Vocabulary

Review

1. Circle the name of the next shape in the *pattern* at the right.

rectangle   circle   (hexagon)   octagon

$\triangle$ $\square$ $\pentagon$ ...

Find the next number in each *pattern*.

2. $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}$

3. $6, 4, 2, 0, -2$

4. $2, 10, 50, 250, 1,250$

Vocabulary Builder

sequence (noun) SEE **kwuns**

Fibonacci sequence
$0, 1, 1, 2, 3, 5, 8, 13, 21, ...$

Definition: A **sequence** is an ordered list of numbers that often form a pattern. Each number in the list is called a *term* of the **sequence**.

Example: The Fibonacci sequence is a **sequence** of numbers where the first number is 0, the second number is 1, and each subsequent number is equal to the sum of the previous two numbers.

Origin: from the Latin word *sequentia*, which means "to follow"

Use Your Vocabulary

The following sets of numbers are *sequences*. Explain each pattern.

5. set of whole numbers greater than or equal to 5: {5, 6, 7, 8, 9, ...}
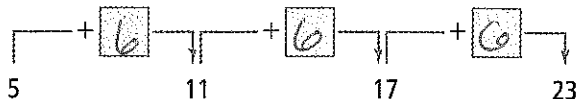
Starting at 5, we are going up by one each # in the set.

6. {40, 42, 44, 46, 48, ...}

Problem 1 Extending Sequences

Got It? Describe a pattern in the sequence 5, 11, 17, 23, ... What are the next two terms of the sequence?

7. Complete the diagram. What number is added to each term?

$$5 \xrightarrow{+\boxed{6}} 11 \xrightarrow{+\boxed{6}} 17 \xrightarrow{+\boxed{6}} 23$$

8. Describe the pattern in the sequence.

   We added 6 to each term.

9. Find the next two terms in the sequence.

   5, 11, 17, 23, 29, 35, ...

Problem 2 Identifying an Arithmetic Sequence

When a sequence has a common difference.

Got It? Tell whether the sequence 8, 15, 22, 30, ... is arithmetic. If it is, what is the common difference?

10. Complete the table.

Consecutive Terms	8 and 15	15 and 22	22 and 30
Difference	7	7	8

11. Do the consecutive terms have a common difference?   Yes (No)

12. Is the sequence an arithmetic sequence? If so, what is the common difference?

   No, the difference is not the same between terms.

Got It? Tell whether the sequence 7, 9, 11, 13, ... is arithmetic. If it is, what is the common difference?

13. Complete the table.

Consecutive Terms	7 and 9	9 and 11	11 and 13
Difference	2	2	2

14. Is the sequence an arithmetic sequence? If so, what is the common difference?

   Yes, the C.D. is 2.

Lesson 4-7

Key Concept Rule for an Arithmetic Sequence

The nth term of an arithmetic sequence with the first term $A(1)$ and common difference d is given by this rule:

$$A(n) = A(1) + (n - 1)d$$

nth term   first term   term number   common difference

— explicit formula

17. The equation $A(5) = 3 + (5 - 1)7$ generates the fifth term in a sequence. Draw a line from each number in Column A to its description in Column B.

Column A	Column B
7	first term of the sequence
5	term number
3	common difference

Find: 3, 5 + 10 terms.

EX: $A(n) = -2 + (n-1)5$

$A(3) = -2 + (3-1)5$
$= -2 + (2)5$
$= -2 + 10$

$A(3) = 8$

$A(5) = -2 + (5-1)5$
$-2 + (4)5$
$-2 + 20$
$A(5) = 18$

$A(10) = -2 + (10-1)5$

$A(10) = 43$

Problem 3 Writing a Recursive Formula

Got It? Write the recursive formula for the arithmetic sequence 3, 9, 15, 21,... What is the 9th term in the sequence?

18. $A(1) = $
$A(2) = A(1) + \quad = 3 + \quad = 9$
$A(3) = A(2) + \quad = \quad + \quad = 15$
$A(4) = A(3) + \quad = \quad + \quad = 21$

19. The recursive formula for the arithmetic sequence is $A(n) = $

20. $A(5) = A(4) + \quad = \quad + \quad = $
$A(6) = A(5) + \quad = \quad + \quad = $
$A(7) = A(6) + \quad = \quad + \quad = $
$A(8) = A(7) + \quad = \quad + \quad = $
$A(9) = A(8) + \quad = \quad + \quad = $

Problem 4 Writing an Explicit Formula

Got It? A subway pass has a starting value of $100. After one ride, the value of the pass is $98.25. After two rides, its value is $96.50. After three rides, its value is $94.75. Write a rule to represent the remaining value on the card as an arithmetic sequence. What is the value of the pass after 15 rides?

21. Describe how the values for $A(n)$ are found.

Summary:

22. How many times is 1.75 subtracted from 100 when $n = 1$? ▢ What is the $A(1)$ term? ▢

   a. How many times is 1.75 subtracted from 100 when $n = 2$? ▢

      What is the $A(2)$ term? ▢

   b. How many times is 1.75 subtracted from 100 when $n = 3$? ▢

      What is the $A(3)$ term? ▢

   c. How many times is 1.75 subtracted from 100 when $n = 4$? ▢

      What is the $A(4)$ term? ▢

   d. How many times is 1.75 subtracted from 100 when $n = n$? ▢

      What is the $A(n)$ term? ▢

23. What is n for the term *after* 15 rides are used? ▢ Using the formula, what is the value of the pass after 15 rides? ▢

Lesson Check • Do you UNDERSTAND?

Reasoning Can you use the rule below to find the nth term of an arithmetic sequence with a first term $A(1)$ and a common difference d? Explain.

$$A(n) = A(1) + nd - d$$

24. Use the Distributive Property to write an equivalent formula.

$$A(n) = A(1) + nd - d$$ ▢

25. Can you use the rule $A(n) = A(1) + nd - d$ to find the nth term of an arithmetic sequence? Explain.

Math Success

Check off the vocabulary words that you understand.

☐ sequence   ☐ term of a sequence   ☐ arithmetic sequence   ☐ common difference

Rate how well you can *understand arithmetic sequences*.

Need to review 0   2   4   6   8   10 Now I get it!

Lesson 4-7