

GUIDED PRACTICE

Vocabulary Check ✓

Concept Check ✓

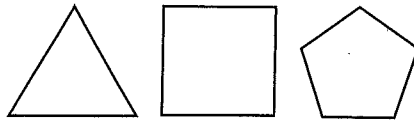
Skill Check ✓

1. Explain what a *conjecture* is.

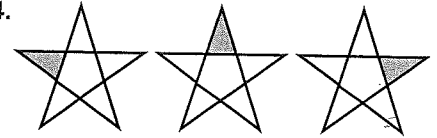
2. How can you prove that a conjecture is false?

Sketch the next figure in the pattern.

3.



4.



Describe a pattern in the sequence of numbers. Predict the next number.

5. 2, 6, 18, 54, ...

6. 0, 1, 4, 9, ...

7. 256, 64, 16, 4, ...

8. 3, 0, -3, 0, 3, 0, ...

9. 7.0, 7.5, 8.0, 8.5, ...

10. 13, 7, 1, -5, ...

11. Complete the conjecture based on the pattern you observe.

$$3 + 4 + 5 = 4 \cdot 3$$

$$6 + 7 + 8 = 7 \cdot 3$$

$$9 + 10 + 11 = 10 \cdot 3$$

$$4 + 5 + 6 = 5 \cdot 3$$

$$7 + 8 + 9 = 8 \cdot 3$$

$$10 + 11 + 12 = 11 \cdot 3$$

$$5 + 6 + 7 = 6 \cdot 3$$

$$8 + 9 + 10 = 9 \cdot 3$$

$$11 + 12 + 13 = 12 \cdot 3$$

Conjecture: The sum of any three consecutive integers is ?

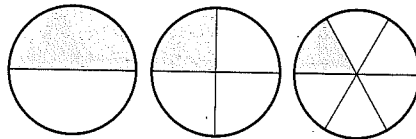
PRACTICE AND APPLICATIONS

STUDENT HELP

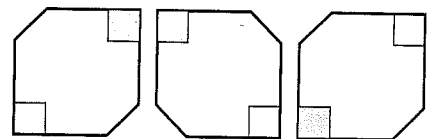
Extra Practice
to help you master
skills is on p. 803.

SKETCHING VISUAL PATTERNS Sketch the next figure in the pattern.

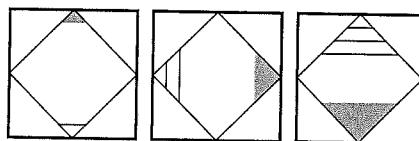
12.



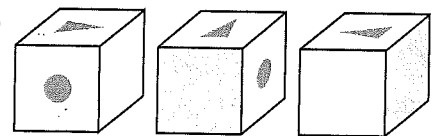
13.



14.



15.



STUDENT HELP

HOMEWORK HELP

Example 1: Exs. 12–15,
24, 25

Example 2: Exs. 16–23,
26–28

Example 3: Exs. 29–33

Example 4: Exs. 34–39

Example 5: Exs. 40, 41

Example 6: Exs. 42, 43

DESCRIBING NUMBER PATTERNS Describe a pattern in the sequence of numbers. Predict the next number.

16. 1, 4, 7, 10, ...

17. 10, 5, 2.5, 1.25, ...

18. 1, 11, 121, 1331, ...

19. 5, 0, -5, -10, ...

20. 7, 9, 13, 19, 27, ...

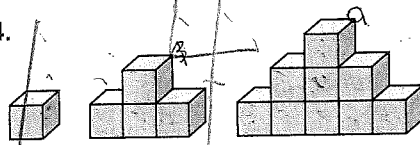
21. 1, 3, 6, 10, 15, ...

22. 256, 16, 4, 2, ...

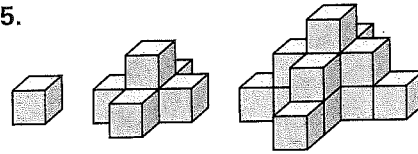
23. 1.1, 1.01, 1.001, 1.0001, ...

VISUALIZING PATTERNS The first three objects in a pattern are shown. How many blocks are in the next object?

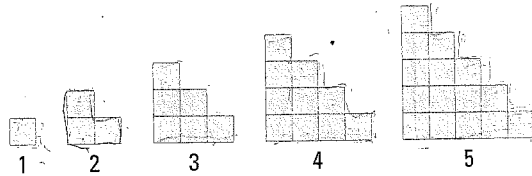
24.



25.



MAKING PREDICTIONS In Exercises 26–28, use the pattern from Example 1 shown below. Each square is 1 unit \times 1 unit.



26. Find the distance around each figure. Organize your results in a table.
 27. Use your table to describe a pattern in the distances.
 28. Predict the distance around the twentieth figure in this pattern.

MAKING CONJECTURES Complete the conjecture based on the pattern you observe in the specific cases.

29. **Conjecture:** The sum of any two odd numbers is ? .

| | |
|-------------|-------------------|
| $1 + 1 = 2$ | $7 + 11 = 18$ |
| $1 + 3 = 4$ | $13 + 19 = 32$ |
| $3 + 5 = 8$ | $201 + 305 = 506$ |

30. **Conjecture:** The product of any two odd numbers is ? .

| | |
|-------------------|---------------------------|
| $1 \times 1 = 1$ | $7 \times 11 = 77$ |
| $1 \times 3 = 3$ | $13 \times 19 = 247$ |
| $3 \times 5 = 15$ | $201 \times 305 = 61,305$ |

31. **Conjecture:** The product of a number $(n - 1)$ and the number $(n + 1)$ is always equal to ? .

| | |
|-----------------------|------------------------|
| $3 \cdot 5 = 4^2 - 1$ | $6 \cdot 8 = 7^2 - 1$ |
| $4 \cdot 6 = 5^2 - 1$ | $7 \cdot 9 = 8^2 - 1$ |
| $5 \cdot 7 = 6^2 - 1$ | $8 \cdot 10 = 9^2 - 1$ |



CALCULATOR Use a calculator to explore the pattern. Write a conjecture based on what you observe.

| | |
|---|--|
| 32. $101 \times 34 = \underline{\quad ? \quad}$ | 33. $11 \times 11 = \underline{\quad ? \quad}$ |
| $101 \times 25 = \underline{\quad ? \quad}$ | $111 \times 111 = \underline{\quad ? \quad}$ |
| $101 \times 97 = \underline{\quad ? \quad}$ | $1111 \times 1111 = \underline{\quad ? \quad}$ |
| $101 \times 49 = \underline{\quad ? \quad}$ | $11,111 \times 11,111 = \underline{\quad ? \quad}$ |


STUDENT HELP
 INTERNET
HOMEWORK HELP
 Visit our Web site
www.mcdougallittell.com
 for help with Exs. 29–31.

FINDING COUNTEREXAMPLES Show the conjecture is false by finding a counterexample.

34. All prime numbers are odd.
35. The sum of two numbers is always greater than the larger number.
36. If the product of two numbers is even, then the two numbers must be even.
37. If the product of two numbers is positive, then the two numbers must both be positive.
38. The square root of a number x is always less than x .
39. If m is a nonzero integer, then $\frac{m+1}{m}$ is always greater than 1.

GOLDBACH'S CONJECTURE In Exercises 40 and 41, use the list of the first prime numbers given below.

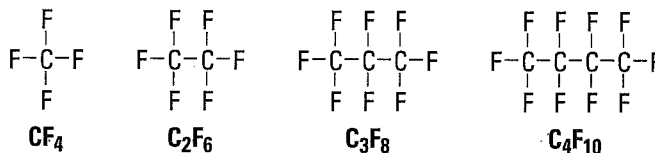
{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, ...}

40. Show that Goldbach's Conjecture (see page 5) is true for the even numbers from 20 to 40 by writing each even number as a sum of two primes.
41. Show that the following conjecture is not true by finding a counterexample.
Conjecture: All *odd* numbers can be expressed as the sum of two primes.
42.  **BACTERIA GROWTH** Suppose you are studying bacteria in biology class. The table shows the number of bacteria after n doubling periods.

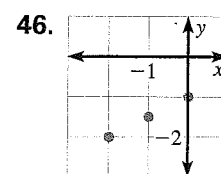
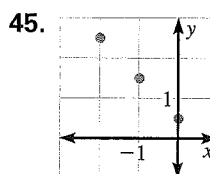
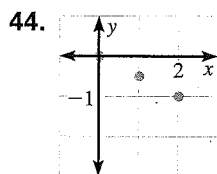
| n (periods) | 0 | 1 | 2 | 3 | 4 | 5 |
|----------------------|---|---|----|----|----|----|
| Billions of bacteria | 3 | 6 | 12 | 24 | 48 | 96 |

Your teacher asks you to predict the number of bacteria after 8 doubling periods. What would your prediction be?

43. **SCIENCE CONNECTION** Diagrams and formulas for four molecular compounds are shown. Draw a diagram and write the formula for the next two compounds in the pattern.



44.  **USING ALGEBRA** Find a pattern in the coordinates of the points. Then use the pattern to find the y -coordinate of the point (3, ?).



FOCUS ON CAREERS



LABORATORY TECHNOLOGIST

Laboratory technologists study microscopic cells, such as bacteria. The time it takes for a population of bacteria to double (the *doubling period*) may be as short as 20 min.



CAREER LINK

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