Algebra 1   3.5
Recognize arithmetic sequences
Relate arithmetic sequences to linear functions...tricky
sequence — *follows rule*
term
arithmetic sequence $a_1 = 1^{st}$ term   *follows adding rule*
common difference (d) $d = rule$
whiteboards

$$-3 = +^-3$$

2, 4, 6, 8.., 10, 12, 14...

✦ 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, …

yes rule: add 4

$d = 4$

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, ... −9, −15, −21

$+^-6$

$d = -6$

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, …

4.26
5.32
6.38

1.08
− 0.02
_____
d = 1.06

13. 6, 12, 18, 24, … 30, 36, 42

18   24
−12   −18
_____   _____
6   6

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

15.5 , 17, 18.5

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

$a_1 = 8$ $d = 3$

23
26    $a_2 = 11$ $(a_1 + d) = a_1 + d$
29    $a_3 = 14$ $(a_1 + d + d) = a_1 + 2d$
32
      $a_4 = 17$ $(a_1 + d + d + d) = a_1 + 3d$
      $a_5 = 20$ $(a_1 + d + d + d + d) = a_1 + 4d = a_1 + d_4$

Term	Symbol	In Terms of a_1 and d	Numbers

$3+3+3+3+3+3+3+3$

first term a_1 a_1 8

$a_9 = 8 + 3 \cdot 8 = 8 + 24 = 32$ $a_1 + 8d$

$a_{100} = a_1 + 99d$

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

$a_1 = -2 \qquad d = 5$

$-2+5$
$3+5$
$8+13+18+23+28 - - - \overline{}$
$a_5 = -2 + 4 \cdot 5 = 18$

$a_{29} = -2 + 28 \cdot 5 = -2 + 140 = 138$

$a_{99} =$

KeyConcept nth Term of an Arithmetic Sequence

The nth 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????

Recursive equation...explicit equation

Example 3 Find the *n*th Term

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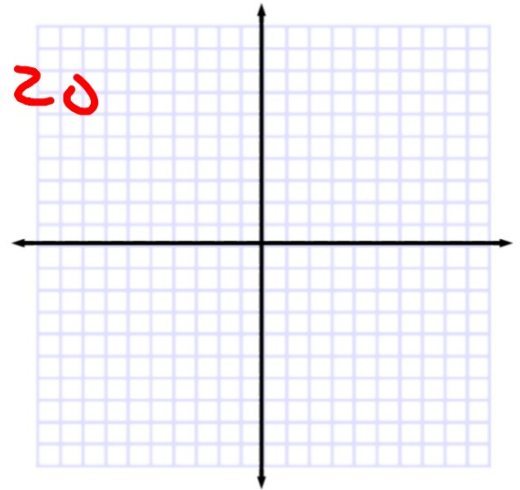$-12, -8, -4, 0, \dots$.

$d = 4$ $\qquad$ $a_1 = -12$

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

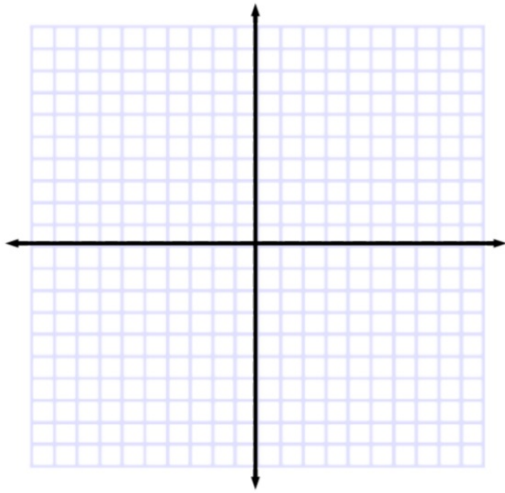**b.** Find the 9th term of the sequence.

$a_9 = -12 + (9-1) \cdot 4$

$-12 + 8 \cdot 4 = -12 + 32 = 20$

c. Graph the first five terms of the sequence.
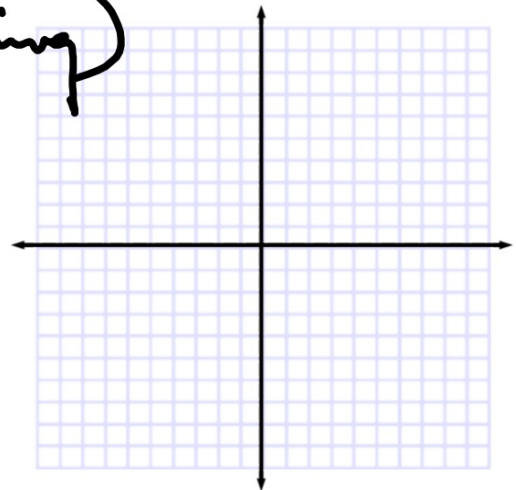
Think of them like ordered pairs...
  (because they are)

c. Graph the first five terms of the sequence.

n	$4n - 16$	a_n	(n, a_n)

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9-21 odd (skip graphing)
41-49 all

d. Which term of the sequence is 32?

Consider the arithmetic sequence 3, −10, −23, −36, … .

3A. Write an equation for the nth 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?

GuidedPractice

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.