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← SOLUTIONS →

WORKSHEET No:- 1

SEQUENCE & SERIES

Ans 1 → given $S_n = 2n + pn^2$

put $n=1$

$S_1 = 2 + p = a_1$

put $n=2$

$S_2 = 22 + 4p = a_1 + a_2$

$\Rightarrow 22 + 4p = 2 + p + a_2$

$\Rightarrow a_2 = 2 + 3p$

Now $d = a_2 - a_1$

$\Rightarrow d = (2 + 3p) - (2 + p)$

$\boxed{d = 2p}$ Ans

Ans 2 →

	1^{st} AP	2^{nd} A.P
1^{st} term	a	a'
difference	d	d'
Sum	S_n	S'_n
12^{th} term	a_{12}	a'_{12}

To find $\dfrac{a_{12}}{a'_{12}} = \dfrac{a + 11d}{a' + 11d'}$

given $\dfrac{S_n}{S'_n} = \dfrac{3n+8}{7n+15}$

$\Rightarrow \dfrac{\frac{n}{2}[2a + (n-1)d]}{\frac{n}{2}[2a' + (n-1)d']} = \dfrac{3n+8}{7n+15}$

put $n = 23$ (both sides)

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$$\Rightarrow \frac{2a+22d}{2a'+22d'} = \frac{69+8}{161+15}$$

$$\Rightarrow \frac{a+11d}{a'+11d'} = \frac{\cancel{77}\ 7}{\cancel{176}\ 16}$$

$\therefore$ Required Ratio : $7:16$ Ans

Ans 3 → To find

$$\frac{a_m}{a_n} = \frac{2m-1}{2n-1}$$

given $\frac{S_m}{S_n} = \frac{m^2}{n^2}$

$$\Rightarrow \frac{\frac{\cancel{m}}{\cancel{2}}[2a+(m-1)d]}{\frac{\cancel{n}}{\cancel{2}}[2a+(n-1)d]} = \frac{m^{\cancel{2}}}{n^{\cancel{2}}}$$

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

$$\Rightarrow 2an + (mn-n)d = 2am + (mn-m)d$$

$$\Rightarrow 2a(n-m) + d(\cancel{mn}-n-\cancel{mn}+m) = 0$$

$$\Rightarrow 2a(n-m) - d(n-m) = 0$$

$$\Rightarrow (n-m)(2a-d) = 0$$

$$\Rightarrow 2a-d = 0$$

$$\Rightarrow \boxed{d = 2a}$$

Now $\frac{a_m}{a_n} = \frac{a+(m-1)d}{a+(n-1)d}$

Soln. sequence (W.S 1) (3)

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

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

$$\frac{a_m}{a_n} = \frac{2m-1}{2n-1}$$ Proved

Qns 4 → given $a = 3$, $b = 24$, $n = 6$

let the numbers to be inserted are $A_1, A_2, A_3, A_4, A_5, A_6$

$$d = \frac{b-a}{n+1} = \frac{24-3}{6+1} = \frac{21}{7} = 3$$

$A_1 = a + d = 3+3 = 6$
$A_2 = a + 2d = 3+6 = 9$
$A_3 = a + 3d = 3+9 = 12$
$A_4 = a + 4d = 3+12 = 15$
$A_5 = a + 5d = 3+15 = 18$
$A_6 = a + 6d = 3+18 = 21$

∴ Nos are 6, 9, 12, 15, 18, 21 Ans

Qn. 5 → given $S_n = 3n^2 + 5n$
and $a_m = 164$
$n=1$ $S_1 = 3+5 = 8 = a_1$
$n=2$ $S_2 = 12+10 = 22 = a_1 + a_2$
$\Rightarrow 22 = 8 + a_2$
$\Rightarrow a_2 = 14$
$d = a_2 - a_1 = 14 - 8 = 6$

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Soln (Ex.5.2) Sequence (4)

$a_m = 164$

$a + (m-1)d = 164$

$\Rightarrow 8 + (m-1)(6) = 164$

$\Rightarrow 8 + 6m - 6 = 164$

$\Rightarrow 6m = 162$

$\Rightarrow m = \frac{\cancel{162}\ 27}{\cancel{6}}$ $\therefore \boxed{m = 27}$ Ans

Qn.6 → given

$S_p = S_q$

$\Rightarrow \frac{p}{\cancel{2}}[2a + (p-1)d] = \frac{q}{\cancel{2}}[2a + (q-1)d]$

$\Rightarrow 2ap + (p^2 - p)d = 2aq + (q^2 - q)d$

$\Rightarrow 2a(p-q) + d(p^2 - p - q^2 + q) = 0$

$\Rightarrow 2a(p-q) + d((p+q)(p-q) - (p-q)) = 0$

$\Rightarrow (p-q)[2a + d(p+q-1)] = 0$

$\Rightarrow 2a + (p+q-1)d = 0$ ----(1)

Now $S_{p+q} = \frac{p+q}{2}(2a + (p+q-1)d)$

$= \frac{p+q}{2}(0)$ --- {from eq(1)}

$= 0$ Ans

Qn.7 → given $a_1 + a_2 + a_3 + a_4 = 56$

$a + a+d + a+2d + a+3d = 56$

$4a + 6d = 56$

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Soln. Sequence (ws 1)

Given I^{st} term $a = 11$

$\therefore 44 + 6d = 56$

$\Rightarrow 6d = 12$

$\Rightarrow d = 2$

Given Sum of last ~~form~~ four terms $= 112$

$\Rightarrow a_{n-3} + a_{n-2} + a_{n-1} + a_n = 112$

$\Rightarrow a + (n-4)d + a + (n-3)d + a + (n-2)d + a + (n-1)d = 112$

$\Rightarrow 4a + d(4n - 10) = 112$

put $a = 11$ & $d = 2$

$\Rightarrow 44 + 2(4n - 10) = 112$

$\Rightarrow 44 + 8n - 20 = 112$

$\Rightarrow 8n = 112 - 24$

$\Rightarrow 8n = 88$

$\Rightarrow \boxed{n = 11}$ Ans.

Q. 8 → total cost $=$ Rs 22000

advance $= 4000$

unpaid ~~pr~~ amount $= 22000 - 4000 =$ Rs 18000

annual Installment $=$ Rs 1000

Number of Installments $= 18$

I^{st} ~~Ie~~ Installment $= 1000 + \frac{10}{100}(18000) = 2800$

2^{nd} Installm $= 1000 + \frac{10}{100}(17000) = 2700$

3^{rd} Installm $= 1000 + \frac{10}{100}(16000) = 2600$

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Soln Sequence (W.S 1) 6 /

∴ Sequence of Installments

2800, 2700, 2600, ... 18 term

AP $a = 2800$, $d = -100$

$S_{18} = \frac{18}{2}\left[5600 + (17)(-100)\right]$

$= 9(5600 - 1700)$

$= 9(3900)$

$= 35100$

total Amount = advance + amount paid in Installments

$= 4000 + 35100$

$=$ Rs 39100 Ans

Qu. 9 → given $a_p = a = A + (p-1)d$

$a_q = b = A + (q-1)d$ where A is the first term

$a_r = c = A + (r-1)d$

L.H.S. $(q-r)a + (r-p)b + (p-q)c$

$\Rightarrow (q-r)\left[A + (p-1)d\right] + (r-p)\left[A + (q-1)d\right] + (p-q)\left[A + (r-1)d\right]$

$\Rightarrow A(\cancel{q} - \cancel{r} + \cancel{r} - \cancel{p} + \cancel{p} - \cancel{q}) + d(\cancel{pq} - \cancel{q} - \cancel{rp} + \cancel{r} + \cancel{qr} - \cancel{r} - \cancel{pq} + \cancel{p} + \cancel{pr} - \cancel{p} - \cancel{qr} + \cancel{q})$

$= A(0) + d(0)$

$= 0 =$ R.H.S. Ans

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Soln Syllabus (W-S 1) (7)

Ans 10 → let the three terms in AP are
$a-d,\ a,\ a+d$

Given sum $= 24$
$\Rightarrow a-\cancel{d}+a+a+\cancel{d}=24$
$\Rightarrow 3a=24$
$\Rightarrow \boxed{a=8}$

Product $= 440$

$\Rightarrow (a-d)(a)(a+d)=440$
$\Rightarrow (8-d)(8)(8+d)=440$
$\Rightarrow (64-d^2)=\frac{440}{8}$
$\Rightarrow 64-d^2=55$
$\Rightarrow d^2=9$
$\Rightarrow \boxed{d=\pm 3}$

for $a=8$ & $d=3$, the three terms are
5, 8, 11

for $a=8$ & $d=-3$, the three term are
11, 8, 5 Ans

Ans 11 → Given $S_1=S_n=\frac{n}{2}[2a+(n-1)d]$
$S_2=S_{2n}=\frac{2n}{2}[2a+(2n-1)d]$
$S_3=S_{3n}=\frac{3n}{2}[2a+(3n-1)d]$

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Sum Sequence (W.S 1) (8)

Rhs $3(S_2 - S_1)$

$$= 3\left[\frac{2n}{2}\left(2a + (2n-1)d\right) - \frac{n}{2}\left(2a + (n-1)d\right)\right]$$

$$= \frac{3n}{2}\left[4a + (4n-2)d - 2a - (n-1)d\right]$$

$$= \frac{3n}{2}\left(2a + d(4n - 2 - n + 1)\right]$$

$$= \frac{3n}{2}\left[2a + (3n-1)d\right]$$

$$= S_3$$

$= \text{Lhs}$

Proved

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