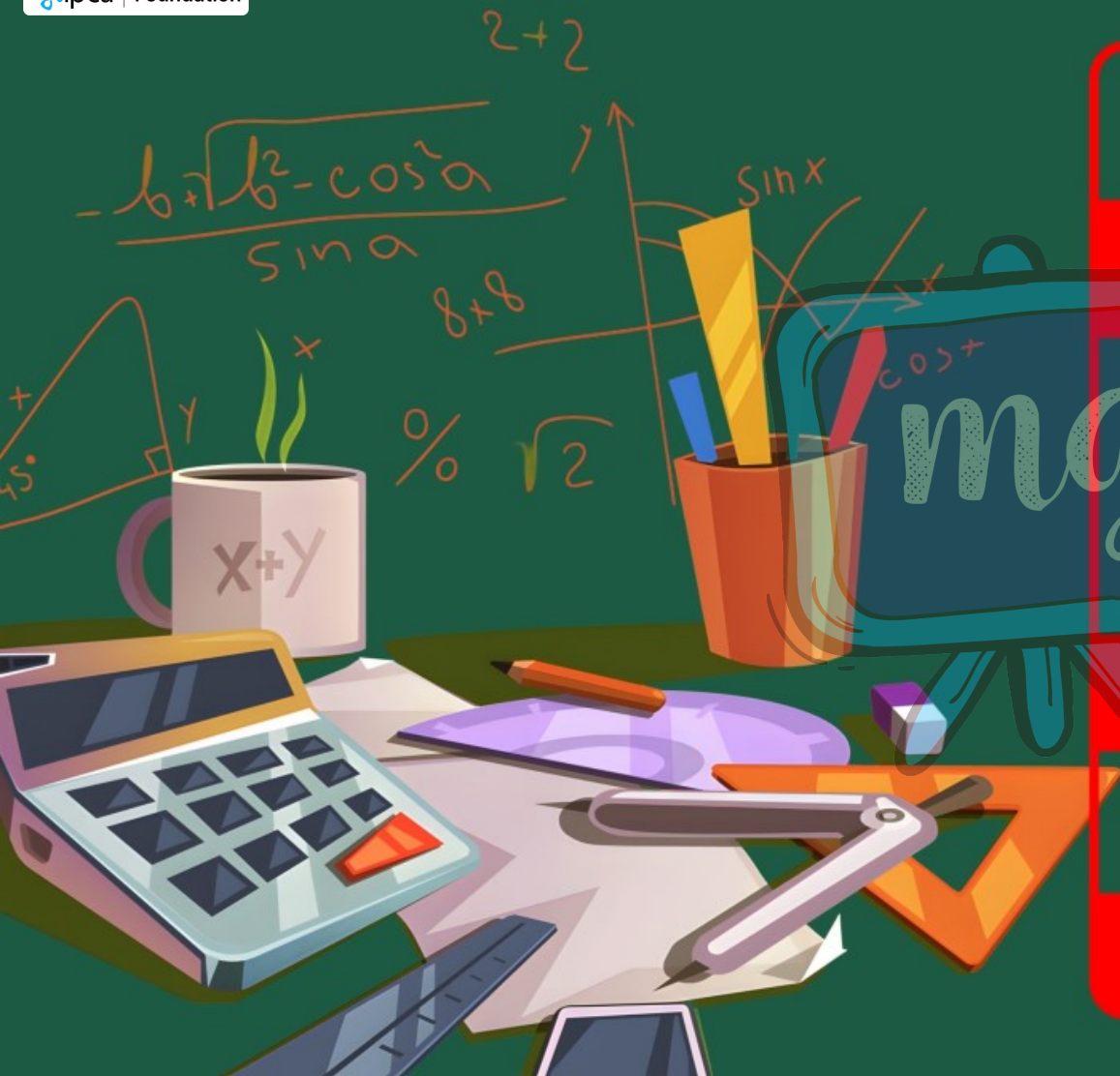
Under CSR Support by ipca | Foundation

missiongyan



CLASS – 10

MATHEMATICS

CH – 5
Arithmetic Progressions

CBSE Board

Previous Year Questions – 4

Shubham Tiwari

33. Find the sum :

$(-5) + (-8) + (-11) + \ldots + (-230)$.

(CBSE 2020)

Solu. $a = -5$

$d = -8 - (-5)$

$= -8 + 5$

$d = -3$

$a_n = -230$

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

$$-230 = -5 + (n-1)(-3)$$

$$-230 + 5 = (n-1)(-3)$$

$$-225 = (n-1)(-3)$$

$$+225 \quad\quad +225$$

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

$$75 = (n-1)$$

$$n = 75 + 1$$

$$\boxed{n = 76}$$

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

$$= \frac{76}{2}[-5 - 230]$$

$$= 38[-235]$$

$$= 38 \times -235$$

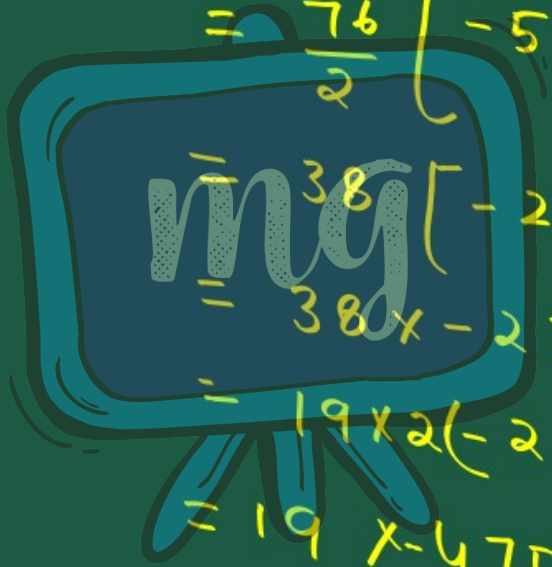
$$= 19 \times 2(-235)$$

$$= 19 \times -470$$

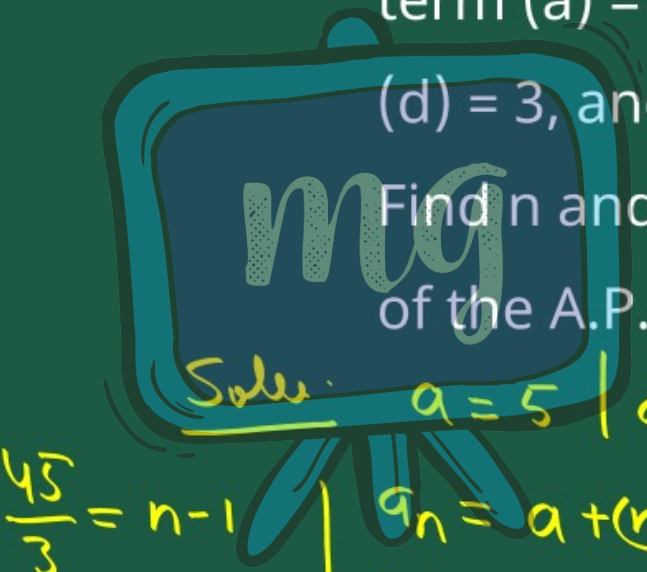
$$= (20-1)(-470)$$

$$-9400 + 470$$

$$= -8930$$



34. For an A.P., it is given that the first term (a) = 5 common difference (d) = 3, and the n^{th} term (a_n) = 50 Find n and sum of first n terms (S_n) of the A.P. (CBSE 2020)



Solu. $a = 5 \mid d = 3 \mid a_n = 50 \mid n = ?, S_n = ?$

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

$50 = 5 + (n-1)(3)$

$45 = (n-1)3$

$\frac{45}{3} = n - 1$

$15 = n - 1$

$16 = n$

$$S_{16} = \frac{16}{2}\left[a + a_{16}\right]$$

$$= 8\left[5 + 50\right]$$

$$= 8 \times 55$$

$$S_{16} = 440$$

35. The ratio of the 11^{th} term to 17^{th} term of an A.P. is 3:4. Find the ratio of 5^{th} term to 21^{st} term of the same A.P. Also, find the ratio of the sum of first 5 terms to that of first 21 terms.

(CBSE 2023)

Solu. $\frac{a_{11}}{a_{17}} = \frac{3}{4}$ | $\frac{a_5}{a_{21}} = ?$ | $\frac{S_5}{S_{21}} = ?$

$\frac{a+10d}{a+16d} = \frac{3}{4}$

$$4(a+10d) = 3(a+16d)$$

$$4a + 40d = 3a + 48d$$

$$4a - 3a = 48d - 40d$$

$$\boxed{a = 8d}$$

$$\frac{a_5}{a_{21}} = \frac{a+4d}{a+20d} = \frac{8d+4d}{8d+20d} = \frac{12d}{28d}$$

$$\frac{a_5}{a_{21}} = \frac{12}{28} = \frac{3}{7}$$

$$\frac{S_5}{S_{21}} = \frac{\frac{5}{2}[2a + 4d]}{\frac{21}{2}[2a + 20d]}$$

$$= \frac{5[2 \times 8d + 4d]}{21[2 \times 8d + 20d]}$$

$$= \frac{5}{21}\left[\frac{20d}{36d}\right]$$

$$\frac{S_5}{S_{21}} = \frac{25}{189}$$

36. 250 logs are stacked in the following manner:

22 logs in the bottom row, 21 in the next row, 20 in the row next to it and so on (as shown by an example). In how many rows, are the 250 logs placed and how many logs are there in the top row? (CBSE 2023)

$22, 21, 19 - - - —$

$a = 22 \quad | \quad d = -1$ $\qquad S_n = 250$

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

$$250 = \frac{n}{2}\left[2 \times 22 + (n-1)(-1)\right]$$

$$= \frac{n}{2}\left[44 - n + 1\right]$$

$$250 = \frac{n}{2}\left[45 - n\right]$$

$500 = 45n - n^2$

$n^2 - 45n + 500 = 0$

$n^2 - 25n - 20n + 500 = 0$

$n[n-25] - 20[n-25] = 0$

$(n-25)(n-20) = 0$

$n = 25$ | $n = 20$

500

25 20

$a = 22 \quad | \quad d = -1$

$a_{20} = a + 19d$

$= 22 + 19(-1)$

$= 22 - 19$

$\boxed{a_{20} = 3}$

$a_{25} = a + 24d$

$= 22 + 24(-1)$

$= 22 - 24$

$\boxed{a_{25} = -2}$ Rejected

37. Solve: 1+ 4 + 7 + 10 +..... + x = 287.

(CBSE 2020)

$S_n = 287 \mid a = 1, \mid d = 4 - 1$

$d = 3$

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

$287 = \frac{n}{2}[2 \times 1 + (n-1)3]$

$= \frac{n}{2}[2 + 3n - 3]$

$287 = \frac{n}{2}[3n - 1]$

$287 \times 2 = n(3n-1)$

$574 = 3n^2 - n$

$0 = 3n^2 - n - 574$

574×3

$2 \times 287 \times 3$

287×6

$41 \times 7 \times 6$

41×42

$41 \times 14 \times 3$

$= 3n^2 - 42n + 41n - 574$

$= 3n[n-14] + 41[n-14]$

$= (3n+41)(n-14) = 0$

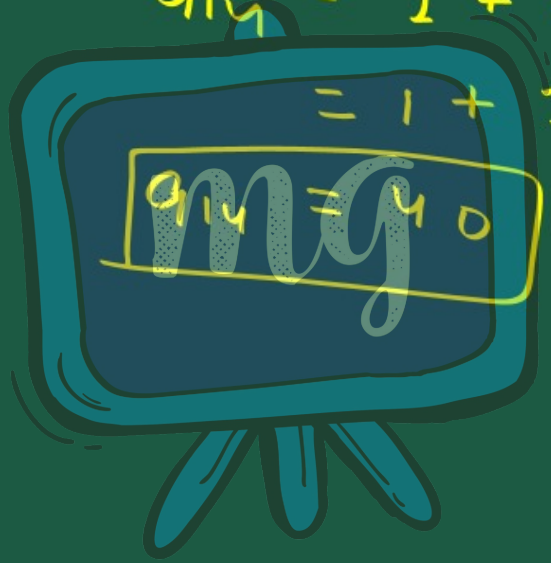
$n = 14$ | $n = -\frac{41}{3}$ {Rejected}

$a_{14} = a + 13d$

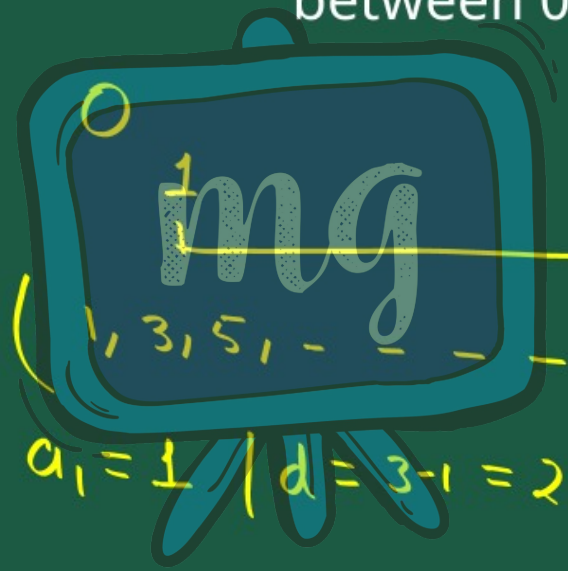
$a_{14} = 1 + 13 \times 3$

$= 1 + 39$

$a_{14} = 40$



38. Find the sum of all odd numbers between 0 and 50. (CBSE 2019)



$a_1 = 1$ | $d = 3-1 = 2$

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

$49 = 1+(n-1)2$

$48 = (n-1)2$

$\frac{48}{2} = (n-1)$

$24 = (n-1)$

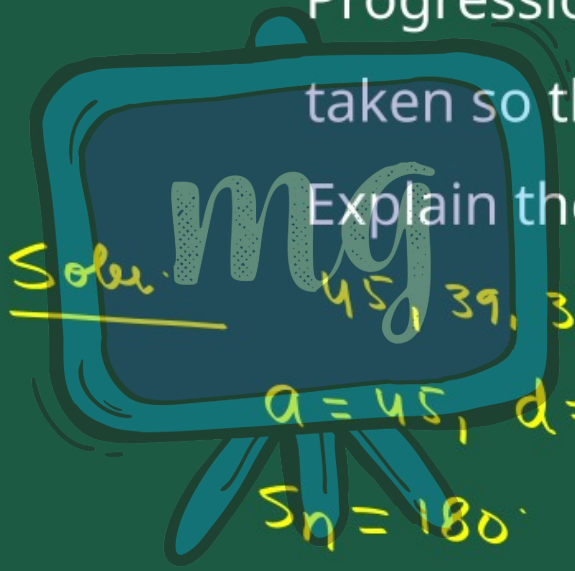
$25 = n$

$S_{25} = \frac{25}{2}[a+l] = \frac{25}{2}[1+49]$

$= \frac{25}{2}[50]$

$S_{25} = 625$

39. How many terms of the Arithmetic Progression 45, 39, 33, ... must be taken so that their sum is 180? Explain the double answer. (CBSE 2019)



Soln.

45, 39, 33, - - - .

$a = 45$, $d = 39 - 45 = -6$

$S_n = 180$

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

$$180 = \frac{n}{2}\left[2(45) + (n-1)(-6)\right] \qquad -3$$

$$180 = n\left[45 - 3n + 3\right]$$

$$180 = n\left[48 - 3n\right]$$

$$60 = n\left[16 - n\right]$$

$$60 = 16n - n^2$$

$$60 - 16n + n^2 = 0$$

$$n^2 - 16n + 60 = 0$$

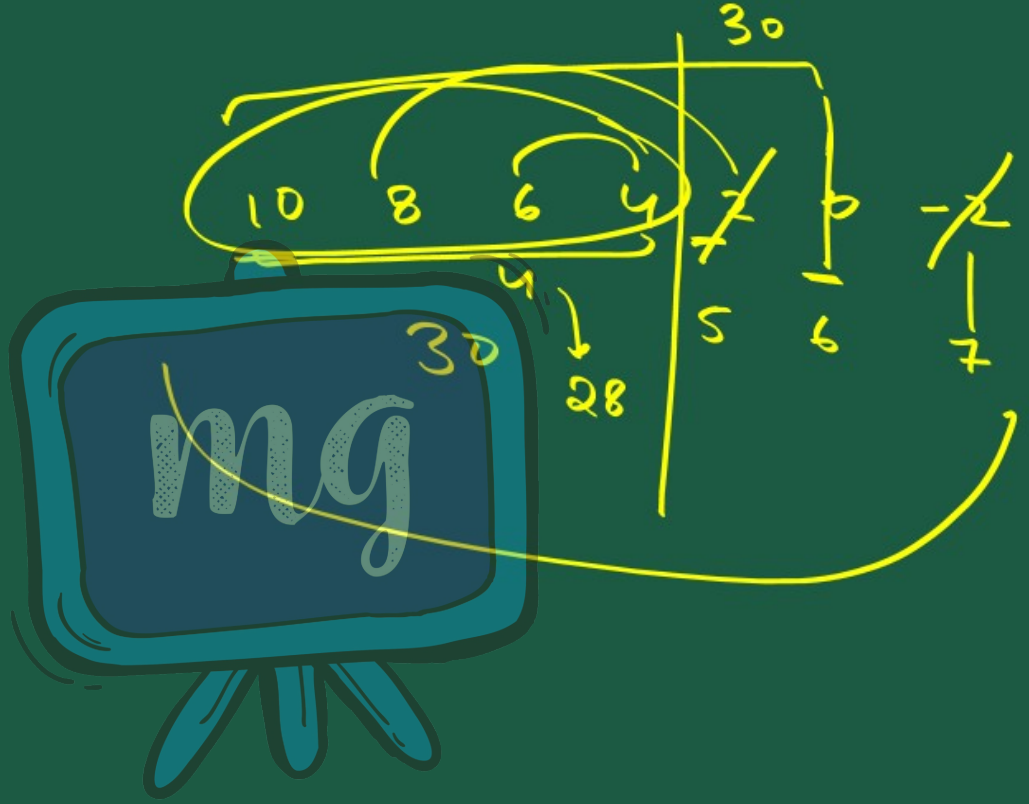
$$n^2 - 10n - 6n + 60 = 0$$

$$n[n-10] - 6[n-10] = 0$$

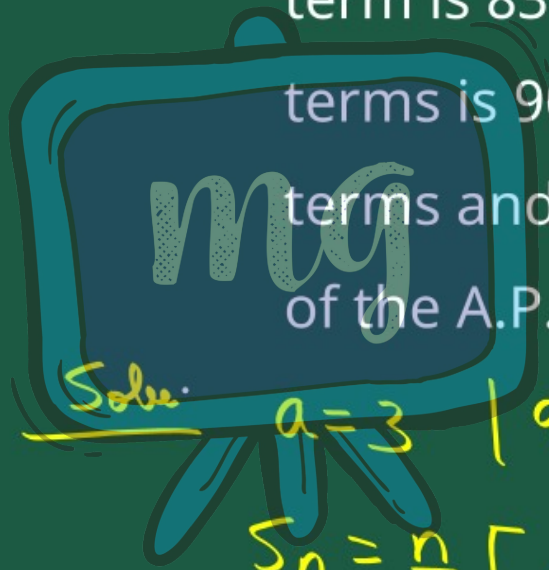
$(n-10)(n-6)=0$

$n-10=0$ | $n-6=0$

$n=10$ $n=6$



40. The first term of an A.P. is 3, the last term is 83 and the sum of all its terms is 903. Find the number of terms and the common difference of the A.P. (CBSE Delhi 2019)



Solu.

$a = 3 \mid a_n = 83 \mid S_n = 903$

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

$903 = \frac{n}{2}[3 + 83]$

$$903 = \frac{n}{2}[3+83]$$

$$903 = \frac{n}{2}(86)$$

$$903 = n(43)$$

$$\frac{903}{43} = n$$

$$21 = n$$

$$a_{21} = 83$$

$$a+20d = 83$$

$$3+20d = 83$$

$$20d = 83-3$$

$$20d = 80$$

$$d = 80/20$$

$$d = 4$$