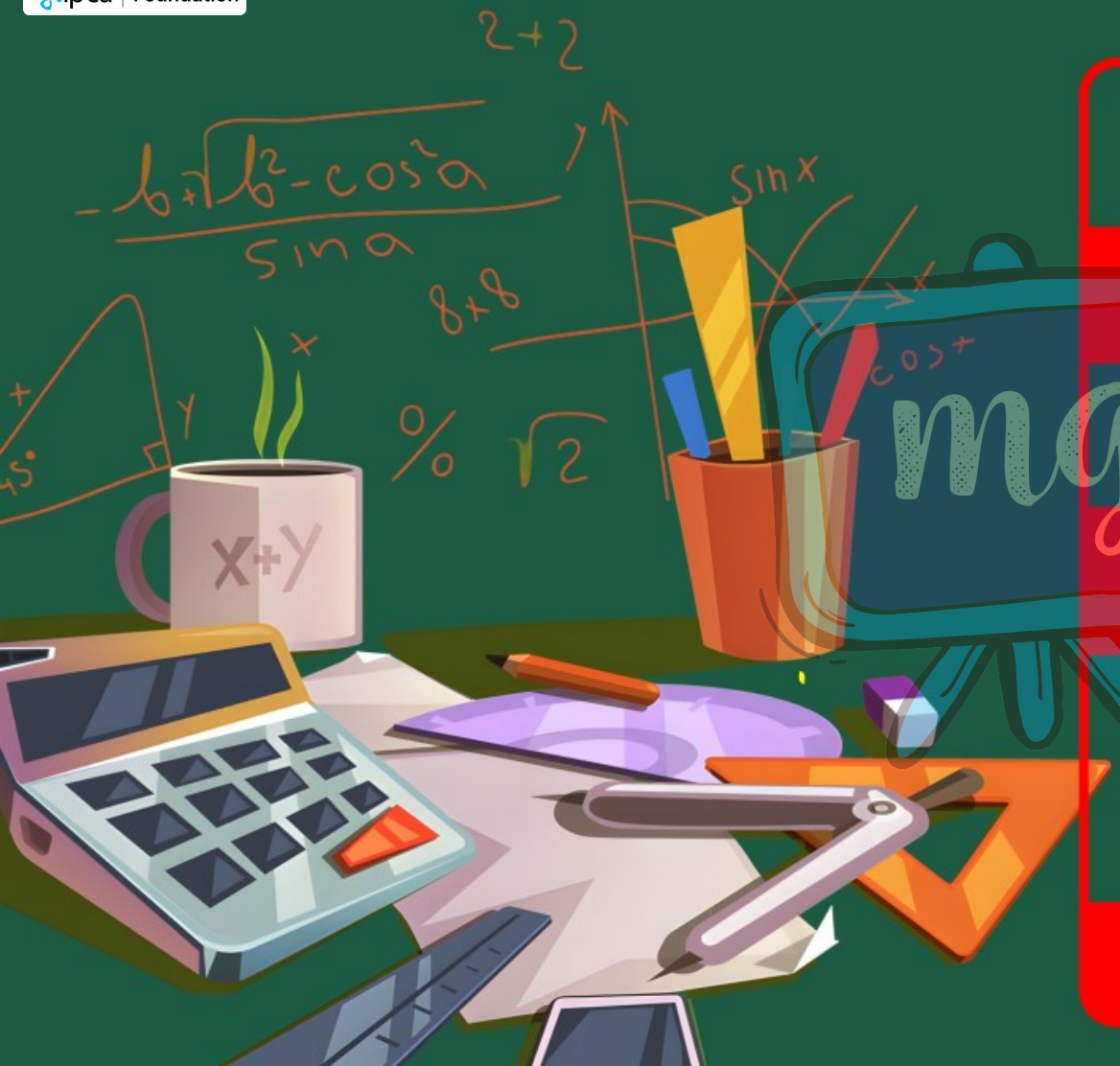


CLASS – 10

MATHEMATICS

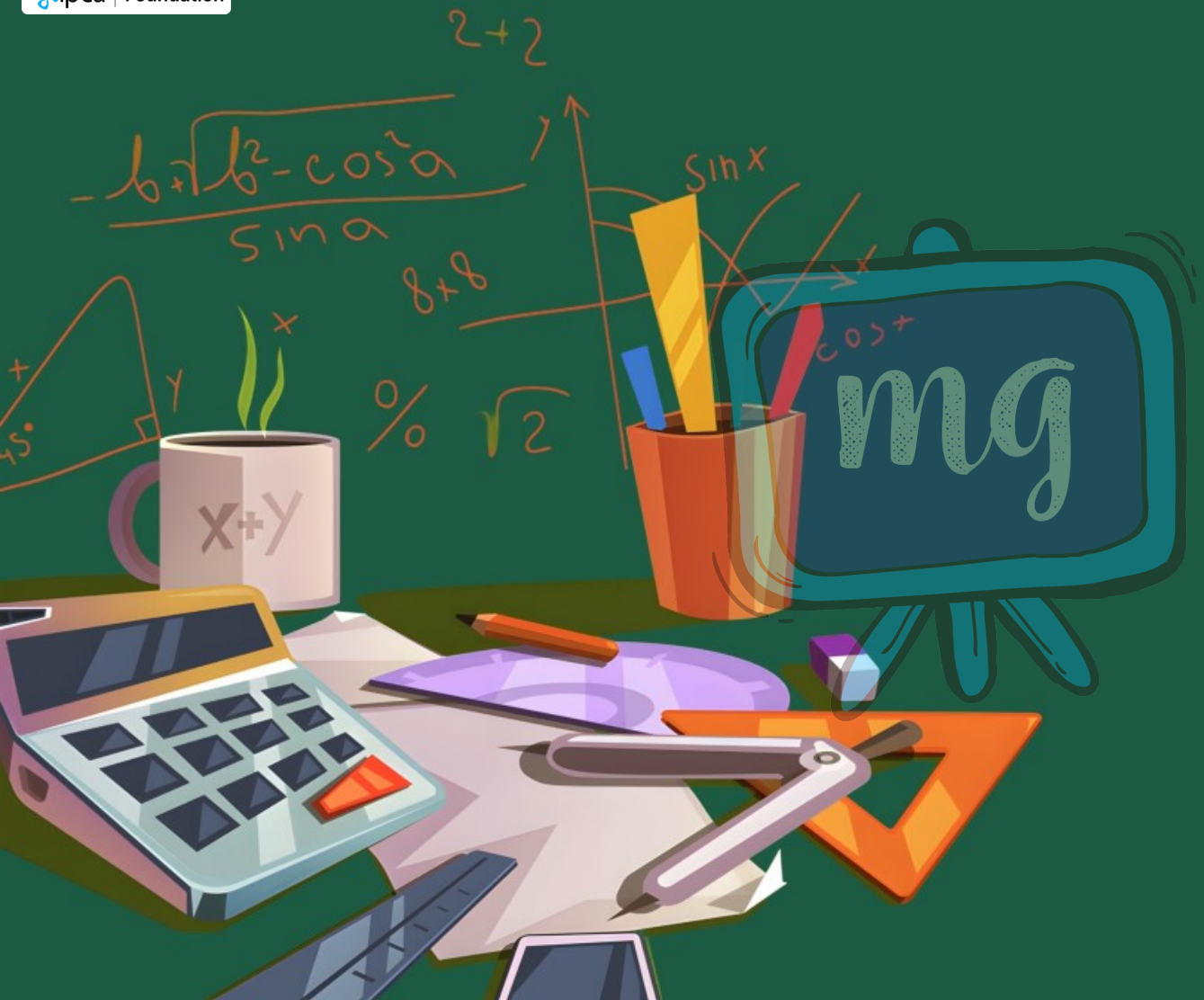
Chapter – 5

Arithmetic Progressions

Part – 11

EXERCISE 5.3 (Q. 3)

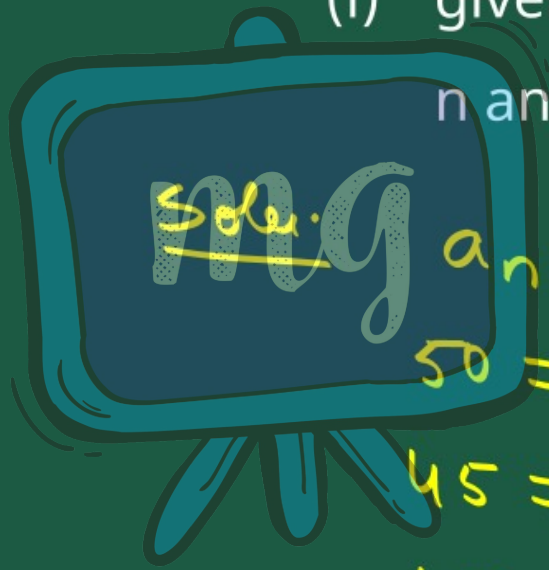
Shubham Tiwari



EXERCISE 5.3

3. In an AP :

(i) given a = 5, d = 3, a_n = 50, find n and S_n.



Sol:

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

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

$45 = (n-1)\,3$

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

$15 = n-1$

$15 = n - 1$

$16 = n$

$S_{16} = \frac{16}{2}[a + l]$

$= \frac{16}{2}[5 + 50]$

$= 8[55]$

$S_{16} = 440$

(ii) given $a = 7$, $a_{13} = 35$, find d and S_{13}.

Solu.

$a_{13} = a + 12d$

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

$35 = 7 + 12d$

$35 - 7 = 12d$

$28 = 12d$

$28/12 = d$

$\frac{7}{3} = d$

$$S_{13} = \frac{n}{2}[a+l]$$

$$= \frac{13}{2}[7+35]$$

$$= \frac{13}{2} \times 42^{21}$$

$$= 13 \times 21$$

$$S_{13} = 273$$

(iii) given $a_{12} = 37$, $d = 3$, find a and S_{12}.

$a_{12} = 37$,

$a + 11d = 37$

$a + 11 \times 3 = 37$

$a + 33 = 37$

$a = 37 - 33$

$a = 4$

$d = 3$, a, S_{12}

$S_{12} = \frac{12}{2}[2a + 11d]$

$= 6[2 \times 4 + 11 \times 3]$

$= 6[8 + 33]$

$= 6 \times 41$

$S_{12} = 246$

(iv) given $a_3 = 15$, $S_{10} = 125$, find d and a_{10}.

Solu.

$a_3 = 15$

$a + 2d = 15$ — (1)

$2a + 4d = 30$ — (3)

$S_{10} = 125$

$S_{10} = \frac{10}{2}[2a + 9d]$

~~$125 = 5[2a + 9d]$~~

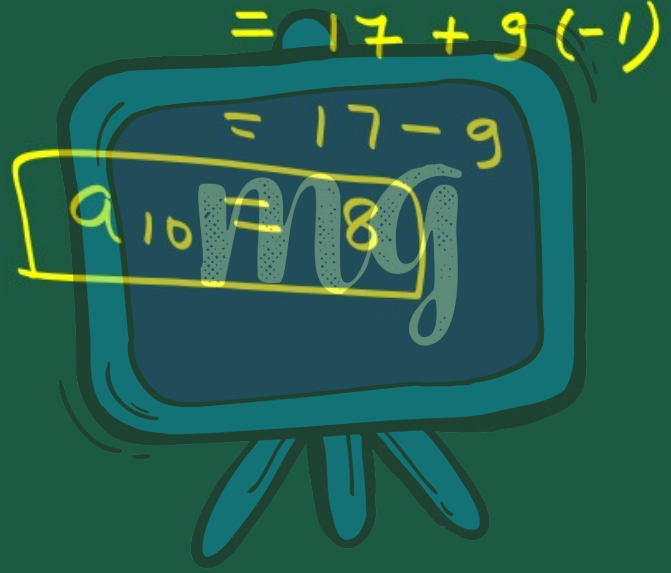
$25 = 2a + 9d$ — (2)

eq② - eq①

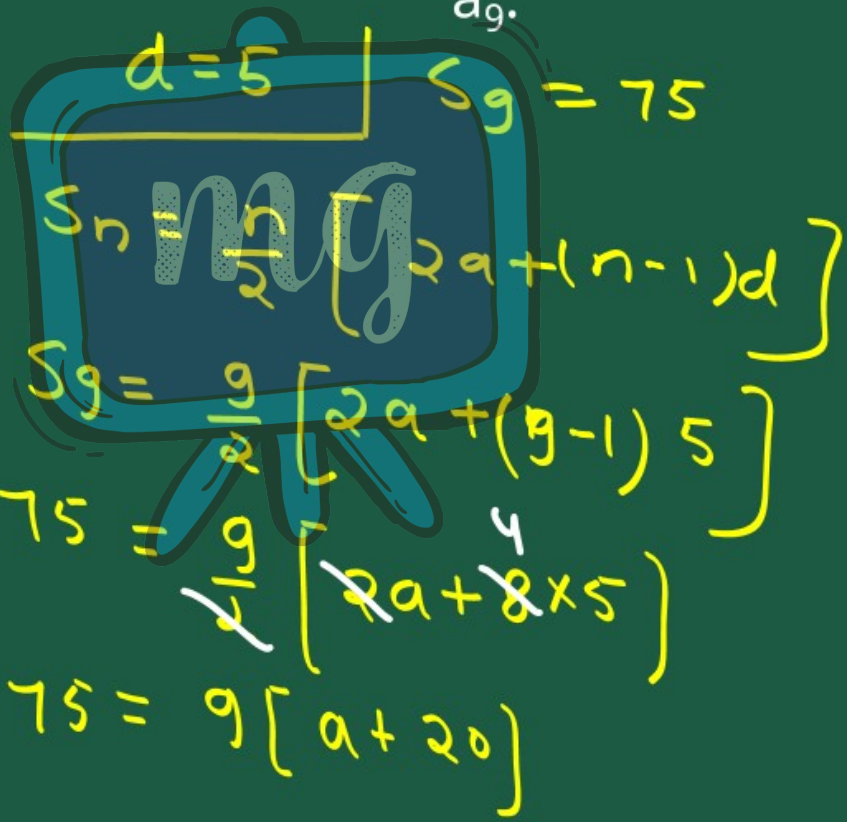
$$2a + 9d = 25$$
$$2a + 4d = 30$$
$$5d = -5$$
$$d = -1$$

From eq①

$$a + 2d = 15$$
$$a + 2(-1) = 15$$
$$a - 2 = 15$$
$$a = 15 + 2$$
$$a = 17$$



(v) given d = 5, S_9 = 75, find a and a_9.



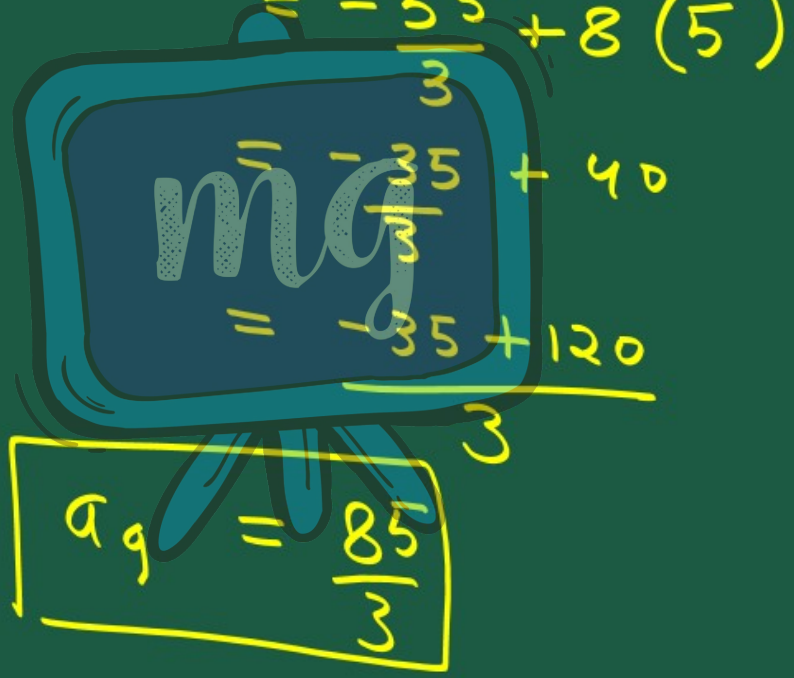
$$75 = g[a+20]$$

$$\frac{75}{g} = a+20$$

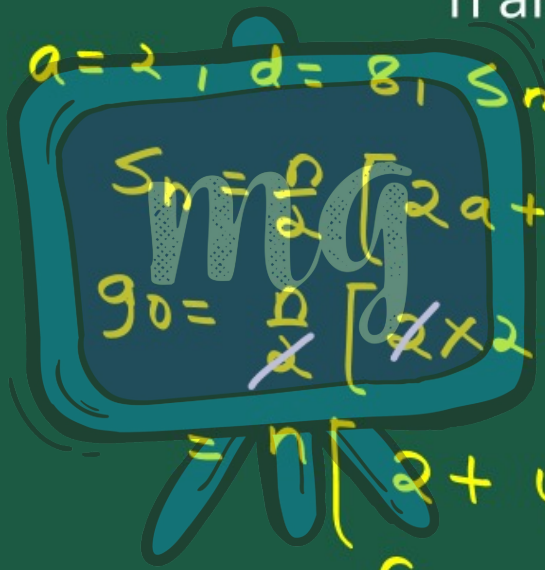
$$\Rightarrow \frac{25}{3} = a+20$$

$$\frac{25}{3} - 20 = a$$

$$\frac{-35}{3} = a$$



(vi) given a = 2, d = 8, S_n = 90, find n and a_n.



$a = 2,\ d = 8,\ S_n = 90$

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

$90 = \frac{n}{2}\left[2 \times 2 + (n-1)8\right]$

$= n\left[2 + 4n - 4\right]$

$90 = n(4n - 2)$

$90 = 4n^2 - 2n$

$$4n^2 - 2n - 90 = 0$$

$$2[2n^2 - n - 45] = 0$$

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

$$2n^2 - 10n + 9n - 45 = 0$$

$$2n[n-5] + 9[n-5] = 0$$

$$(n-5)(2n+9) = 0$$

$n = 5$ | $n = -9/2$ { Rejected }

$$a_5 = a + 4d$$
$$= 2 + 4 \times 8$$
$$= 2 + 32$$
$$a_5 = 34$$

(vii) given $a = 8$, $a_n = 62$, $S_n = 210$, find n and d.

$a = 8 \mid a_n = 62 \mid S_n = 210$

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

$62 = 8 + (n-1)d$

$62 - 8 = (n-1)d$

$54 = (n-1)d$

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

$210 = \frac{n}{2}[2a + (n-1)d]$

$210 = \frac{n}{2}[2 \times 8 + 54]$

$210 = \frac{n}{2}[16 + 54]$

$$210 = \frac{n}{2}[70]$$

$$\frac{210}{70} = \frac{n}{2}$$

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

$$6 = n$$

$$54 = (n-1)d$$

$$54 = (6-1)d$$

$$54 = 5d$$

$$\frac{54}{5} = d$$

(viii) given $a_n = 4$, $d = 2$, $S_n = -14$, find n and a.

$a_n = 4 \mid d = 2 \mid S_n = -14$

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

$4 = a + (n-1)(2)$

$4 - 2(n-1) = a$

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

$-14 = \frac{n}{2}[2a + (n-1)2]$

$-14 = n[a + (n-1)]$

$$-14 = n\left[a+(n-1)\right]$$

$$= n\left[4-2(n-1)+(n-1)\right]$$

$$= n\left[4-(n-1)\right]$$

$$= n\left[4-n+1\right]$$

$$-14 = n\left[5-n\right]$$

$$-14 = 5n-n^2$$

$$n^2-5n-14=0$$

$$n^2-7n+2n-14=0$$

$$n(n-7)+2(n-7)=0$$

$$(n-7)(n+2)=0$$

$$n=7,\quad n=-2$$

$n = 7$ | $n = -2$ Rejected.

$a = 4 - 2(n-1)$

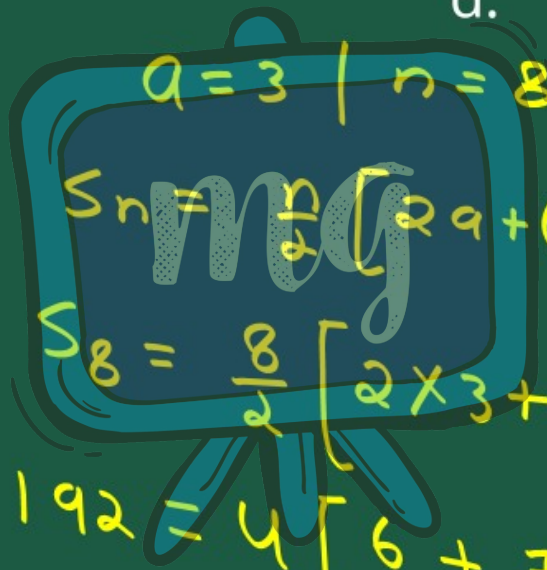
$a = 4 - 2(7-1)$

$= 4 - 2(6)$

$= 4 - 12$

$a = -10$

(ix) given a = 3, n = 8, S = 192, find d.



$a = 3 \mid n = 8 \mid S_n = 192 \mid$

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

$S_8 = \frac{8}{2}[2 \times 3 + (8-1)d]$

$192 = 4[6 + 7d]$

$\frac{192}{4} = 6 + 7d$

$$\frac{192}{4} = 6 + 7d$$

$$48 = 6 + 7d$$

$$48 - 6 = 7d$$

$$42 = 7d$$

$$\frac{42}{7} = d$$

$$6 = d$$

(x) given $\ell = 28$, S = 144, and there are total 9 terms. Find a.

$a_n = \ell = 28$ | $S_n = 144$ | $n = 9$

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

$144 = \frac{9}{2}[a + 28]$

$32 = a + 28$

$32 - 28 = a$

$4 = a$