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11-1 Study Guide and Intervention

Arithmetic Sequences

Arithmetic Sequences An **arithmetic sequence** is a sequence of numbers in which each **term** after the first term is found by adding the **common difference** to the preceding term.

***n*th Term of an Arithmetic Sequence**	$a_n = a_1 + (n - 1)d$, where a_1 is the first term, d is the common difference, and n is any positive integer

Example 1 **Find the next four terms of the arithmetic sequence 7, 11, 15, ...**

Find the common difference by subtracting two consecutive terms.

$11 - 7 = 4$ and $15 - 11 = 4$, so $d = 4$.

Now add 4 to the third term of the sequence, and then continue adding 4 until the four terms are found. The next four terms of the sequence are 19, 23, 27, and 31.

Example 2 **Find the thirteenth term of the arithmetic sequence with $a_1 = 21$ and $d = -6$.**

Use the formula for the nth term of an arithmetic sequence with $a_1 = 21$, $n = 13$, and $d = -6$.

$a_n = a_1 + (n - 1)d$	Formula for *n*th term
$a_{13} = 21 + (13 - 1)(-6)$	$n = 13$, $a_1 = 21$, $d = -6$
$a_{13} = -51$	Simplify.

The thirteenth term is -51.

Example 3 **Write an equation for the *n*th term of the arithmetic sequence $-14, -5, 4, 13, \ldots$.**

In this sequence $a_1 = -14$ and $d = 9$. Use the formula for a_n to write an equation.

$a_n = a_1 + (n - 1)d$	Formula for the *n*th term
$= -14 + (n - 1)9$	$a_1 = -14$, $d = 9$
$= -14 + 9n - 9$	Distributive Property
$= 9n - 23$	Simplify.

Exercises

Find the next four terms of each arithmetic sequence.

1. 106, 111, 116, ...

2. $-28, -31, -34, \ldots$

3. 207, 194, 181, ...

Find the first five terms of each arithmetic sequence described.

4. $a_1 = 101, d = 9$

5. $a_1 = -60, d = 4$

6. $a_1 = 210, d = -40$

Find the indicated term of each arithmetic sequence.

7. $a_1 = 4, d = 6, n = 14$

8. $a_1 = -4, d = -2, n = 12$

9. $a_1 = 80, d = -8, n = 21$

10. a_{10} for $0, -3, -6, -9, \ldots$

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

11. 18, 25, 32, 39, ...

12. $-110, -85, -60, -35, \ldots$

13. 6.2, 8.1, 10.0, 11.9, ...

Lesson 11-1

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11-1 Study Guide and Intervention *(continued)*

Arithmetic Sequences

Arithmetic Means The **arithmetic means** of an arithmetic sequence are the terms between any two nonsuccessive terms of the sequence.

To find the k arithmetic means between two terms of a sequence, use the following steps.

Step 1	Let the two terms given be a_1 and a_n, where $n = k + 2$.
Step 2	Substitute in the formula $a_n = a_1 + (n - 1)d$.
Step 3	Solve for d, and use that value to find the k arithmetic means: $a_1 + d, a_1 + 2d, \ldots, a_1 + kd$.

Example **Find the five arithmetic means between 37 and 121.**

You can use the nth term formula to find the common difference. In the sequence, 37, ?, ?, ?, ?, ?, 121, ..., a_1 is 37 and a_7 is 121.

$a_n = a_1 + (n - 1)d$	Formula for the nth term
$121 = 37 + (7 - 1)d$	$a_1 = 37$, $a_7 = 121$, $n = 7$
$121 = 37 + 6d$	Simplify.
$84 = 6d$	Subtract 37 from each side.
$d = 14$	Divide each side by 6.

Now use the value of d to find the five arithmetic means.

$$37 \overset{+14}{\rightarrow} 51 \overset{+14}{\rightarrow} 65 \overset{+14}{\rightarrow} 79 \overset{+14}{\rightarrow} 93 \overset{+14}{\rightarrow} 107 \overset{+14}{\rightarrow} 121$$

The arithmetic means are 51, 65, 79, 93, and 107.

Exercises

Find the arithmetic means in each sequence.

1. 5, ?, ?, ?, −3

2. 18, ?, ?, ?, −2

3. 16, ?, ?, 37

4. 108, ?, ?, ?, ?, 48

5. −14, ?, ?, ?, −30

6. 29, ?, ?, ?, 89

7. 61, ?, ?, ?, ?, 116

8. 45, ?, ?, ?, ?, ?, 81

9. −18, ?, ?, ?, 14

10. −40, ?, ?, ?, ?, ?, −82

11. 100, ?, ?, 235

12. 80, ?, ?, ?, ?, −30

13. 450, ?, ?, ?, 570

14. 27, ?, ?, ?, ?, ?, 57

15. 125, ?, ?, ?, 185

16. 230, ?, ?, ?, ?, ?, 128

17. −20, ?, ?, ?, ?, 370

18. 48, ?, ?, ?, 100

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