

## 4-6 Arithmetic Sequences

Warm Up

Lesson Presentation

Lesson Quiz

Holt Algebra 1

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## 4-6 Arithmetic Sequences

**Warm Up**

**Evaluate.**

- |                                     |                |                                                             |               |
|-------------------------------------|----------------|-------------------------------------------------------------|---------------|
| 1. $5 + (-7)$                       | $-2$           | 2. $\frac{2}{3} + \frac{1}{3} + \frac{1}{3}$                | $\frac{4}{3}$ |
| 3. $5.3 + 0.8$                      | $6.1$          | 4. $6(4 - 1)$                                               | $18$          |
| 5. $-3(2 - 5)$                      | $9$            | 6. $\frac{12}{5} \left( \frac{10}{3} + \frac{5}{4} \right)$ | $11$          |
| 7. $\frac{3}{4} + h$ where $h = -2$ | $-\frac{5}{4}$ | 8. $n - 2.8$ where $n =$                                    |               |
| 9. $6(x - 1)$ where $x = 5$         | $24$           |                                                             |               |
| 10. $10 + (5 - 1)s$ where $s =$     | $-4$           | $-6$                                                        |               |

Holt Algebra 1

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**4-6 Arithmetic Sequences*****Objectives***

Recognize and extend an arithmetic sequence.

Find a given term of an arithmetic sequence.

**4-6 Arithmetic Sequences*****Vocabulary***

sequence

term

arithmetic sequence

common difference

## 4-6 Arithmetic Sequences

<b>Time (s)</b>	1	2	3	4	5	6	7	8
<b>Distance (mi)</b>	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6

$+0.2 +0.2 +0.2 +0.2 +0.2 +0.2 +0.2$

When the terms of a sequence differ by the same nonzero number  $d$ , the sequence is an **arithmetic sequence** and  $d$  is the **common difference**. So the distances in the table form an arithmetic sequence with the common difference of 0.2.

## 4-6 Arithmetic Sequences

### Example 1A: Identifying Arithmetic Sequences

**Determine whether the sequence appears to be an arithmetic sequence. If so, find the common difference and the next three terms.**

**9, 13, 17, 21,...**

**Step 1** Find the difference between successive terms.

$9, 13, 17, 21, \dots$   
  
 $+4 +4 +4$

*You add 4 to each term to find the next term. The common difference is 4.*

## 4-6 Arithmetic Sequences

### Reading Math

The three dots at the end of a sequence are called an ellipsis. They mean that the sequence continues and can read as "and so on."

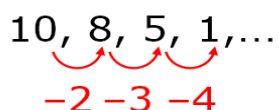
## 4-6 Arithmetic Sequences

### Example 1B: Identifying Arithmetic Sequences

**Determine whether the sequence appears to be an arithmetic sequence. If so, find the common difference and the next three terms.**

**10, 8, 5, 1, ...**

Find the difference between successive terms.

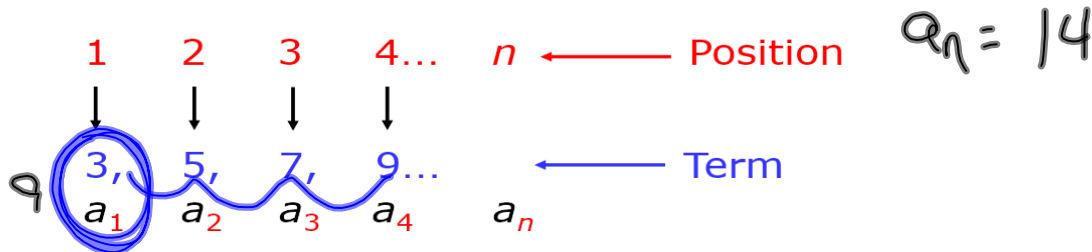
10, 8, 5, 1, ...  
  
 -2 -3 -4

*The difference between successive terms is not the same.*

This sequence is not an arithmetic sequence.

## 4-6 Arithmetic Sequences

The variable  $a$  is often used to represent terms in a sequence. The variable  $a_9$ , read “a sub 9,” is the ninth term, in a sequence. To designate any term, or the  $n$ th term in a sequence, you write  $a_n$ , where  $n$  can be any number.



The sequence above starts with 3. The common difference  $d$  is 2. You can use the first term and the common difference to write a rule for finding  $a_n$ .

## 4-6 Arithmetic Sequences

Words	Numbers	Algebra
1st term	3	$a_1$
2nd term	$3 + (1)2 = 5$	$a_1 + 1d$
3rd term	$3 + (2)2 = 7$	$a_1 + 2d$
4th term	$3 + (3)2 = 9$	$a_1 + 3d$
⋮	⋮	⋮
$n$ th term	$3 + (n - 1)2$	$a_1 + (n - 1)d$

The pattern in the table shows that to find the  $n$ th term, add the first term to the product of  $(n - 1)$  and the common difference.

## 4-6 Arithmetic Sequences

$f(6)$

### Finding the $n$ th Term of an Arithmetic Sequence

The  $n$ th term of an arithmetic sequence with common difference  $d$  and first term  $a_1$  is

$$a_n = a_1 + (n - 1)d.$$

$Q_{24} =$

## 4-6 Arithmetic Sequences

### Example 2A: Finding the $n$ th Term of an Arithmetic Sequence

Find the indicated term of the arithmetic sequence.

**16th term:** 4, 8, 12, 16, ...

**Step 1** Find the common difference.

4, 8, 12, 16, ... *The common difference is 4.*  
 $+4 \quad +4 \quad +4$

**Step 2** Write a rule to find the 16th term.

$$a_n = a_1 + (n - 1)d \quad \text{Write a rule to find the } n\text{th term.}$$

$$a_{16} = 4 + (16 - 1)(4) \quad \text{Substitute 4 for } a_1, 16 \text{ for } n, \text{ and 4 for } d.$$

$$= 4 + (15)(4) \quad \text{Simplify the expression in parentheses.}$$

$$= 4 + 60 \quad \text{Multiply.}$$

$$a_{16} = 64 \quad \text{Add.} \quad \text{The 16th term is 64.}$$

## 4-6 Arithmetic Sequences

### Example 2B: Finding the $n$ th Term of an Arithmetic Sequence

Find the indicated term of the arithmetic sequence.

The 25th term:  $a_1 = -5$ ;  $d = -2$

$$a_n = a_1 + (n - 1)d \quad \text{Write a rule to find the } n\text{th term.}$$

$$a_{25} = -5 + (25 - 1)(-2) \quad \text{Substitute } -5 \text{ for } a_1, 25 \text{ for } n, \text{ and } -2 \text{ for } d.$$

$$= -5 + (24)(-2) \quad \text{Simplify the expression in parentheses.}$$

$$= -5 + (-48) \quad \text{Multiply.}$$

$$= -53 \quad \text{Add.}$$

The 25th term is  $-53$ .

## 4-6 Arithmetic Sequences

### Check It Out! Example 2a

Find the indicated term of the arithmetic sequence.

60th term: 11, 5, -1, -7, ...

$$\begin{aligned}
 & 11 + (60-1)(-6) \\
 & 11 + -6(59) \\
 & 11 + -354
 \end{aligned}$$

$$-343$$

$$\begin{aligned}
 d &= -6 \\
 n &= 60 \\
 a_1 &= 11
 \end{aligned}$$



## 4-6 Arithmetic Sequences

### Check It Out! Example 2b

Find the indicated term of the arithmetic sequence.

12th term:  $a_1 = 4.2$ ;  $d = 1.4$

$$4.2 + (12-1)1.4$$

$$4.2 + 15.4$$

$$19.6$$

## 4-6 Arithmetic Sequences

### Example 3: Application

A bag of cat food weighs 18 pounds. Each day, the cats are fed 0.5 pound of food. How much does the bag of cat food weigh after 30 days?

$$d = -0.5$$

$$a_1 = 18$$

$$n = 30$$

$$a_{30} = 18 + (30-1)(-0.5)$$

$$18 + 29(-0.5)$$

$$18 + -14.5$$

$$\text{bag of food} = 3.5 \text{ lbs.}$$





## 4-6 Arithmetic Sequences

### Lesson Quiz: Part I

Determine whether each sequence appears to be an arithmetic sequence. If so, find the common difference and the next three terms in the sequence.

1. ~~3, 9, 27, 81, ...~~      not arithmetic

2. 5, 6.5, 8, 9.5, ...      arithmetic;  
1.5; 11, 12.5, 14

## 4-6 Arithmetic Sequences

### Lesson Quiz: Part II

Find the indicated term of each arithmetic sequence.

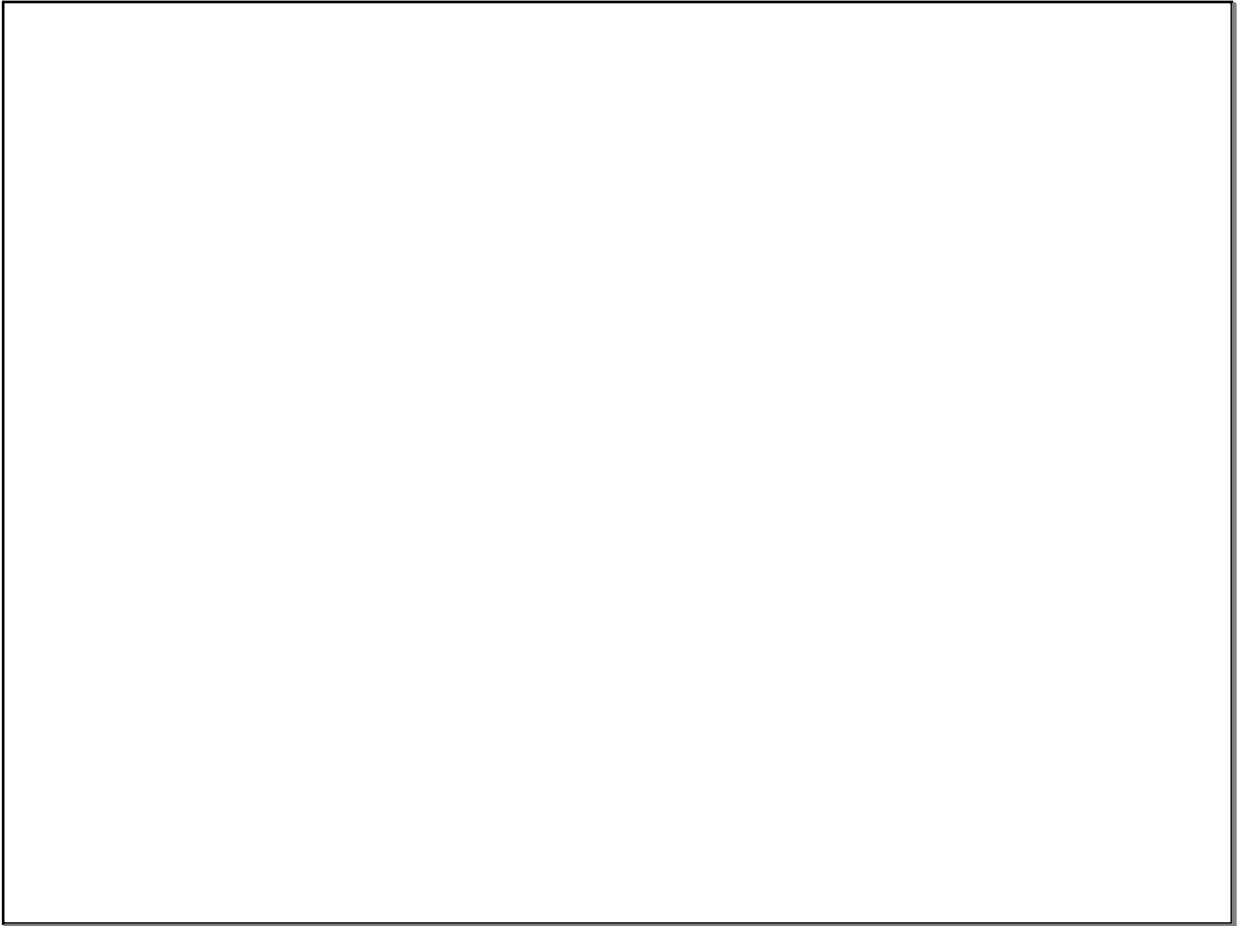
3. 23rd term:  $-4, -7, -10, -13, \dots$

4. 40th term:  $2, 7, 12, 17, \dots$

5. 7th term:  $a_1 = -12, d = 2$

6. 34th term:  $a_1 = 3.2, d = 2.6$

7. Zelle has knitted 61 rows of a scarf. Each day she adds 17 more rows. How many rows total has Zelle knitted 16 days later?



Oct 29-8:46 PM