

Algebra 1 3.5
 Recognize arithmetic sequences
 Relate arithmetic sequences to linear functions...tricky

sequence rule
 term each item $a_1, a_2, a_3, a_4, \dots$
 arithmetic sequence \times adding rule
 common difference (d)
 $+2$
 whiteboards
 $13, 11, 9, 7, 5, \dots$ $2, 4, 6, 8, 10, 12, 14, \dots$
 $2, 4, 8, 16, 32, 64, \dots$

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KeyConcept Arithmetic Sequence

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

Examples $3, 5, 7, 9, 11, \dots$ $33, 29, 25, 21, 17, \dots$
 $+2$ -4
 $d=2$ $d=-4$

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

8. $-3, 1, 5, 9, \dots$ 9. $\frac{1}{2}, \frac{3}{4}, \frac{5}{8}, \frac{7}{16}, \dots$

yes *no*
 $d=4$

What's the rule?

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What's the rule? What comes next?

Example 2 Find the Next Term

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

$d = -6$
 $-9, -15, -21$

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What's the rule? What comes next?

Find the next three terms of each arithmetic sequence.

12. $0.02, 1.08, 2.14, 3.2, \dots$ 13. $6, 12, 18, 24, \dots$

$0.02 + (?) = 1.08$ $6 + ? = 12$
 $(d = 1.06)$ -6 -6
 $4.26, 5.32, 6.38$ $30, 36, 42$

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Guided Practice

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

$9.5 + ? = 11$ $15.5, 17, 18.5, 20$

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

8 11 14 17

$a_1 = 8$ $a_2 = 8 + 3$ $a_3 = 8 + 3 + 3$ $a_4 = 8 + 3 + 3 + 3$

$a_5 = 8 + 4 \cdot 3$ $a_6 = 8 + 5 \cdot 3$

$a_{10} = 8 + 9 \cdot 3$ $a_{90} = 8 + 89 \cdot 3$

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

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

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Key Concept 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.

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

Why is it one less????

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Recursive equation...explicit equation

Example 3 Find the n th Term

a. Write an equation for the n th term of the arithmetic sequence $-12, -8, -4, 0, 4, 8, 12, 16, 20$

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

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

b. Find the 9th term of the sequence.

$$4 \cdot 9 + 16 = 20$$

$$a_n = -12 + 4n + 4$$

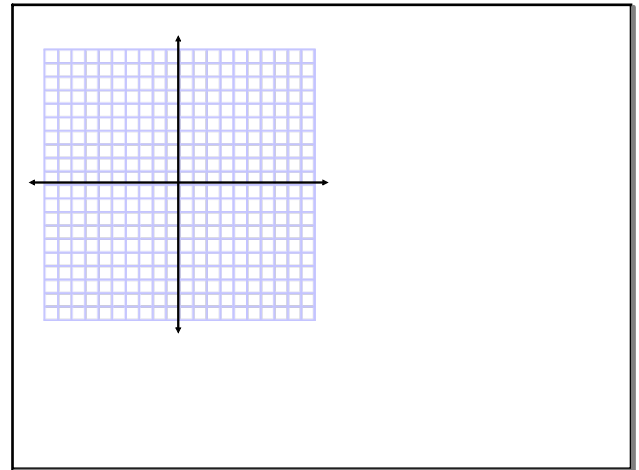
$$a_n = 4n - 8$$

c. Graph the first five terms of the sequence.

1 | -2
2 | -8
3 | -4
4 | 0
5 | 4

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

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c. Graph the first five terms of the sequence.

n	$4n - 16$	a_n	(n, a_n)
1	-12	-12	(1, -12)
2	-8	-8	(2, -8)
3	-4	-4	(3, -4)
4	0	0	(4, 0)
5	4	4	(5, 4)

$$a_n = 4n - 16$$

$$32 = 4n - 16$$

$$48 = 4n$$

$$n = 12$$

d. Which term of the sequence is 32?

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Guided Practice $a_n = 3 + (n-1)(-13)$

Consider the arithmetic sequence $3, -10, -23, -36, \dots$ $d = -13$

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

3B. Find the 15th term in the sequence. $a_n = 3 + -13n + 13$

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

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

$$a_n = -13n + 16$$

$$-114 = -13n + 16$$

$$-130 = -13n$$

$$\frac{-130}{-13} = \frac{-13n}{-13}$$

$$n = 10$$

1	3
2	-10
3	-23
4	-36
5	-49

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3.5 (p. 193)
9-230 37-550

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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.

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