CLASS – 10

MATHEMATICS

Chapter – 5

Arithmetic Progressions

Part – 12

EXERCISE 5.3 (Q.4 – 9)

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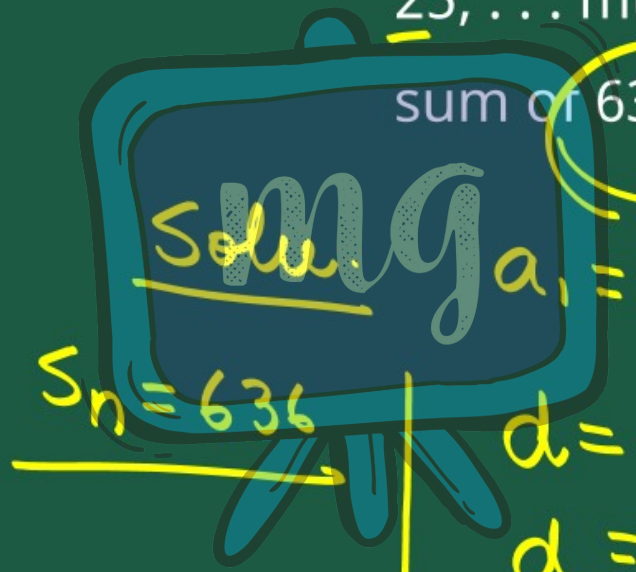
4. How many terms of the AP : 9, 17, 25, . . . must be taken to give a sum of 636 ?



$a_1 = 9, \quad a_2 = 17$

$d = a_2 - a_1$

$d = 17 - 9 = 8$

$\boxed{d = 8}$

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

$$636 = \frac{n}{2}\left[2 \times 9 + (n-1)\,8\right]$$

$$= \frac{n}{2}\left[2 \times 9 + (n-1)\,8\right]$$

$$636 = n\left[9 + 4n - 4\right]$$

$$= n\left[5 + 4n\right]$$

$$636 = 5n + 4n^2$$

$4n^2 + 5n - 636 = 0$

$4n^2 + 53n - 48n - 636 = 0$

$n[4n + 53] - 12[4n + 53] = 0$

$(4n + 53)(n - 12) = 0$

636×4

2 | 318

2 | 159

3 | 53

$12 \times 53 \times 4$

48×53

$4n + 53 = 0$

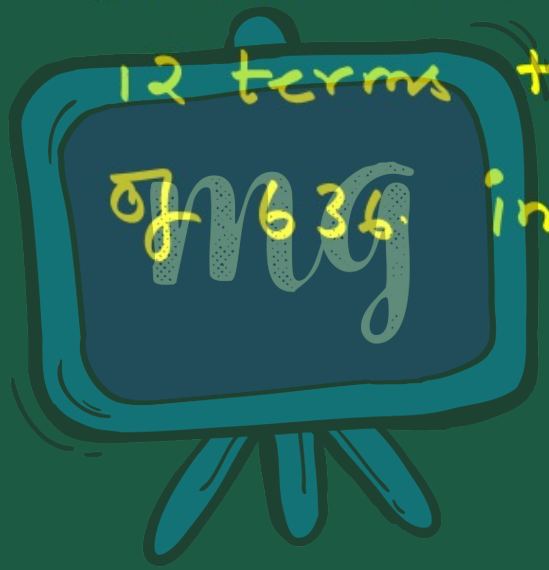
$n = -\frac{53}{4}$

Rejected

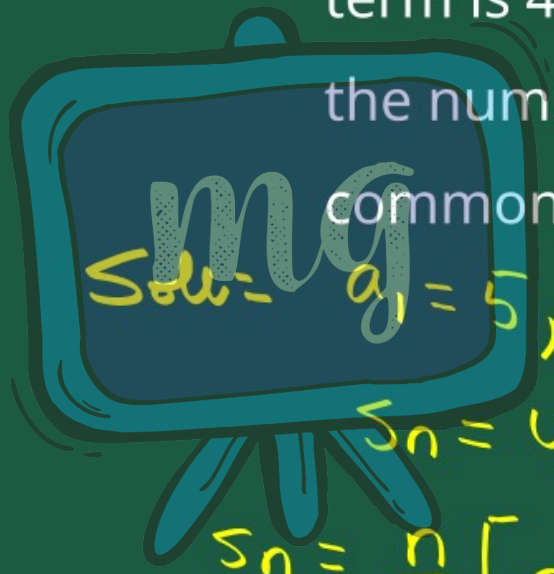
$n - 12 = 0$

$n = 12$

Hence there must be 12 terms to get a Sum of 636 in the given A.P.



5. The first term of an AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.



Sol:- $a_1 = 5$, $a_n = 45$.

$S_n = 400$

$S_n = \frac{n}{2}[a + l]$

$400 = \frac{n}{2}[5 + 45]$

$400 = \frac{n}{2}[50]$

$\frac{800}{50} = n$

$\therefore 16 = n$

$a_1 = 5$ | $n = 16$

$a_{16} = 45$

$a_{16} = a + 15d$ { $a_n = a + (n-1)d$ }

$45 = 5 + 15(d)$

$45 - 5 = 15d$

$40 = 15d$

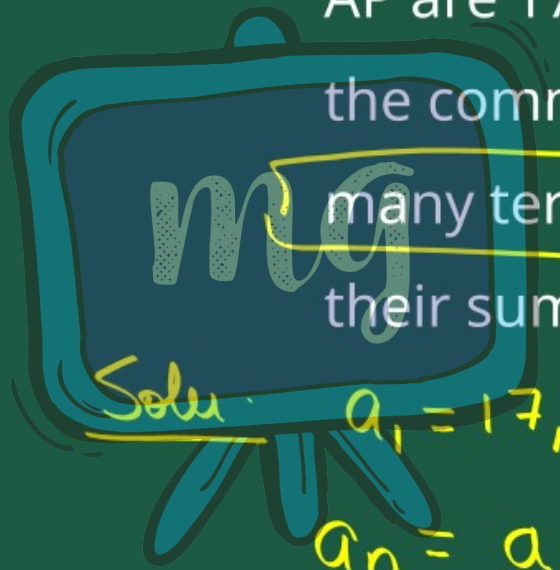
$\frac{8}{3} \frac{40}{15} = d$

$d = 8/3$

Here the common diff is $\frac{8}{3}$

and the No. of terms are 16.

6. The first and the last terms of an AP are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum?



Solu: $a_1 = 17$, $a_n = 350$ | $d = 9$

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

$350 = 17 + (n-1)9$

$$350 = 17(n-1)g$$

$$350 - 17 = (n-1)g$$

$$333 = (n-1)g$$

$$\frac{333}{g} = (n-1)$$

$$37 = (n-1)$$

$$37 + 1 = n$$

$$\boxed{38 = n}$$

$$S_n = \frac{n}{2}\left[a + l\right]$$

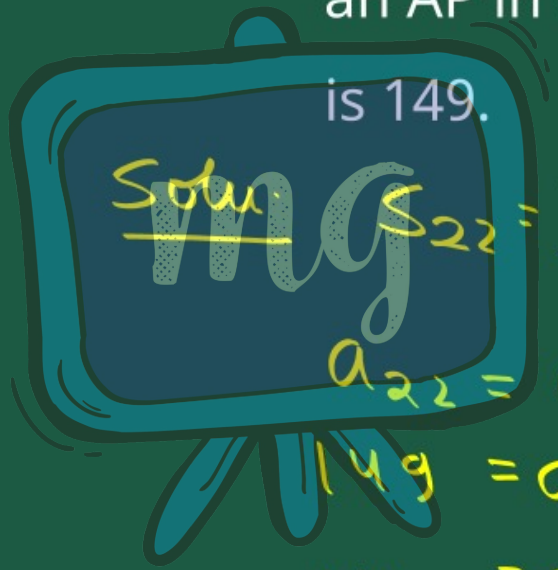
$$S_{38} = \frac{38}{2}\left[17 + 350\right]$$

$$S_{38} = 19\left[367\right]$$

$$S_{38} = 19 \times 367$$

$$S_{38} = 6973$$

7. Find the sum of first 22 terms of an AP in which d = 7 and 22nd term is 149.



Sol: $S_{22} = ?$ | $d = 7$, $a_{22} = 149$

$a_{22} = a + 21d$

$149 = a + 21(7)$

$149 = a + 147$

$149 - 147 = a$

$a = 2$

$$S_{22} = \frac{n}{2}[a+l]$$

$$= \frac{22}{2}[2+149]$$

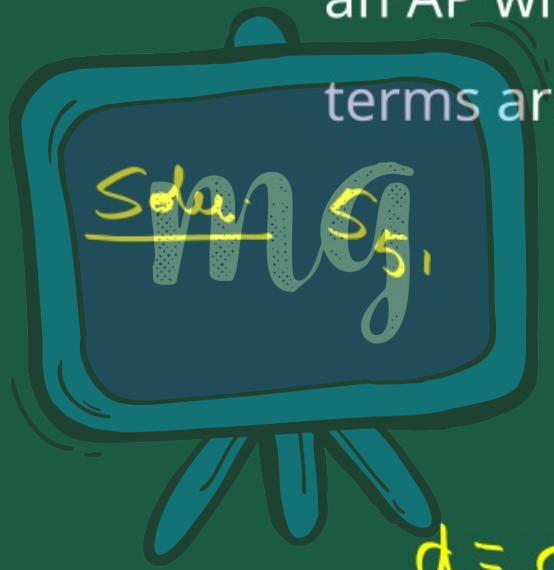
$$= 11 \times 151$$

$$1 \quad 5 \quad 1$$

$$1 \quad 5 \quad 6 \quad 1$$

$$S_{22} = 1661$$

8. Find the sum of first 51 terms of an AP whose second and third terms are 14 and 18 respectively.



Sol: S_{51}

$a_2 = 14$ | $a_3 = 18$

a_1, a_2, a_3 (d)

$d = a_3 - a_2$

$d = 18 - 14$

$d = 4$

$d = a_2 - a_1$

$4 = 14 - a_1$

$a_1 = 10$

$$a_{51} = a + 50d$$

$$= 10 + 50 \times 4$$

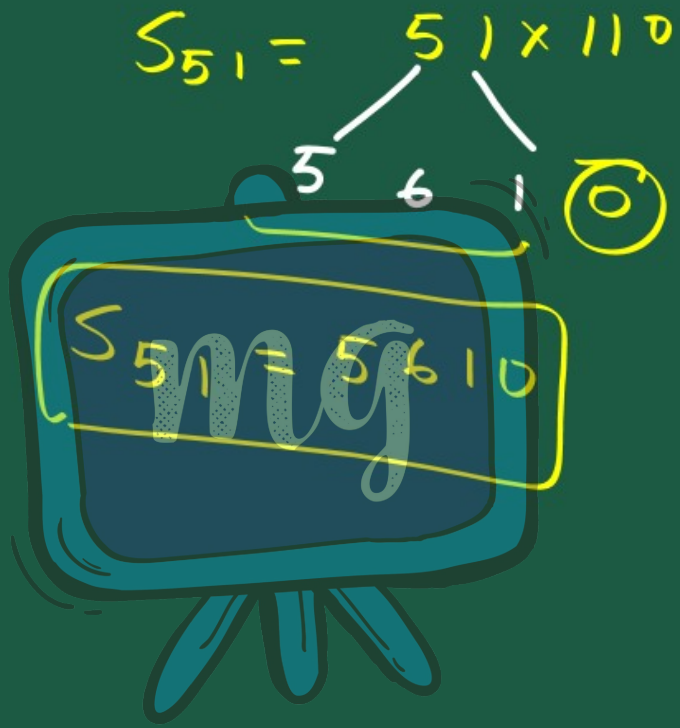
$$= 10 + 200$$

$$a_{51} = 210$$

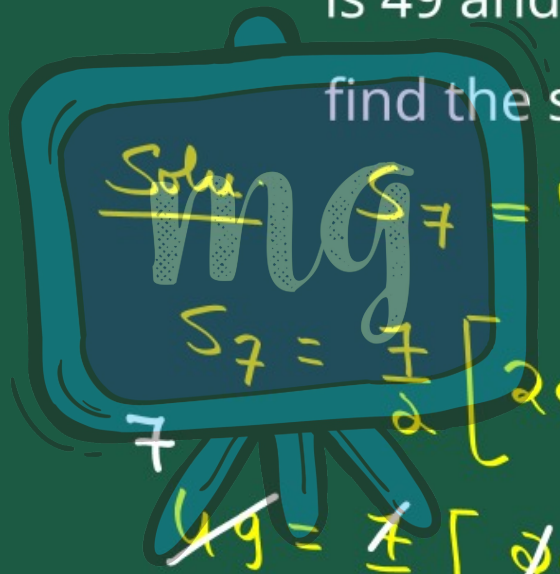
$$S_{51} = \frac{51}{2}\left[a + l\right]$$

$$= \frac{51}{2}\left[10 + 210\right]$$

$$= \frac{51}{\cancel{2}}\left[\overset{110}{\cancel{220}}\right]$$



9. If the sum of first 7 terms of an AP is 49 and that of 17 terms is 289, find the sum of first n terms.



Solu. $S_7 = 49 \mid S_{17} = 289$

$S_7 = \frac{7}{2}[2a+(7-1)d]$

$49 = \frac{7}{2}[2a+6d]$

$7 = a+3d$ — (1)

$S_{17} = 289$

$\frac{17}{2}[2a + (17-1)d] = 289$

$\frac{17}{2}[2a + 16d] = 289$

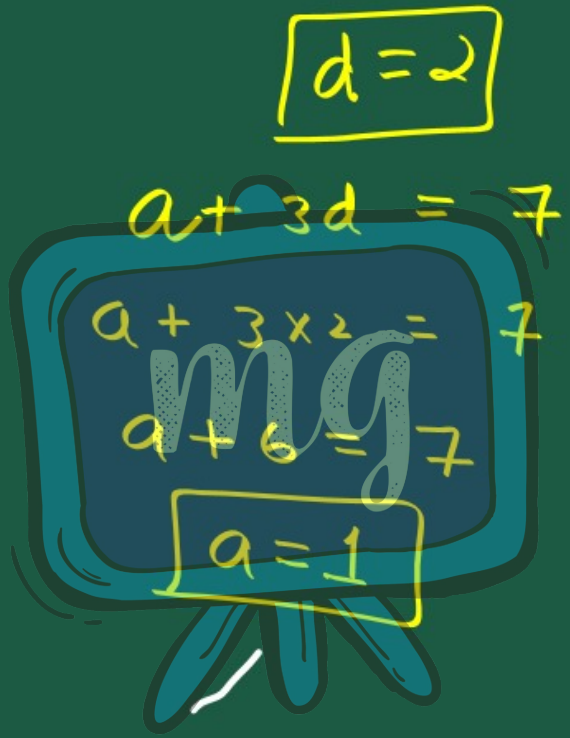
$a + 8d = 17$ — (2)

Eq (2) − Eq (1)

$a + 8d - (a + 3d) = 17 - 7$

$a + 8d - a - 3d = 10$

$5d = 10$



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

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

$$= n\left[1 + (n-1)\right]$$

$$= n\left[1 + n - 1\right]$$

$$S_n = n^2$$