Class - Xth **Arithmetic Progression (A.P)** [Sonu kr. Gupta]

→ A progression in which the difference between it's consecutive terms is constant or common, Called AP Example ↓ by Sonu sir

(1) 1, 2, 3, 4, 5, ... → Common diff = d = 1

(2) 2, 4, 6, 8, 10, ... → Common diff = d = 2

(3) 1, 3, 5, 7, 9, 11, ... → Common diff = d = 2

(4) $-1, -5, -9, -13, \ldots\ldots$ → Common diff = d = −4

(5) $\frac{1}{2}, 1, \frac{3}{2}, 2, \ldots\ldots$ → Common diff = $d = \frac{1}{2}$

* How to check the given terms are in AP or not in AP?

→ For terms → $t_1, t_2, t_3, t_4, t_5, \ldots\ldots$

if $t_2 - t_1 = t_3 - t_2 = t_4 - t_3 =$ constant

then $t_1, t_2, t_3, t_4, t_5, \ldots\ldots$ are in AP

* How to Write an AP ? by Sonu sir

→ If For an AP → First term = a

Common difference = d

then $AP = a, (a+d), (a+2d), (a+3d), \ldots$ etc.

* General term of An AP → [n^{th} term of an AP = last term

If For an AP → 1st term = a

C.d = d

How many terms = number of term = n →

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

Here n^{th} term $= t_n$ = also called last term $= l$

$$t_n = l$$

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

→ When last term given then Apply this Formula

↳ If Apply when last term given and we have to find no. of terms (n)

→ $$n - 1 \quad \frac{l-a}{d}$$

by Sonu sir

$$n = \frac{l-a}{d} + 1$$

→ To Find "n" (No. of terms)

$$n = \frac{l-a+d}{d}$$

Note → Write all this Formula from 1st Page and 2nd Page. See and write the Solved Example with Formula.

V.V.I

* For an AP → nth term from end or Last term 'l' → $a, (a+d), (a+2d), \ldots\ldots, d$

From end → 1st term = $a' = l$

common diff = $-(t_2 - t_1) = -d$

$t_n = l - (n-1)d$ → $t_n = l - (n-1)d$

Q. Is 2, 5/2, 3, 7/2 ... are in AP ?

Soln 2, $\frac{5}{2}$, 3, $\frac{7}{2}$, ...

Here $t_2 - t_1 = \frac{5}{2} - 2 = \frac{5-4}{2} = \frac{1}{2}$

$t_3 - t_2 = 3 - \frac{5}{2} = \frac{6-5}{2} = \frac{1}{2}$

$t_4 - t_3 = \frac{7}{2} - 3 = \frac{7-6}{2} = \frac{1}{2}$

$\therefore t_2 - t_1 = t_3 - t_2 = t_4 - t_3 = \ldots$ Constant $= \frac{1}{2}$

Yes. 2, $\frac{5}{2}$, 3, $\frac{7}{2}$, ... are in AP.

Q. Write First Four terms of the AP. if $a=4$ and $d=-3$.

Q Soln $\therefore a = 4$, $d = -3$

$\therefore$ AP $\rightarrow$ $a, (a+d), (a+2d), (a+3d), \ldots$

$= 4, (4-3), \{4+2(-3)\}, \{4+3\times(-3)\}, \ldots$

$= 4, 1, (4-6), (4-9), \ldots$

$= 4, 1, -2, -5, \ldots$

Q. Find the 8th term of the AP. Whose 1st term is 7 and C.d is 3.

Q (3) From Question $\rightarrow$ $a = 7$, $C.d = d = 3$

8th term $= t_8 = a + (8-1)d$

$= 7 + 7\times 3 = 7 + 21$

$t_8 = 28$

Note. Re-solve All Solved Examples ↑ may be ask in Exam.

Q. Find the 20th term from the Last term of AP 3, 8, 13, ... 253

Soln: AP → 3, 8, 13, ..., 253 ①

Here, $a = 3$, | $c - d = d = t_2 - t_1$

$d = 8 - 3$

$d = 5$

Last term = $l = 253$

∵ From end (last) term, t_n Formula is

∴ $t_n = l - (n-1)d$

A/c 20th term → $n = 20$ — Jonny sir

∴ $t_{20} = 253 - (20-1) \times 5$

$= 253 - 19 \times 5$ — Jonny sir

$t_{20} = 253 - 95$

$t_{20} = 158$ Ans

Q. Find the 12th term from the end of the AP.
-2, -4, -6, ... -100.

Q Soln: From Question: $a = -2$, $l = -100$, $n = 12$

$d = t_2 - t_1 = -4 - (-2)$

$d = -4 + 2 \Rightarrow d = -2$ — Jonny sir

∴ From end → $t_n = l - (n-1)d$

$t_{12} = -100 - (12-1) \times (-2)$

$t_{12} = -100 - 11 \times (-2) = -100 + 22$

$t_{12} = -78$

$t_{12} = -78$

Sol^n (i) If For an AP it's 4th term is 13 and 10th term is 25 Find it's 17th term.

Let First term = a

common diff = d

A/Q 4th term = 13

$t_4 = 13$

$a + (4-1)d = 13$

$\boxed{a + 3d = 13}$ — (i)

And 10th term = 25

$t_{10} = 25$

$a + (10-1)d = 25$

$\boxed{a + 9d = 25}$ — (ii)

Now from eq^n (ii) and (i)

$$\begin{array}{r} a + 9d = 25 \\ -\quad a + 3d = 13 \\ \hline 6d = 12 \end{array}$$

$d = \frac{12}{6}$

$\boxed{d = 2}$

Jony Sir

→ from eq^n (i)

$a + 3d = 13$

$a + 3 \times 2 = 13$

$a + 6 = 13$

$a = 13 - 6$

$\boxed{a = 7}$

(ii) 17th term $= t_{17} = a + (17-1)d$

$= 7 + 16 \times 2$

$= 7 + 32$

$\boxed{t_{17} = 39}$

Q Find the 31st term of an AP whose 11th term is 38 and 6th term is 73. (by sonu sir)

Soln Let 1st term = a

Common diff. = C.d = d

A/Q 11th term = 38

$t_{11} = 38$

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

$\therefore$ $a + (11-1)d = 38$

$\boxed{a + 10d = 38}$ — (I)

A/Q 6th term = 73

$t_6 = 73$

$a + (6-1)d = 73$

$\boxed{a + 5d = 73}$ — (II)

Now From eqn (I) and (II)

$a + 10d = 38$

$-a \pm 5d = \pm 73$

$5d = -35$

$d = \frac{-35}{5}$

$\boxed{d = -7}$

From eqn (I)

$a + 10d = 38$

$a + 10 \times (-7) = 38$

$a - 70 = 38$

$a = 38 + 70$

$\boxed{a = 108}$ — (III)

Now A/Q 31st term is

$t_{31} = a + (31-1)d$

$t_{31} = 108 + 30 \times (-7)$

$t_{31} = 108 - 210$

$\boxed{t_{31} = -102}$

Sonu sir

(10) (AP)

(1) How many terms are there in the AP →
7, 11, 15, ... 139?

Soln AP → 7, 11, 15, ... 139

Here **First term = a = 7**

c.d = d = $t_2 - t_1$ = 11 − 7

d = 4

last term = 139

l = 139

Let nth term = t_n = l

$\therefore a + (n-1)d = 139$

$7 + (n-1) \times 4 = 139$

$\Rightarrow (n-1) \times 4 = 139 - 7$

$\Rightarrow (n-1) \times 4 = 132$

$\Rightarrow n - 1 = \frac{132}{4} = 33$

$\Rightarrow n = 33 + 1$

n = 34

Jaysir

V.V.I

Property → **If three terms t_1, t_2, t_3 are in given AP. then Use →**

By. Jay Sir

$$t_2 - t_1 = t_3 - t_2$$

$$2 \cdot t_2 = t_1 + t_3$$

It is use to Find Un-known element

Q① Find the value of x for which $(5x+2)$, $(4x-1)$ and $(x+2)$ are in AP.

Soln A/Q t_1 = First term = $(5x+2)$

t_2 = 2nd term = $(4x-1)$

t_3 = 3rd term = $(x+2)$

$\because$ t_1, t_2, t_3 are in AP.

$\therefore$ $\boxed{2t_2 = t_1 + t_3}$

$\rightarrow 2 \times (4x-1) = 5x+2 + x+2$

$\Rightarrow 8x - 2 = 6x + 4$

$\Rightarrow 8x - 6x = 4 + 2$

$\Rightarrow 2x = 6$

$\rightarrow x = \frac{6}{2}$

$\boxed{x = 3}$

Jony sir

Note

Re-solve all this examples

Q If the n^{th} term of an AP. is $(4n-10)$, Find it's ① First term ② C.d. ③ 16th term.

Soln A/Q $\because$ nth term = $4n-10$

$\therefore$ $\boxed{t_n = (4n-10)}$

Jony sir

① For 1st term $\Rightarrow$ put, $\boxed{n=1} \rightarrow t_1 = 4 \times 1 - 10 = 4 - 10$

$\boxed{t_1 = -6}$

② For 2nd term $\rightarrow$ put $\rightarrow \boxed{n=2} \rightarrow t_2 = 4 \times 2 - 10 = 8 - 10 = -2$

$\boxed{t_2 = -2}$

① $\therefore$ $\boxed{\text{First term} = t_1 = a = -6}$

② C.d = $d = t_2 - t_1 = -2 - (-6)$

$= -2 + 6 = 4$

Q 6, 10, 14, 18, ... 174? Find the no. of terms in this AP.

Soln $a = 6$, c.d $= d = d_2 - d_1$

$d = 10 - 6$

$d = 4$

Let Last term $= l = t_n = 174$

$\therefore a + (n-1)d = 174$ $\left[\because t_n = a + (n-1)d\right]$

$6 + (n-1) \times 4 = 174$

$6 + 4n - 4 = 174$

$2 + 4n = 174$

$4n = 174 - 2$

$4n = 172$

$n = \frac{172}{4}$

$n = 43$

$n = 43$ terms

2nd Method

$\therefore n = \frac{l - a + d}{d}$

$n = \frac{205 - 7 + 6}{6}$

$= \frac{205 - 1}{6} = \frac{204}{6}$

$n = 34$

Formula Method

$\therefore n = \frac{l - a + d}{d} = \frac{205 - 7 + 6}{6}$

$n = \frac{204}{6} \Rightarrow n = 34$

$\therefore$ no. of terms $= n = 34$

Q.N. ① Write First Four terms of the AP.
If $a = 4$, $d = -3$

Solve these Questions

Q.N ② Is $2, \frac{5}{2}, 3, \frac{7}{2}, \ldots$ are in AP. ?

Q.N ③ Find the 8th term of the AP.
Whose First term is 7 and common diff. is 3.

Q.N ④ How many terms in AP $7, 13, 19, \ldots 205$

Q.N ⑤ Find the 20th term from the last term of the AP → $3, 8, 13, \ldots 253$

Q.N ⑥ Find the 12th term from the end of the AP $-2, -4, -6, \ldots, -100$. Sonu sir

Q.N ⑦ Find the 31st term of an AP Whose 11th term is 38 and 6th term is 73.

Q ⑧ Which term of the AP $5, 9, 13, 17, \ldots$ is 81 ? [Ans. 20]

Q ⑨ The 6th term of an AP is -10 and 10th term is -26 Find the 15th term of the AP [Ans. -46]

Q ⑩ If the 8th term of an AP is 31 and 15th term is 16 more than the 11th term. Find AP. [Ans. 3, 7, 11, 15, ...

Q ⑪ Find the value of x For which $(5x+2)$, $(4x-1)$ and $(x+2)$ are in AP [Ans $x = 3$] by Sonu sir

Q ⑫ The 4th and 10th terms of an AP are 13 and 25 respectively. Find it's 17th term [Ans. 39].