

1.1 Arithmetic Sequences

Arithmetic Sequence is a sequence in which the difference between consecutive terms is constant.

In the sequence: 4, 7, 10, 13, 16, 19, ...

The first term is represented by: $t_1 = 4$

The common difference is represented by: d ; $d = t_2 - t_1$
It can either be positive or negative.
 $d = +3$

The formula that allows you to find any term in the sequence is called:

THE GENERAL TERM

$$t_n = t_1 + (n-1)d$$

Where: t_1 is the first term of the sequence.

Where: n is the number of terms in the sequence.

Where: d is the common difference between the terms.

Where: t_n is the value of the n^{th} term OR is the **General Term of the sequence**.

Example 1: Find the value of the 17th term for the following arithmetic sequence: 4, 7, 10, 13, 16, 19, ...

$$t_1 = 4$$

$$d = 3$$

$$n = 17$$

$$t_n = t_1 + (n-1)d$$

$$t_{17} = 4 + (17-1)(3)$$

$$t_{17} = 4 + (16)(3)$$

$$t_{17} = 4 + 48$$

$$t_{17} = 52$$

Example 2: Given the following arithmetic sequence: -3, 2, 7, 12, ...

a) Determine t_{20} (the 20th term)

$$\begin{aligned} t_n &= t_1 + (n-1)d \\ t_{20} &= -3 + (20-1)(5) \\ &= -3 + (19)(5) \\ &= -3 + 95 \end{aligned}$$

$$t_{20} = 92$$

b) Which term has a value of 212?

$$\begin{aligned} t_n &= t_1 + (n-1)d \\ 212 &= -3 + (n-1)(5) \\ 212 &= -3 + 5n - 5 \\ 212 &= -8 + 5n \\ +8 & \quad +8 \\ \frac{220}{5} &= \frac{5n}{5} \end{aligned}$$

$$n = 44$$

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Example 3: Two terms in an arithmetic sequence are: $t_3 = 4$ and $t_8 = 34$. What is:

a) d

$$_, _, \frac{4}{t_3}, _, _, _, _, \frac{34}{t_8}$$

$n=3$

when $n=3$: $t_n = t_1 + (n-1)d$

$$t_3 = t_1 + (3-1)d$$

$$4 = t_1 + 2d \quad \text{equation 1}$$

$n=8$: $t_8 = t_1 + (8-1)d$

$$34 = t_1 + 7d \quad \text{equation 2}$$

Use substitution or elimination to solve for d (and t_1)

$$\begin{array}{r} 34 = t_1 + 7d \\ - (4 = t_1 + 2d) \\ \hline \end{array}$$

$$\frac{30}{5} = \frac{5d}{5}$$

$$6 = d \quad \text{common difference}$$

b) t_1 use equation 1 or 2 from part (a) to solve for t_1

$$4 = t_1 + 2d$$

$$4 = t_1 + 2(6)$$

$$4 = t_1 + 12$$

$$\begin{array}{r} -12 \\ -12 \end{array}$$

$$-8 = t_1$$

c) t_n (General Term)

→ your answer will have "n" in it since we aren't finding an exact term value.

$$t_n = t_1 + (n-1)d$$

$$t_n = -8 + (n-1)(6)$$

$$t_n = -8 + 6n - 6$$

$$t_n = -14 + 6n$$

or

$$t_n = 6n - 14$$

Practice: p.16 #1ad, 2, 3, 4, 5ab, 6a, 9, 10, 16

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