

Algebra 1 3.5

Recognize arithmetic sequences

Relate arithmetic sequences to linear functions...tricky

sequence follows rule

term

arithmetic sequence +

common difference (d)

whiteboards

$$-3 = +^{-}3$$

$$d = 5$$

$$5, 10, 15, 20 \dots$$

↘ ↘ ↘
+5 +5 +5

$$d = 2$$

$$2, 4, 6, 8 \dots$$

↘ ↘ ↘
+2 +2 +2

$$22, 19, 16, 13 \dots$$

↘ ↘ ↘
-3 -3 -3

$$d = -3$$

$$2, 4, 8, 16 \dots$$

no

Key Concept Arithmetic Sequence

Words

An arithmetic sequence is a numerical pattern that increases or decreases at a constant rate called the *common difference*.

Examples

3, 5, 7, 9, 11, ...


+2 +2 +2 +2

$$d = 2$$

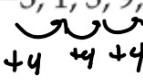
33, 29, 25, 21, 17, ...


-4 -4 -4 -4

$$d = -4$$

Example 1

Determine whether each sequence is an arithmetic sequence. Write *yes* or *no*. Explain.

8. $-3, 1, 5, 9, \dots$


yes $d = 4$

What's the rule?

What's the rule? What comes next?

Example 2 Find the Next Term

Find the next three terms of the arithmetic sequence $15, 9, 3, -3, \dots$ $-9, -15, -21$

$\begin{array}{cccc} \checkmark & \checkmark & \checkmark & \\ -6 & -6 & -6 & \end{array}$

What's the rule? What comes next?

Find the next three terms of each arithmetic sequence.

12. 0.02, 1.08, 2.14, 3.2, ... ^{yes}
+ 1.06 4.26, 5.32, 6.38
13. 6, 12, 18, 24, ... 30, 36, 42

Guided Practice

2. Find the next four terms of the arithmetic sequence 9.5, 11.0, 12.5, 14.0,

15.5, 17, 18.5, 20

First term is 8, and common difference is 3..

$$a_1 = 8$$

$$a_2 = 11 \quad 8 + 3$$

$$a_3 = 14 \quad 8 + 3 + 3$$

$$a_4 = 17 \quad 8 + 3 + 3 + 3$$

$$a_5 = 20 \quad 8 + 3 + 3 + 3 + 3$$

$$a_6 = 23 \quad 8 + 3 + 3 + 3 + 3 + 3$$

$$a_{70} = 8 + 69 \cdot 3 = 215$$

$$a_1 \quad 8 + 0 \cdot 3$$

$$a_2 \quad 8 + 1 \cdot 3$$

$$a_3 \quad 8 + 2 \cdot 3$$

$$a_4 \quad 8 + 3 \cdot 3$$

$$a_5 \quad 8 + 4 \cdot 3$$

$$a_6 \quad 8 + 5 \cdot 3$$

$$a_7 \quad 8 + 6 \cdot 3$$

$$a_8 \quad 8 + 7 \cdot 3$$

$$a_9 \quad 8 + 8 \cdot 3$$

$$a_{10} \quad 8 + 9 \cdot 3$$

$$a_{15} \quad 8 + 14 \cdot 3$$

$$a_{20} \quad 8 + 19 \cdot 3$$

$$a_{50} \quad 8 + 49 \cdot 3$$

$$a_{99} \quad 8 + 98 \cdot 3$$

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

$$a_n = 8 + 3(n-1)$$

$$a_{72} = 8 + 3 \cdot 71 = 221$$

$$a_{158} = 8 + 157 \cdot 3 = 479$$

Symbol a_1 In Terms of a_1 and d

KeyConcept n th Term of an Arithmetic Sequence

The n th term of an arithmetic sequence with first term a_1 and common difference d is given by $a_n = a_1 + (n - 1)d$, where n is a positive integer.

Why is it one less????

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

Example 3 Find the n th Term

- a. Write an equation for the n th term of the arithmetic sequence
-12, -8, -4, 0, ...

-12 4

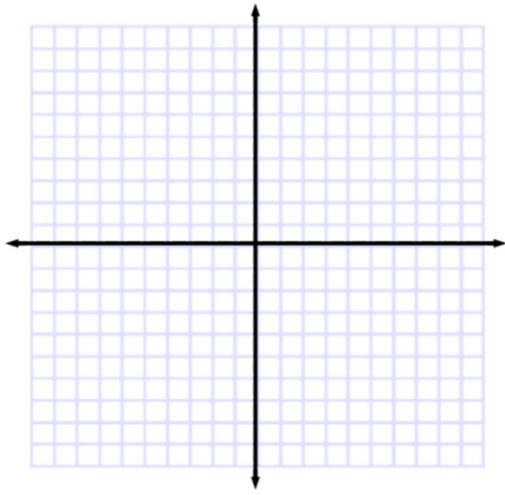
$$a_n = -12 + (n-1) \cdot 4$$

- b. Find the 9th term of the sequence.

$$\begin{aligned} & -12 + (8) \cdot 4 \\ & -12 + 32 = 20 \end{aligned}$$

- ~~c. Graph the first five terms of the sequence.~~

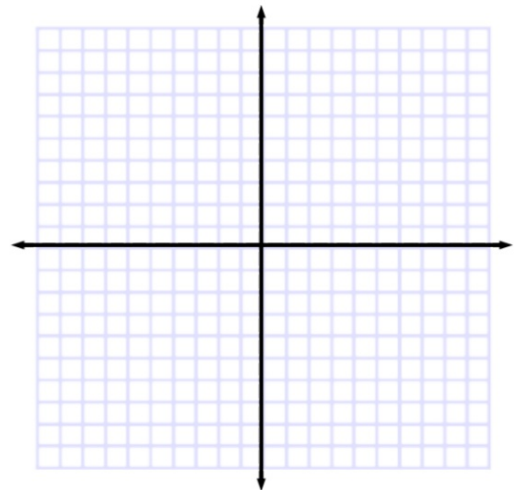
Think of them like ordered pairs...
(because they are)



c. Graph the first five terms of the sequence.

n	$4n - 16$	a_n	(n, a_n)
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d. Which term of the sequence is 32?



Guided Practice

Consider the arithmetic sequence $3, -10, -23, -36, \dots$.

- 3A.** Write an equation for the n th term of the sequence.
- 3B.** Find the 15th term in the sequence.
- 3C.** Graph the first five terms of the sequence.
- 3D.** Which term of the sequence is -114 ?

Guided Practice

4. **TRACK** The chart below shows the length of Martin's long jumps.

Jump	1	2	3	4
Length (ft)	8	9.5	11	12.5

- A. Write a function to represent this arithmetic sequence.
- B. Then graph the function.