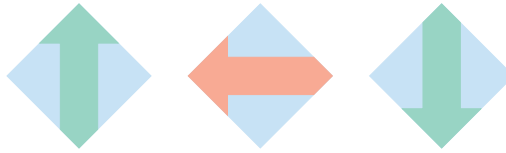
Solution

The arrow's color changes back and forth between green and red.
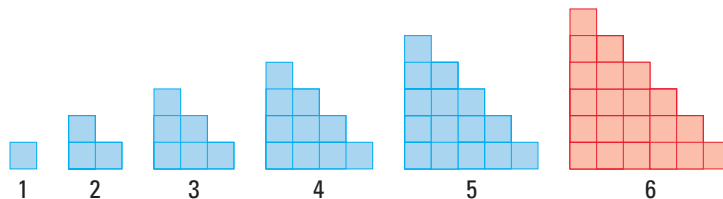The arrow makes a quarter turn each time.

ANSWER ▶ The fourth figure is red. Its arrow points to the right.

EXAMPLE 4 **Make a Prediction**

Sketch the next figure you expect in the pattern.

Solution

ANSWER ▶ The sixth figure has six squares in the bottom row.

Checkpoint ✓ *Make a Prediction*

Sketch the next two figures you expect in the pattern.

5.

6.

Write the next two numbers you expect in the pattern.

7. $-2, -5, -8, -11, \ldots$ **8.** $4, 10, 16, 22, \ldots$
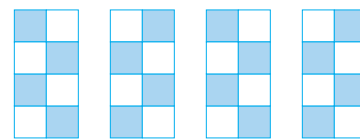
1.1 Exercises

Guided Practice

Skill Check
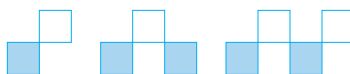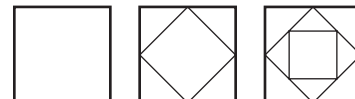
Sketch the next figure you expect in the pattern.

1.

2.

3.

4.

Describe a pattern in the numbers. Write the next two numbers you expect in the pattern.

5. 3, 11, 19, 27, . . .   **6.** 2, 6, 18, 54, . . .   **7.** 7.0, 7.5, 8.0, 8.5, . . .

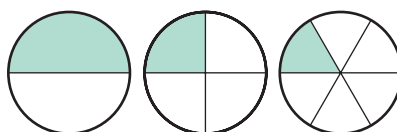**8.** 13, 7, 1, −5, . . .   **9.** 256, 64, 16, 4, . . .   **10.** 3, 0, −3, 0, 3, 0, . . .
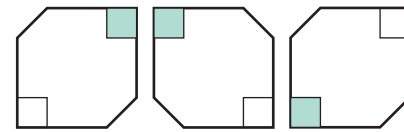
Practice and Applications

Extra Practice

See p. 675.

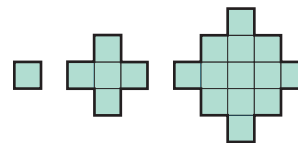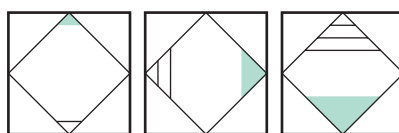**Describing Visual Patterns** Sketch the next figure you expect in the pattern.
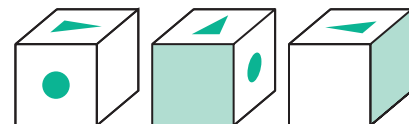
11.

12.

13.

14.

15.

16.

Homework Help

Example 1: Exs. 11–16
Example 2: Exs. 17–25
Example 3: Exs. 26–32
Example 4: Exs. 26–32

Describing Number Patterns Describe a pattern in the numbers. Write the next number you expect in the pattern.
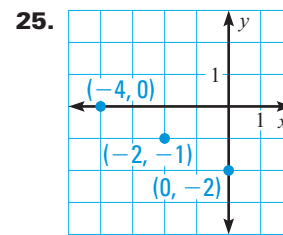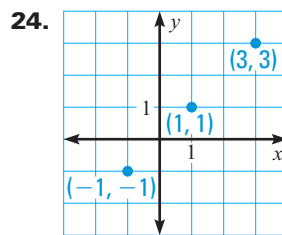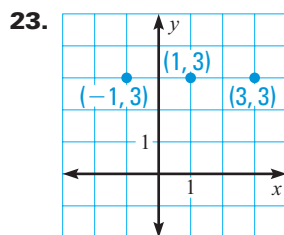
17. 4, 9, 14, 19, . . .   **18.** 2, −7, −16, −25, . . .

19. 320, 80, 20, 5, . . .   **20.** 2.5, 5, 10, 20, . . .

21. 1, 3, 6, 10, 15, . . .   **22.** 5, 7, 11, 17, 25, . . .

1.1 *Finding and Describing Patterns*   **5**

xy **Using Algebra** Find a pattern in the coordinates of the points. Then write the coordinates of another point in the pattern.

23.

24.

25.

Making Predictions In Exercises 26–30, use the staircase pattern from Example 4 shown below.
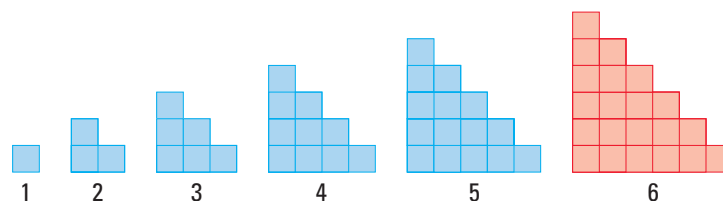
26. Find the distance around each figure. Organize your results in a table like the one shown.

Figure	1	2	3	4	5	6
Distance	4	8	?	?	?	?

Link to
Careers

27. Use your table to describe a pattern in the distances.

28. Write a variable expression for the distance around the nth figure.

29. Predict the distance around the tenth figure.

30. ⚖ **You be the Judge** Will a figure in this pattern have a distance of 60? If so, which one?

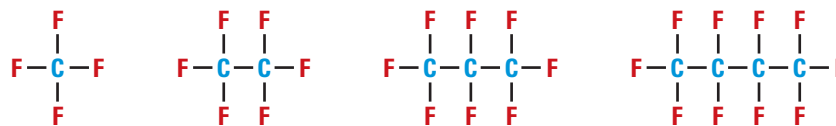**31. Science Connection** Diagrams for four molecules are shown. Draw a diagram for the next two molecules in the pattern.

LABORATORY TECHNOLOGISTS study microscopic cells, such as bacteria. The doubling period for a population of bacteria may be as short as 20 minutes.

Career Links
CLASSZONE.COM

32. Bacteria Growth You are studying bacteria in biology class. The table shows the number of bacteria after n doubling periods. Predict the number of bacteria after 8 doubling periods.

| n (doubling periods)	0	1	2	3	4	5
Billions of bacteria	3	6	12	24	48	96

The digits 1–9 in Braille are the same as the letters a–i. A number sign (⠼) precedes digits.
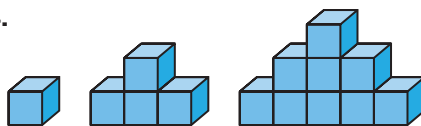
Application Links
CLASSZONE.COM

33. Braille System The Braille alphabet uses raised dots that can be read by touch. Describe a pattern that links the first ten letters and the next ten letters. Complete the missing letters.
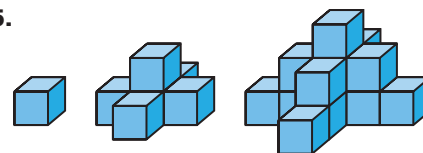
A B C D E F **G** H **I** J

K L M N O **P** Q **R** S **T**
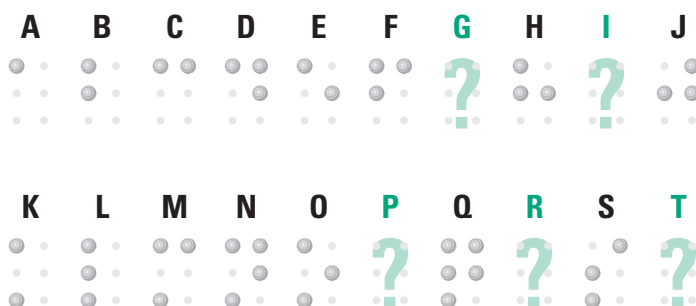
Visualizing Patterns The first three objects in a pattern are shown. How many blocks are in the next object?

34.

35.

36. Multiple Choice What is the next number you expect?

55, 110, 165, 220, . . .

Ⓐ 255　　　Ⓑ 265　　　Ⓒ 275　　　Ⓓ 440

37. Multiple Choice What is the next number you expect?

1, 5, 13, 25, . . .

Ⓕ 33　　　Ⓖ 38　　　Ⓗ 41　　　Ⓙ 169

Mixed Review

Problem Solving Draw a diagram to solve. *(Skills Review, p. 653)*

38. Robert, Susan, and Todd are standing in a line. How many ways can they be arranged?

39. A table is two feet longer than it is wide. What are five possible areas for the table?

Algebra Skills

Adding Decimals Find the sum. *(Skills Review, p. 655)*

40. $9.3 + 0.2$　　　**41.** $2.4 + 8.9$　　　**42.** $10.5 + 5.5$

43. $0.71 + 0.33$　　　**44.** $5.64 + 12.75$　　　**45.** $34.08 + 11.16$

Plotting Points Plot the points in a coordinate plane.
(Skills Review, p. 664)

46. $A(5, 2)$　　　**47.** $B(6, 1)$　　　**48.** $C(3, -8)$　　　**49.** $D(4, -1)$

50. $E(-2, 7)$　　　**51.** $F(-5, 2)$　　　**52.** $G(-2, -6)$　　　**53.** $H(-4, -3)$