

12-3 Arithmetic Sequences.....page #

GOAL:

Find the indicated terms of an arithmetic sequence.

Feb 13-6:01 PM

During a thunderstorm, you can estimate your distance from a lightning strike by counting the number of seconds from the time you see the lightning until you hear the thunder.

Remember !!
from 12-1.

When you list the times and distances in order, each list forms a sequence. A **sequence** is a list of numbers that often forms a pattern. Each number in a sequence is a **term**.

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

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

Notice that in the distance sequence, you can find the next term by adding 0.2 to the previous term. 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.

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Determine whether the sequence could be arithmetic. If so, find the common first difference and the next term.

$-10, -4, 2, 8, 14, 20, 26, 32$

$\begin{matrix} \underbrace{-10} & \underbrace{-4} & \underbrace{2} & \underbrace{8} & \underbrace{14} & \underbrace{20} & \underbrace{26} & \underbrace{32} \\ & +6 & +6 & +6 & +6 & +6 & +6 & \end{matrix}$

$\begin{matrix} -10, & -4, & 2, & 8, & 14 \\ \text{Differences} & 6 & 6 & 6 & 6 \end{matrix}$

The sequence could be arithmetic with a common difference of 6.

The next term is $14 + 6 = 20$.

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Determine whether the sequence could be arithmetic. If so, find the common first difference and the next term.

$-2, -5, -11, -20, -32, \dots$

$\begin{matrix} -2 & -5 & -11 & -20 & -32 \\ & -3 & -6 & -9 & \end{matrix}$

Not Arith.

$1.9, 1.2, 0.5, -0.2, -0.9, \dots$

$\begin{matrix} 1.9 & 1.2 & 0.5 & -0.2 & -0.9 \\ & -.7 & -.7 & -.7 & -.7 \end{matrix}$

$d = -.7$

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General Rule for Arithmetic Sequences

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

Find the 12th term of the arithmetic sequence $20, 14, 8, 2, 4, \dots$

Step 1 Find the common difference: $d = 14 - 20 = -6$.

Step 2 Evaluate by using the formula.

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

$a_{12} = 20 + (12-1)(-6)$ *Substitute 20 for a_1 , 12 for n , and -6 for d .*

$= -46$

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Find the 11th term of the arithmetic sequence.

Follow the steps.

1. Find d.

2. Use the formula.

$-3, -5, -7, -9, \dots$

$-2 \quad -2 \quad -2 \quad d = -2$

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

$a_{11} = -3 + (10) \cdot -2$

$a_{11} = -3 + -20 \quad a_{11} = -23$

Feb 14-10:45 AM

Find the missing terms in the arithmetic sequence

$17, \square, \square, \square, -7$

$11 \quad 5 \quad -7 \quad a_5 = -7$

$-7 = 17 + 4d$
 $-17 = -17$

Step 1 Find the common difference.

$-24 = 4d$
 $d = -6$

General rule

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

$-7 = 17 + (5 - 1)(d)$

$-6 = d$

Step 2 Find the missing terms using $d = -6$ and $a_1 = 17$.

Substitute -7 for a_n , 17 for a_1 , and 5 for n .
Solve for d .

Feb 14-10:47 AM

Find the missing terms in the arithmetic sequence

$2, \square, \square, \square, 0$

$15 \quad 1 \quad \frac{1}{2} \quad a_5 = 0$

Find d using the formula.

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

$0 = 2 + (5 - 1)d$

$0 = 2 + 4d$

$-2 = 4d$
 $\frac{-2}{4} = \frac{4d}{4}$
 $d = -\frac{1}{2}$

Feb 17-11:22 AM

Because arithmetic sequences have a common difference, you can use any two terms to find the difference.

Find the 5th term of the arithmetic sequence with $a_8 = 85$ and $a_{14} = 157$.

Step 1 Find the common difference.

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

$a_{14} = a_8 + (14 - 8)d$

$a_{14} = a_8 + 6d$

$157 = 85 + 6d$

$72 = 6d$

$12 = d$

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Step 2 Find a_1 .

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

$85 = a_1 + (8 - 1)(12)$

$85 = a_1 + 84$

$1 = a_1$

$a_5 = 1 + (4) \cdot 12$

$1 + 48$

$a_5 = 49$

Step 3 Evaluate to find a_5 .

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

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

$a_5 = 1 + (5 - 1)(12)$

$= 49$

The 5th term is 49.

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Find the 6th term of the arithmetic sequence with $a_9 = 64$ and $a_{12} = 88$.

STEPS:

1. Find d.

2. Find a_1

3. Find a_6

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

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Assignment:

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problems: ~~2-16~~, ~~52-55~~

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

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