

Arithmetic and Geometric Sequences and Series

A **sequence** is a set of numbers, called **terms**, arranged in some particular order.

An **arithmetic sequence** is a sequence with the **difference** between two consecutive terms constant. The difference is called the **common difference**.

A **geometric sequence** is a sequence with the **ratio** between two consecutive terms constant. The ratio is called the **common ratio**.

A **series** is the sum of the terms of a sequence.

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What type of sequence is each of the following?

- 1) 3, 8, 13, 18, 23...
- 2) 1, 2, 4, 8, 16...
- 3) 24, 12, 6, 3, 3/2, 3/4...
- 4) 55, 51, 47, 43, 39, 35...
- 5) 2, 5, 10, 17...
- 6) 1, 4, 9, 16, 25, 36...

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Notations:

$a_n$  is the  $n^{\text{th}}$  term of the sequence  
 $a_1$  is the first term of the sequence  
 $s_n$  is the sum of the sequence  
 $d$  is the common difference

Find the first five terms of the following sequences...

- a)  $a_n = 3 + 2n$
- b)  $a_n = 2^n$
- c)  $a_n = (-1)^n$
- d)  $a_1 = 3 \quad a_n = a_{n-1} + 2$
- e)  $a_1 = -3 \quad a_n = 2 a_{n-1}$




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Arithmetic Sequences

Formula: The  $n^{\text{th}}$  term of an arithmetic sequence

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

Example 1:  
 Find the 7th term of an AS whose first term is 3 and whose common difference is -6.

$a_1 =$         $d =$         $n =$  

$a_n = a_1 + (n-1) d$       Can you check your answer?

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**Example 2**

What is the 20th term?

-9, -7, -5, -3

**Example 3**

Find  $a_{13}$  and  $a_n$  for -3, 1, 5, 9

**Example 4**

Find  $a_8$  and  $a_n$  for the following

- a)  $a_1 = 5 \quad d = 2$
- b)  $a_1 = -3 \quad d = 4$

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