

1.1 Arithmetic Sequences

An arithmetic sequence is a sequence of terms where the difference between each consecutive terms is constant (the same).

2, 7, 12, 17, ... \leftarrow arithmetic 2, 4, 8, 17, ... \leftarrow not arithmetic

- A finite sequence has a finite number of terms
- A infinite sequence has an infinite number of terms.

We will use the following variables to assist in arithmetic sequence calculations:

t_1 - the first term of a sequence

Ex: 4, 7, 10, 13, 16 $\rightarrow t_1 = \underline{4}$

n - the number (total) of terms

Ex: 8, 4, 0, -4 $\rightarrow n = \underline{4}$

d - the common difference between consecutive terms

Ex: 2, 5, 8, 11 $\rightarrow d = \underline{3}$ $d = t_2 - t_1 = 3$ $d = t_3 - t_2 = 3$ $d = t_{n+1} - t_n = 3$

$\begin{matrix} \uparrow & \uparrow & \uparrow & \uparrow \\ t_1 & t_2 & t_3 & t_4 \end{matrix}$

t_n - the general term or the n^{th} term

Consider the sequence 3, 7, 11, 15, ... $d = \underline{4}$

$$t_1 = 3$$

$$t_2 = 3 + 4 = 7$$

$$t_3 = 3 + 4 + 4 = 11$$

$$t_4 = 3 + 4 + 4 + 4 = 15$$

$$t_n = t_1 + (4 + 4 + 4 + 4 \dots)$$

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

The general term of an arithmetic sequence is:

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

Example #4: A furnace technician charges \$65 for making a house call plus \$42 per hour or portion of an hour.

a) Generate the possible charges for the first 4 hours of time.

| # of hours worked | 1 | 2 | 3 | 4 |
|-------------------|----------------------|-------------------------|-------------------------|-------------------------|
| charge | $65 + 42$ $= 107$ | $65 + 2(42)$ $= 149$ | $65 + 3(42)$ $= 191$ | $65 + 4(42)$ $= 233$ |
| | | ✓ 42 | ✓ 42 | ✓ 42 |

b) What is the charge for 10 hours of time?

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

$$t_1 = 107$$

$$t_{10} = 107 + (10-1)42$$

$$d = 42$$

$$t_{10} = 107 + (9)(42)$$

$$n = 10$$

$$t_{10} = \$485$$

$$t_{10} = ?$$