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कक्षा-10

समांतर श्रेढ़ियाँ

Arithmetic Progressions

अध्याय - 5

भाग - 9

प्रश्नावली 5.3

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2. नीचे दिए हुए योगफलों को ज्ञात कीजिए :

(ii) $34 + 32 + 30 + \ldots + 10$

यहाँ $a = 34$

$d = 32 - 34 = -2$

$a_n = 10$

$\Rightarrow a + (n-1)d = 10$

$34 + (n-1)(-2) = 10$

$\Rightarrow (n-1)(-2) = 10 - 34$

$\Rightarrow (n-1)(-2) = -24$

$n - 1 = \frac{-24}{-2}$ 12

$n - 1 = 12$

$n = 12 + 1 = 13$

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हल :

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

$$S_{13} = \frac{13}{2}(34 + 10)$$

$$= \frac{13}{2} \times 44^{22}$$

$$\boxed{S_{13} = 286}$$

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

यहाँ $a = -5$

$d = -8 - (-5) = -8 + 5 = -3$

$a_n = -230$

$\Rightarrow a + (n-1)d = -230$

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

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

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

$n - 1 = \frac{-225}{-3}$ (75)

$n = 76$

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अत : $S_n = \frac{n}{2}[a + l]$

$S_{76} = \frac{\cancel{76}^{38}}{\cancel{2}}[-5 - 230]$

$= 38(-235)$

$= -38 \times 235$

$= -8930$

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3. एक A.P. में,

(i) $a = 5, d = 3$ और $a_n = 50$ दिया है। n और S_n ज्ञात कीजिए।

यहाँ $a_n = 50$

$a + (n-1)d = 50$

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

$\Rightarrow (n-1)(3) = 50 - 5 = 45$

$\Rightarrow n - 1 = \frac{45}{3} = 15$

$n = 15 + 1$

$\boxed{n = 16}$

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अब,

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

$$S_{16} = \frac{\cancel{16}^{8}}{\cancel{2}}[5 + 50]$$

$$S_{16} = 8 \times 55$$

$$\boxed{S_{16} = 440}$$

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(ii) $a = 7$ और $a_{13} = 35$ दिया है। d और S_{13} ज्ञात कीजिए।

$a_{13} = a + 12d = 35$

$7 + 12d = 35$

$12d = 35 - 7 = 28$

$d = \frac{28}{12}$ (7, 3)

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

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अत: $S_n = \frac{n}{2}[a + l]$

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

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

$S_{13} = 273$

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(iii) $a_{12} = 37$ और $d = 3$ दिया है। a और S_{12} ज्ञात कीजिए।

$a_{12} = a + 11d = 37$

$a + 11 \times 3 = 37$

$a = 37 - 33 = 4$

अत: $S_n = \frac{n}{2}[a + a_n]$

$S_{12} = \frac{6}{\cancel{2}}\cancel{12}[4 + 37]$

$S_{12} = 6 \times 41$

$S_{12} = 246$

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(iv) $a_3 = 15$ और $S_{10} = 125$ दिया है। d और a_{10} ज्ञात कीजिए।

$$a_3 = a + 2d = 15 \quad \text{——} (1)$$

$$S_{10} = \frac{\cancel{10}^{5}}{\cancel{2}}\left[2a + (10-1)\,d\right] = 125$$

$$\cancel{5}\,(2a + 9d) = \cancel{125}^{25}$$

$$2a + 9d = 25 \quad \text{——} (2)$$

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समी. ① × 2 व समी. ② से :

$$2a + 4d = 30$$

$$-\ 2a + 9d = -\ 25$$

$$-5d = 5$$

$$d = -1$$

समी. ① से :

$$a + 2d = 15$$

$$a - 2 \times 1 = 15$$

$$a = 15 + 2 = 17$$

अत :

$$a_{10} = a + 9d$$

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

$$= 17 - 9$$

$$a_{10} = 8$$

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(v) $d = 5$ और $S_9 = 75$ दिया है। a और a_9 ज्ञात कीजिए।

$$S_9 = \frac{9}{2}\left[2a + (9-1)5\right] = 75$$

$$\frac{9}{2} \times 2\left[a + 4 \times 5\right] = 75$$

$$9(a + 20) = 75$$

$$a + 20 = \frac{75}{9}^{25}_{3}$$

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

$$a = \frac{25 - 60}{3}$$

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

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अब, $a_9 = a + 8d$

$= -\frac{35}{3} + 8 \times 5$

$= -\frac{35}{3} + 40$

$= \frac{-35 + 120}{3}$

$\boxed{a_9 = \frac{85}{3}}$

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(vi) $a = 2, d = 8$ और $S_n = 90$ दिया है। n और a_n ज्ञात कीजिए।

$$S_n = \frac{n}{2}[2a + (n-1)d] = 90$$

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

$$\frac{n}{2} \times 2[2 + (n-1)4] = 90$$

$$n(2 + 4n - 4) = 90$$

$$n(4n - 2) = 90$$

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$\Rightarrow \cancel{4}^{2} n^2 - \cancel{2}n = \cancel{90}^{45}$

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

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

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

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

यातो $2n + 9 = 0$

$n = \frac{-9}{2}$

अमान्य है, क्योंकि यह प्राकृत संख्या नहीं है।

या फिर $n - 5 = 0$

$\Rightarrow \boxed{n = 5}$

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अब, $a_7 \Rightarrow a_5 = a + 4d$

$= 2 + 4 \times 8$

$= 2 + 32$

$\boxed{a_5 = 34}$

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(vii) $a = 8$, $a_n = 62$ और $S_n = 210$ दिया है। n और d ज्ञात कीजिए।

$a_n = a + (n-1)d = 62$

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

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

$(n-1)d = 54$ —— (1)

तथा $S_n = 210$

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

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$$\frac{n}{2}[2a + 54] = 210 \quad \text{(सभी 0 से)}$$

$$\frac{n}{2} \times 2[a + 27] = 210$$

$$n(8 + 27) = 210$$

$$n = \frac{210}{35} \quad \begin{matrix} 30 \\ 5 \end{matrix} \quad 6$$

$$\Rightarrow \boxed{n = 6}$$

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अब, समी. (1) से :

$$(n-1)\,d = 5y$$

$$(6-1)\,d = 5y$$

$$\boxed{d = \frac{5y}{5}}$$

अत :

$$n = 6$$

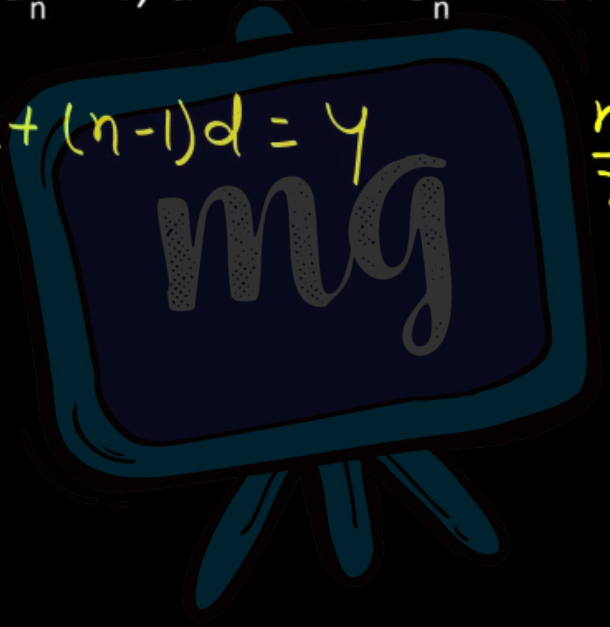
$$d = \frac{5y}{5}$$

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(viii) $a_n = 4$, $d = 2$ और $S_n = -14$ दिया है। n और a ज्ञात कीजिए।



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

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

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(ix) a = 3, n = 8 और S = 192 दिया है। d ज्ञात कीजिए।



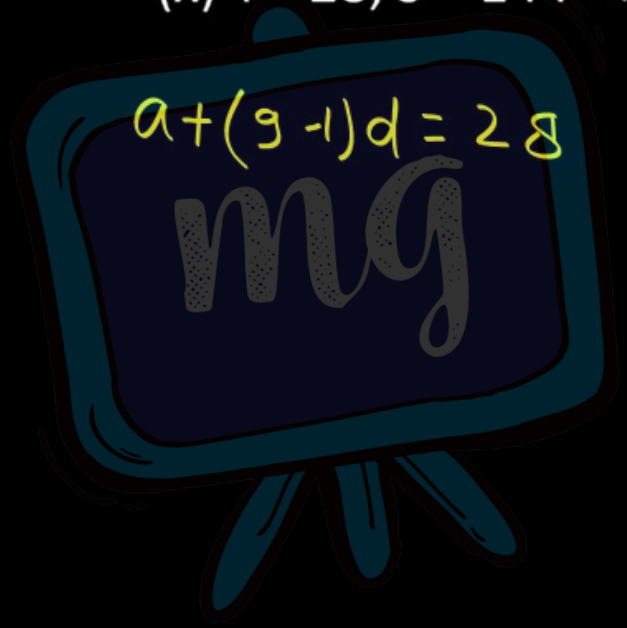
$$S_8 = \frac{8}{2}\left[2 \times 3 + (8-1)d\right] = 192$$

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(x) $l = 28$, $S = 144$ और कुल 9 पद हैं। a ज्ञात कीजिए।



$S_9 = 144$

$\frac{9}{2}[2a + (9-1)d] = 144$