ARITHMETIC PROGRESSION

SESSION - 1

Construct an A.P with first term 6, and common difference 5, write upto first 4 terms.

$a = 6$

$d = 5$

AP = 6, 11, 16, 21

E1.

AP: $\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{3}{2} \ldots$

$a = \frac{3}{2}$

$d = ?$

$d = \frac{1}{2} - \frac{3}{2} \quad (a_2 - a_1)$

$d = \frac{1-3}{2}$

$d = -\frac{2}{2}$

$d = -1$

E2 (i) 4, 10, 16, 22 ... (ii) 1, -1, -3, -5 ...

(iii) -2, 2, -2, 2 .... (iv) 1, 1, 1, 2, 2, 2

Check whether it is an AP.

Ans, (i) $d = a_2 - a_1 \Rightarrow 10 - 4 \Rightarrow 6 = a_3 - a_2 = 16 - 10 = 6$ ($\because$ it is AP)

(ii) $d = -2$ ($\because$ it is AP)

(iii) d is not constant ($\because$ not an AP)

(iv) d is not constant ($\because$ not an AP).

PYQ.

$2p-1$, $3p+1$, 11 are in AP

Find value of p

$a_2 - a_1 = d \rightarrow 3p+1-(2p-1)$

$a_3 - a_2 = d \rightarrow 3p+1-2p+1$

$p+2 \quad \ldots (1)$

$p+2 = 10-3p \rightarrow 11-(3p+1)$

$p+3 = 10-2 \quad 11-3p-1$

$4p = 8 \quad 10-3p \ldots (2)$

$p = 2$

5, 11, 17, 22 Find n^{th} term

$a = 5$, $d = 11-5 \Rightarrow 6$

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

$a_n = 5+(n-1)6$

$a_n = 5+6n-6$

$a_n = 6n-1$

Ex. 2, 7, 12 $\Rightarrow$ n^{th} term ?

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

$a_n = 2+(n-1)5$

$a_n = 2+5n-5$

$a_n = 5n-3$

Eg: $21, 18, 15, \ldots -81$

Find nth term

$$a_n = 24 + (n-1)3$$
$$= 21 - 3n + 3$$
$$= 24 - 3n$$

Substituting:

$$24 - 3n = -81$$
$$-3n = -81 - 24$$
$$-3n = -105$$
$$n = \frac{-105}{-3}$$
$$n = 35$$

Eg.

$3^{rd} = a_3 = 5$
$7^{th} = a_7 = 9$
} Find a & d.

$$a_n = a + (n-1)d$$
$$a_3 = a + 2d = 5$$
$$a_7 = a + 6d = 9$$
$$4y = 4$$
$$y = 1$$

$$x + 2(1) = 5$$
$$\Rightarrow x = 5 - 2 = 3$$
$$x = 3$$

$\therefore a = 3, \; d = 1$

AP = 3, 4, 5, 6, 7, 8, ...

EG:

$n = 1 \rightarrow 2$
$n = 2 \rightarrow 4$
$n = 3 \rightarrow 6$
} n = int

5, 11, 17, 23 ....

$d = 6$

Find which term = 301

$5 + (n-1)6 = 301$
$5 + (n-1)6 = 301$
$6(n-1) = 301 - 5$
$6(n-1) = 296$
$(n-1) = \frac{296}{6}$
$(n-1) = 49.5$
$n - 1 = 49.5$
$n = 49.5 + 1$
$n = 50.5$

Because we cannot have 50.5 as a term

$n =$ ~~50~~ 51

E7. How many 2-digit numbers are divisible by 3:

10, 11, 12, ..., 99

12, 15, 18 ..., 99

$a + (n-1)d = 99$

$12 + 3(n-1) = 99$
$3(n-1) = 99 - 12$
$3(n-1) = 87$
$n - 1 = \frac{87}{3}^{29}$
$n = 29 + 1$
$n = 30$

SESSION : 2

E11:

8, 3, −2, ...

First 22 terms

$d = -5$

$a_{22} = a + 21d$

$= 8 + 21(-5)$

$= 8 + (-105)$

$= -97$

$S_n = n\left(\frac{a+l}{2}\right) \Rightarrow 22^{11}\left(\frac{8+(-97)}{2}\right)$

$= 11(-89)$

$S_n = -979$

E12:

Find 20th term $\Rightarrow a + 19d$

First 14 terms $\Rightarrow 1050 \Rightarrow \left[S_{14} = \frac{14(a+l)}{2}\right]$

First [redacted] terms $= 10 \Rightarrow (a = 10)$

$S_n = n\left[\frac{2a + (n-1)d}{2}\right]$

$S_{14} = 14\left\{\frac{2(10) + (13d)}{2}\right\}$

$1050 = 7(20 + 13d)$

$\frac{1050}{7} = 20 + 13d$

$150 = 20 + 13d$

$150 - 20 = 13d$

$\frac{130}{13} = d$

$d = 10$

$a_{20} = 10 + 19(10)$

$= 10 + 190$

$a_{20} = 200$

Ex13 =

24, 21, 18 ...

$n = ?$

$S_n = 78$

$S_n = \frac{n(2a + (n-1)d)}{2}$

$78 = \frac{n}{2}[2(24) + (n-1)(-3)]$

$78(2) = n(48 - 3n + 3)$

$156 = n(51 - 3n)$

$156 = 51n - 3n^2$

$3n^2 - 51n + 156 = 0$

$3x^2 - 51x + 156 = 0$ ⟶ divide by 3.

$x^2 - 17x + 52 = 0$

$(x - 4)(x - 13) = 0$

$x = 4, x = 13$

$\therefore n = 4$ and 13