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4-8 Study Guide and Intervention

Writing Equations from Patterns

Look for Patterns A very common problem-solving strategy is to **look for a pattern.** Arithmetic sequences follow a pattern, and other sequences can follow a pattern.

Example 1 **Find the next three terms in the sequence 3, 9, 27, 81, ...**

Study the pattern in the sequence.

3 $\xrightarrow{\times 3}$ 9 $\xrightarrow{\times 3}$ 27 $\xrightarrow{\times 3}$ 81

Successive terms are found by multiplying the last given term by 3.

81 $\xrightarrow{\times 3}$ 243 $\xrightarrow{\times 3}$ 729 $\xrightarrow{\times 3}$ 2187

The next three terms are 243, 729, 2187.

Example 2 **Find the next three terms in the sequence 10, 6, 11, 7, 12, 8, ...**

Study the pattern in the sequence.

10 $\xrightarrow{-4}$ 6 $\xrightarrow{+5}$ 11 $\xrightarrow{-4}$ 7 $\xrightarrow{+5}$ 12 $\xrightarrow{-4}$ 8

Assume that the pattern continues.

8 $\xrightarrow{+5}$ 13 $\xrightarrow{-4}$ 9 $\xrightarrow{+5}$ 14

The next three terms are 13, 9, 14.

Lesson 4-8

Exercises

1. Give the next two items for the pattern below.

Give the next three numbers in each sequence.

2. 2, 12, 72, 432, ...

3. 7, −14, 28, −56, ...

4. 0, 10, 5, 15, 10, ...

5. 0, 1, 3, 6, 10, ...

6. $x - 1, x - 2, x - 3, \ldots$

7. $x, \frac{x}{2}, \frac{x}{3}, \frac{x}{4}, \ldots$

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4-8 Study Guide and Intervention *(continued)*

Writing Equations from Patterns

Write Equations Sometimes a pattern can lead to a general rule that can be written as an equation.

Example **Suppose you purchased a number of packages of blank compact disks. If each package contains 3 compact disks, you could make a chart to show the relationship between the number of packages of compact disks and the number of disks purchased. Use x for the number of packages and y for the number of compact disks.**

Make a table of ordered pairs for several points of the graph.

Number of Packages	1	2	3	4	5
Number of CDs	3	6	9	12	15

The difference in the x values is 1, and the difference in the y values is 3. This pattern shows that y is always three times x. This suggests the relation $y = 3x$. Since the relation is also a function, we can write the equation in functional notation as $f(x) = 3x$.

Exercises

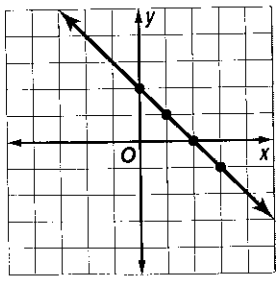
1. Write an equation for the function in functional notation. Then complete the table.

x	−1	0	1	2	3	4
y	−2	2	6			

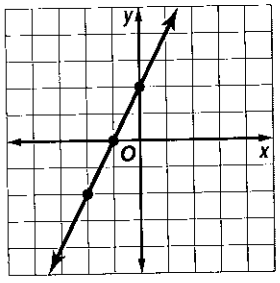
2. Write an equation for the function in functional notation. Then complete the table.

x	−2	−1	0	1	2	3
y	10	7	4			

3. Write an equation in functional notation.



4. Write an equation in functional notation.



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4-8 Practice

Writing Equations from Patterns

1. Give the next two items for the pattern. Then find the 21st figure in the pattern.

Find the next three terms in each sequence

2. $-5, -2, -3, 0, -1, 2, 1, 4, \ldots$

3. $0, 1, 3, 6, 10, 15, \ldots$

4. $0, 1, 8, 27, \ldots$

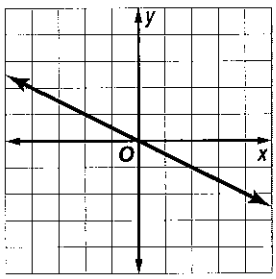
5. $3, 2, 4, 3, 5, 4, \ldots$

6. $a + 1, a + 4, a + 9, \ldots$

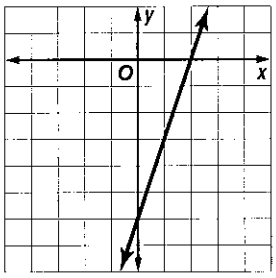
7. $3d - 1, 4d - 2, 5d - 3, \ldots$

Write an equation in function notation for each relation.

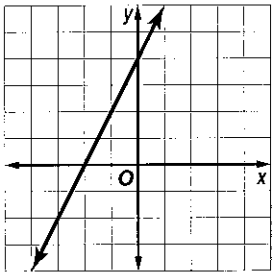
8.



9.



10.



BIOLOGY For Exercises 11 and 12, use the following information.

Male fireflies flash in various patterns to signal location and perhaps to ward off predators. Different species of fireflies have different flash characteristics, such as the intensity of the flash, its rate, and its shape. The table below shows the rate at which a male firefly is flashing.

Time (seconds)	1	2	3	4	5
Number of Flashes	2	4	6	8	10

11. Write an equation in function notation for the relation.

12. How many times will the firefly flash in 20 seconds?

13. GEOMETRY The table shows the number of diagonals that can be drawn from one vertex in a polygon. Write an equation in function notation for the relation and find the number of diagonals that can be drawn from one vertex in a 12-sided polygon.

Sides	3	4	5	6
Diagonals	0	1	2	3