# ARITHMETIC PROGRESSION (A.P.)

## Sequence & series

2, 4, 16, 256, ----
5, 10, 15, 20, ----
2, 4, 6, 8, -----

5 + 10 + 15 + 20 + -----

− 5 − 10 − 15 − 20 − ----

General A.P. is

$$a,\ a+d,\ a+2d,\ \ldots$$

where, $a$ = first term

& $d$ = common difference

2, 4, 6, 8, -------

Here $a = 2$, $d = 2$

$$d = t_2 - t_1 = t_3 - t_2 = \ldots$$

## General term of A.P. :-

$$\boxed{t_n = a + (n-1)d}$$

$n^{th}$ term

last term $\boxed{l = a + (n-1)d}$

Q. Find the $n^{th}$ term & the $20^{th}$ term of the sequence

$$9, \; 5, \; 1, \; -3, \; \ldots\ldots$$

$$a = 9, \quad d = 5 - 9 = -4$$

$$n^{th} \text{ term} = t_n = a + (n-1)d = 9 + (n-1)(-4)$$
$$= 9 - 4n + 4$$
$$n^{th} \text{ term} = \boxed{13 - 4n}$$

$$\therefore 20^{th} \text{ term} = 13 - 4 \times 20 = 13 - 80 = \boxed{-67}$$

Q. Find the A.P. whose second term is 12 & $7^{th}$ term exceeds the $4^{th}$ by 15.

$$a + d = 12 \longrightarrow a = 7$$

$$t_7 = t_4 + 15$$
$$\cancel{a} + 6d = \cancel{a} + 3d + 15$$
$$3d = 15 \Rightarrow d = 5$$

Hence, A.P. is $7, \; 12, \; 17, \; \ldots\ldots$

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

$$2^{nd} \text{ term} = a + d$$
$$3^{rd} \text{ term} = a + 2d$$
$$4^{th} \text{ term} = a + 3d$$

19th term = $a + 18d$

Musheer term = $a + (\text{Musheer} - 1)d$

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Q Is 205 a term of the sequence

8, 12, 16, 20, ---- ?

Let 205 is the $n^{th}$ term

Given $a = 8$, $d = 12 - 8 = 4$

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

$$205 = 8 + (n-1)4$$

$$205 - 8 = (n-1)4$$

$$197 = 4n - 4$$

$$197 + 4 = 4n$$

$$n = \frac{201}{4} = 50\frac{1}{4}$$

Since $n$ is not a natural number

$\therefore$ 205 is not a term of the given sequence.

Q. Find the $12^{th}$ term from the end in the A.P. 13, 18, 23, ------ 153, 158

Writing the giving sequence in reverse order

158, 153, ---- 23, 18, 13

$a = 158$, $\quad d = 153 - 158 = -5$, $\quad n = 12$

$\therefore$ $12^{th}$ term $= t_{12} = a + (12-1)d$

$= 158 + 11(-5)$

$= 158 - 55 = \boxed{103}$

Q Find the number of all natural numbers between 20 & 80, which are divisible by 3.

The natural numbers in between 20 & 80, divisible by 3 are

21, 24, 27, ------ 78

Since it is an A.P.

$\therefore$ $a = 21$, $d = 24 - 21 = 3$, $n = ?$

$l = 78$

$$l = a + (n-1)d$$

$$78 = 21 + (n-1)(3)$$

$$78 - 21 = (n-1)3$$

$$\frac{57}{3} = n - 1$$

$$19 + 1 = n$$

$$n = 20$$

$\therefore$ Required number of terms $= \boxed{20}$

Q. Which term of the A.P. 4, 11, 18, 25, ...... is 42 more than its 25th term?

$d = 11 - 4 = 7$

Let $n^{th}$ term of A.P. is the required term

Given $t_n = 42 + t_{25}$

$$\cancel{a} + (n-1)d = 42 + \cancel{a} + 24d$$

$$(n-1)7 = 42 + 24 \times 7$$

$$= 7(6 + 24)$$

$$(n-1)\cancel{7} = \cancel{7} \times 30$$

$$n = 31$$

$\therefore$ Required term $= \boxed{31^{st} \text{ term}}$

Q. How many whole numbers, each divisible by 7, lie between 200 & 500?

203, 210, 217, ...... 497

$a = 203$, $d = 210 - 203 = 7$

$l = 497$

$$7 \overline{)200} (28$$
$$14$$
$$60$$
$$56$$
$$4$$

$$7 \overline{)500} (71$$
$$49$$
$$10$$
$$7$$
$$3$$

$7 \times 28 + 4$

$$l = a + (n-1)d$$

$$497 = 203 + (n-1)7$$

$$497 - 203 = (n-1)7$$

$$294 = (n-1)7$$

$$\frac{294}{7} = n-1$$

$$42+1 = n$$

$$n = 43$$

Hence there are 43 numbers in between 200 & 500.

H.W.

Ex. 10A → 1, 2, 4, 5, 8, 10, 11, 12, 14, 16, 18, 20

10B → 2, 3, 7, 8, 12, 13, 14, 16