Algebra 1 3.5

Recognize arithmetic sequences

Relate arithmetic sequences to linear functions...tricky

sequence

term

arithmetic sequence

common difference (d)

whiteboards

rule

add

add (same) amount

first, first + d, sec. + d, third + d

a_1 $a_2 = a_1 + 2$ $a_3 = a_2 + 2$ $a_4 = a_3 + 2$

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

KeyConcept 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

$d = -4$

-4 +-4

Example 1 **Determine whether each sequence is an arithmetic sequence. Write *yes* or *no*. Explain.**

8. $-3, 1, 5, 9, \ldots$ 13, 17

yes, add 4

What's the rule?

What's the rule? What comes next?

-6

Example 2 Find the Next Term

Find the next three terms of the arithmetic sequence 15, 9, 3, −3, ...? , -9, -15, -21

-6

-3 + 6

3 + 6

9 + 6

-3 - 6

-9 - 6

-15 - 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

1.06 1.06 1.06

~~1.06~~

+1.06

13 6, 12, 18, 24, … 30, 36, 42

+6

6 6 6

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$d = 1.5$

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...

8, 11, 14, 17 ...

a_1 8

a_2 8 + 3

a_3 11 + 3 8 + 3 + 3

a_4 14 + 3 8 + 3 + 3 + 3

$a_{98} = 8 + 98(3)$

$= a_1 + (\text{less})(d)$

$a_{57} = 8 + 56(3)$

Term	Symbol	In Terms of a_1 and d	Numbers
first term	a_1	a_1	8

$a_1 + (n-1)d$

first + (less)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????

Example 3 Find the *n*th Term

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

$+4$

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

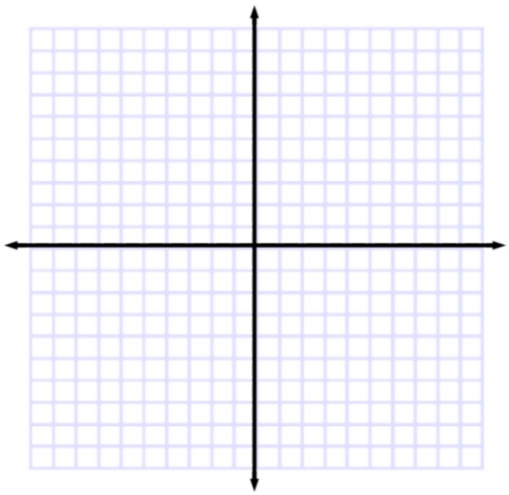
b. Find the 9th term of the sequence.

$-12 + 8 \cdot 4$

$-12 + 32$

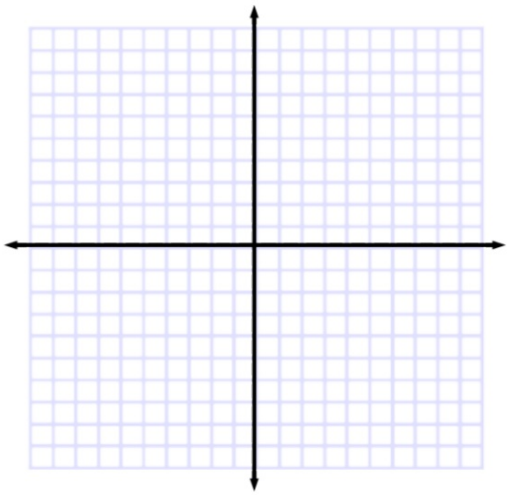
~~**c. Graph the first five terms of the sequence.**~~

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)



d. Which term of the sequence is 32?

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$a_n = 3 + (n-1)(-13)$ (a1, 1st no., nth)

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

$d = -13$

$a_1 =$

3A. Write an equation for the *n*th term of the sequence.

3B. Find the 15th term in the sequence. $3 + (14)(-13) = -179$

3C. ~~Graph the first five terms of the sequence.~~

3D. Which term of the sequence is −114?

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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.