# Study Guide ~~and Intervention~~

## Arithmetic Sequences

**Recognize Arithmetic Sequences** A sequence is a set of numbers in a specific order. If the difference between successive terms is constant, then the sequence is called an **arithmetic sequence**.

| Arithmetic Sequence | a numerical pattern that increases or decreases at a constant rate or value called the **common difference** |
|---|---|

**Example 1** Determine whether the sequence 1, 3, 5, 7, 9, 11, ... is an arithmetic sequence. Justify your answer.

If possible, find the common difference between the terms. Since $3 - 1 = 2$, $5 - 3 = 2$, and so on, the common difference is 2.

Since the difference between the terms of 1, 3, 5, 7, 9, 11, ... is constant, this is an arithmetic sequence.

**Example 2** Determine whether the sequence 1, 2, 4, 8, 16, 32, ... is an arithmetic sequence. Justify your answer.

If possible, find the common difference between the terms. Since $2 - 1 = 1$ and $4 - 2 = 2$, there is no common difference.

Since the difference between the terms of 1, 2, 4, 8, 16, 32, ... is not constant, this is not an arithmetic sequence.

### Exercises

Determine whether each sequence is an arithmetic sequence. If it is, state the common difference.

**1.** 1, 5, 9, 13, 17, ...

**2.** 8, 4, 0, −4, −8, ...

**3.** 1, 3, 9, 27, 81, ...

**4.** 10, 15, 25, 40, 60, ...

**5.** −10, −5, 0, 5, 10, ...

**6.** 8, 6, 4, 2, 0, −2, ...

**7.** 4, 8, 12, 16, ...

**8.** 15, 12, 10, 9, ...

**9.** 1.1, 2.1, 3.1, 4.1, 5.1, ...

**10.** 8, 7, 6, 5, 4, ...

**11.** 0.5, 1.5, 2.5, 3.5, 4.5, ...

**12.** 1, 4, 16, 64, ...

**13.** 10, 14, 18, 22, ...

**14.** −3, −6, −9, −12, ...

**15.** 7, 0, −7, −14, ...

## Study Guide ~~(continued)~~ *(continued)*

### Arithmetic Sequences

**Write Arithmetic Sequences** You can use the common difference of an arithmetic sequence to find the next term of the sequence. Each term after the first term is found by adding the preceding term and the common difference.

| Terms of an Arithmetic Sequence | If $a_1$ is the first term of an arithmetic sequence with common difference $d$, then the sequence is $a_1$, $a_1 + d$, $a_1 + 2d$, $a_1 + 3d$, .... |
|---|---|
| $n$th Term of an Arithmetic Sequence | $a_n = a_1 + (n - 1)d$ |

**Example 1** Find the next three terms of the arithmetic sequence 28, 32, 36, 40, ....

Find the common difference by subtracting successive terms.

$$28 \quad 32 \quad 36 \quad 40$$
$$+4 \quad +4 \quad +4$$

The common difference is 4.

Add 4 to the last given term, 40, to get the next term. Continue adding 4 until the next three terms are found.

$$40 \quad 44 \quad 48 \quad 52$$
$$+4 \quad +4 \quad +4$$

The next three terms are 44, 48, 52.

**Example 2** Write an equation for the $n$th term of the sequence 12, 15, 18, 21, ... .

In this sequence, $a_1$ is 12. Find the common difference.

$$12 \quad 15 \quad 18 \quad 21$$
$$+3 \quad +3 \quad +3$$

The common difference is 3.

Use the formula for the $n$th term to write an equation.

$a_n = a_1 + (n - 1)d$    Formula for the $n$th term
$a_n = 12 + (n - 1)3$    $a_1 = 12$, $d = 3$
$a_n = 12 + 3n - 3$    Distributive Property
$a_n = 3n + 9$    Simplify.

The equation for the $n$th term is $a_n = 3n + 9$.

### Exercises

**Find the next three terms of each arithmetic sequence.**

1. 9, 13, 17, 21, 25, ...

2. 4, 0, −4, −8, −12, ...

3. 29, 35, 41, 47, ...

4. −10, −5, 0, 5, ...

5. 2.5, 5, 7.5, 10, ...

6. 3.1, 4.1, 5.1, 6.1, ...

**Find the $n$th term of each arithmetic sequence described.**

7. $a_1 = 6$, $d = 3$, $n = 10$

8. $a_1 = -2$, $d = -3$, $n = 8$

9. $a_1 = 1$, $d = -5$, $n = 20$

10. $a_1 = -3$, $d = -2$, $n = 50$

11. $a_1 = -12$, $d = 4$, $n = 20$

12. $a_1 = 1$, $d = \frac{1}{2}$, $n = 11$

**Write an equation for the $n$th term of the arithmetic sequence.**

13. 1, 3, 5, 7, ...

14. −1, −4, −7, −10, ...

15. −4, −9, −14, −19, ...

Lesson 3-4