

Topic 3.1 - Day 2 - Arithmetic Sequences

Definition of an Arithmetic Sequence

An **arithmetic sequence** is a sequence in which each term after the first differs from the preceding term by a constant amount. The difference between consecutive terms is called the **common difference** of the sequence.

The common difference, d , is found by subtracting any term from the term that directly follows it. In the following examples, the common difference is found by subtracting the first term from the second term, $a_2 - a_1$.

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1 - 33 odds, 60

Arithmetic Sequence

142, 146, 150, 154, 158, ...

-5, -2, 1, 4, 7, ...

8, 3, -2, -7, -12, ...

Common Difference

$$d = 146 - 142 = 4$$

$$d = -2 - (-5) = -2 + 5 = 3$$

$$d = 3 - 8 = -5$$

If the first term of an arithmetic sequence is a_1 , each term after the first is obtained by adding d , the common difference, to the previous term. This can be expressed recursively as follows:

Recursive Formula:

$$a_n = a_{n-1} + d.$$

Add d to the term in any position to get the next term.

EXAMPLE 1 Writing the Terms of an Arithmetic Sequence

Write the first six terms of the arithmetic sequence in which $a_1 = 6$ and

$$a_n = a_{n-1} - 2.$$

d

6, 4, 2, 0, -2, -4, ...
 a_1

Check Point 1 Write the first six terms of the arithmetic sequence in which $a_1 = 100$ and $a_n = a_{n-1} - 30$.

d

100, 70, 40, 10, -20, -50, ...
 a_1

General Term of an Arithmetic Sequence

The n th term (the general term) of an arithmetic sequence with first term a_1 and common difference d is

Explicit Formula:

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

EXAMPLE 2 Using the Formula for the General Term of an Arithmetic Sequence

$a_8 = ?$

$a_1 = 4$

Find the eighth term of the arithmetic sequence whose first term is 4 and whose common difference is -7 . $d = -7$

$$a_8 = 4 + (8 - 1)(-7) = \boxed{a_8 = -45}$$

Check Point 2 Find a_{50} when $a_1 = 6$ and $d = 4$.

$$a_{50} = 6 + (50 - 1)(4)$$

$$\boxed{a_{50} = 202}$$

Example 3: Write a formula (explicit) for the general term (n th term) of the arithmetic sequence. Then use the formula to find a_{20} .

a.) 5, 11, 17, 23, $d = 6$

$a_1 = 5$

$$a_n = 5 + (n - 1)(6)$$

$$a_n = 5 + 6n - 6$$

$$\boxed{a_n = 6n - 1}$$

$$a_{20} = 6(20) - 1 = \boxed{119}$$

b.) $a_n = a_{n-1} - 7$, $a_1 = 40$

recursive formula

$d = -7$

$$a_n = 40 + (n - 1)(-7)$$

$$a_n = 40 - 7n + 7$$

$$\boxed{a_n = -7n + 47}$$

$$a_{20} = -7(20) + 47 = \boxed{-93}$$

Answer Key HW - Day 2**Check your answers.... Questions???**

- 1.) 200, 220, 240, 260, 280, 300
 3.) -7, -3, 1, 5, 9, 13
 5.) 300, 210, 120, 30, -60, -150
 7.) $5/2$, 2, $3/2$, 1, $1/2$, 0
 9.) -9, -3, 3, 9, 15, 21
 11.) 30, 20, 10, 0, -10, -20
 13.) 1.6, 1.2, 0.8, 0.4, 0, -0.4
 15.) 33
 17.) 252



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#'s: 1 - 33 odds, 60

- 19.) 955
 21.) -142
 23.) $4n-3$; 77
 25.) $-4n+11$; -69
 27.) $2n+7$; 47
 29.) $-4n-16$; -96
 31.) $3n+1$; 61
 33.) $-10n+40$; -160
 60.) $2n+1$

