4. AP : 9, 17, 25 - ..

$S_n = 636$

$a = 9$

$d = 17 - 9 = 8$

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

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

$$\Rightarrow 636 \times 2 = n[18 + 8n - 8]$$

$$\Rightarrow 1272 = n[10 + 8n]$$

$$\Rightarrow 1272 = 10n + 8n^2$$

$\Rightarrow 8n^2 + 10n - 1272 = 0$

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

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

$\Rightarrow$ ~~4n(n+53) - 12(n+53) = 0~~

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

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

$\therefore n = -\frac{53}{4} \,/\, 12$

n can't be negative or fraction,

$\therefore n = 12$

5. $a = 5$

$a_n = 45$

$S_n = 400$

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

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

$\Rightarrow \frac{400 \times 2}{50} = n$

$\Rightarrow 16 = n$

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

$\Rightarrow 45 = 5 + (16-1)d$

$\Rightarrow 40 = 15d$

$\Rightarrow \frac{40^{8}}{15_{3}} = d$

$\Rightarrow \frac{8}{3} = d$

6. $a = 17$

$a_n = 350$

$d = 9$

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

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

$\Rightarrow 333 = (n-1)9$

$\Rightarrow \frac{333^{37}}{9_{1}} = (n-1)$

$\Rightarrow 38 = n$

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

$\Rightarrow S_n = \frac{38}{2}[17 + 350]$

$\Rightarrow S_n = 19 \times 367$

$\Rightarrow S_n = 6973$

$$\begin{array}{r} 367 \\ \times\ 19 \\ \hline 3303 \\ 367\times \\ \hline 6973 \end{array}$$

7. $d = 7$

$a_{22} = 149$

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

$\Rightarrow a_{22} = a + (n-1)7$

$\Rightarrow 149 = a + (22-1)7$

$\Rightarrow 156 = a + 21 \times 7$ — (2)

$\Rightarrow 146 - 147 =$

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

$\Rightarrow S_{22} = \frac{22}{2}[a + a_{22}]$

$\Rightarrow S_{22} = 11[a +$

7. $d = 7$

$a_{22} = 149$

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

$\Rightarrow a_{22} = a + (22-1)d$

$\Rightarrow 149 = a + 21 \times 7$

$\Rightarrow 149 = a + 147$

$\Rightarrow 2 = a$ — (1)

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

$$\Rightarrow S_{22} = \frac{22}{2}[2 + 14a]$$

$$\Rightarrow = 11 \times 151$$

$$= 1661$$

8. $a_2 = 14$

$a_3 = 18$ $\qquad 18 = a + 6$

$$d = a_3 - a_2 = 18 - 14 = 4$$

$$a_2 = a + d$$

$$\Rightarrow 14 = a + 4$$

$$\Rightarrow 10 = a$$

$$S_{51} = \frac{51}{2}$$

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

$$\Rightarrow S_{51} = \frac{51}{2}[2 \times 10 + (51-1)4]$$

$$= \frac{51}{2}[20 + 200]$$

$= \frac{31}{2} \times 220^{110}$

$= 5610$

9. $S_7 = 49$

$S_{17} = 289$

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

$\Rightarrow$

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

$\Rightarrow S_7 = \frac{7}{2}[2a + 6d]$

$\Rightarrow \frac{49^{7} \times 2}{7} = 2a + 6d$

$\Rightarrow \frac{7 \times 2}{2} = a + 3d$

$\Rightarrow 7 = a + 3d$ ——— (1)

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

$\Rightarrow \frac{289^{17} \times 2}{17} = 2a + 16d$

$\Rightarrow \frac{17 \times 2}{2} = a + 8d$

$\Rightarrow 17 = a + 8d$ ——— (II)

Subtracting (I) from (II), we get,

$$\begin{array}{r} 17 = a + 8d \\ \ominus \quad 7 = a + 3d \\ \hline 10 = \quad 5d \end{array}$$

$\Rightarrow 2 = d$

Placing value of d in eqn (II), we have:

$17 = a + 8d$

$\Rightarrow 17 = a + 8 \times 2$

$\Rightarrow 17 - 16 = a$

$\Rightarrow 1$

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

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

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

$\Rightarrow S_n = \frac{n}{\cancel{2}} \times \cancel{2}n$

$\Rightarrow S_n = n^2$

10 i) $a_n = 3 + 4n$

$a_1 = 3 + 4(1) = 3 + 4 = 7$

$a_2 = 3 + 4(2) = 3 + 8 = 11$

$a_3 = 3 + 4(3) = 3 + 12 = 15$

$a_4 = 3 + 4(4) = 3 + 16 = 19$

$d = 4$

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

$\Rightarrow S_{15} = \frac{15}{2}[2 \times 7 + (15-1)4]$

$= \frac{15}{2}[14 + 56]$

$= \frac{15}{2} \times 70^{35}$

$\therefore S_{15} = 525$

ii) $a_n = 9 - 5n$

$a_1 = 9 - 5(1) = 9 - 5 = 4$

$a_2 = 9 - 5(2) = 9 - 10 = -1$

$a_3 = 9 - 5(3) = 9 - 15 = -6$

$a_4 = 9 - 5(4) = 9 - 20 = -11$

$d = (-5)$

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

$\Rightarrow S_{15} = \frac{15}{2}[2 \times 4 + (15-1)(-5)]$

$= \frac{15}{2}[8 - 70]$

$= \frac{15}{2} \times (-62)^{31}$

$\therefore S_{15} = -465$

11. $S_n = 4n - n^2$

$S_1 = 4(1) - (1)^2$

$= 4 - 1 = 3$

$S_2 = 4(2) - (2)^2$

$= 8 - 4 = 4$

$a_2 = S_2 - S_1 = 4 - 3 = 1$

$d = a_2 - a = 1 - 3 = -2$

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

$\Rightarrow a_n = 3 + (n-1)-2$

$\Rightarrow a_n = 3 - 2n + 2$

$\Rightarrow a_n = 5 - 2n$

$a_3 = 5 - 2 \times 3$

$= -1$

$a_{10} = 5 - 2 \times 10$

$= 5 - 20$

$= -15$

∴ $a_3 = -1$, $a_{10} = -15$, $a_n = 5 - 2n$

12. Positive integers divisible by 6: 6, 12, 18, 24 . . .
It seems like an AP with first term = 6

$a = 6$

$d = 6$

$S_{40} = ?$

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

$\Rightarrow S_{40} = \frac{40}{2}[2 \times 6 + (40-1)6]$

$\Rightarrow S_{40} = 20[12 + 234]$

$= 20[246]$

$= 4920$

∴ $S_{40} = 4920$

13. Multiples of 8 : 8, 16, 24, 32 . . .
AP : 8, 16, 24, 32 . .

$a = 8$

$d = 8$

$S_{15} = ?$

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

$$\Rightarrow S_{15} = \frac{15}{2}[2 \times 8 + (15-1)8]$$

$$= \frac{15}{2}[16 + 112]$$

$$= \frac{15}{\cancel{2}} \times \cancel{128}\ 64$$

$$= 960$$

14 Odd No. between 0 to 50 are 1, 3, 5, 7, 9 ... 49.

AP: 1, 3, 5, 7, 9 ... 49

$a = 1$

$d = 2$

$l(a_n) = 49$

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

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

$$\Rightarrow 49 = 1 + 2n - 2$$

$\Rightarrow$ $49 = 2n - 1$

$\Rightarrow$ $50 = 2n$

$\Rightarrow$ $25 = n$

~~$S_{25} =$~~

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

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

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

$= \frac{25}{2} \times 50^{25}$

$= 625$

$\therefore$ $S_{25} = 625$

15. The given penalties in a day form an AP with first term as ₹200 and common difference as 50

$a = 200$

$d = 50$

$S_{30} = ?$

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

$\Rightarrow S_{30} = \frac{30}{2}[2 \times 200 + (30-1)50]$

$\Rightarrow S_{30} = 15[400 + 1450]$

$= 15[1850]$

$= 27750$

$\therefore$ for 30 days, penalty will be ₹ 27750

16. Let cost of 1st prize = x

Cost of 2nd prize = $x - 20$

Cost of 3rd prize = $x - 40$

Cost of Prizes form an AP with first term, $a = x$

common difference, $d = -20$

$S_7 = 700$

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

$\Rightarrow S_7 = \frac{7}{2}[2 \times x + (7-1) - 20]$

$\Rightarrow 700 = \frac{7}{2}[2x - 120]$

$\Rightarrow \frac{\overset{100}{\cancel{700}} \times 2}{\cancel{7}} = 2x - 120$

$\Rightarrow \frac{100 \times 2}{x} = x - 60$

$\Rightarrow 200 = x - 60$

$\Rightarrow 160 = x$

$\therefore$ value of each prizes are ₹160, ₹140, ₹120, ₹100, ₹80, ₹60 and ₹40

17. No. of trees planted by students is in an AP.

1, 2, 3, 4, 5 12

$a = 1$

$d = 1$

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

$\Rightarrow S_{12} = \frac{12}{2}[2 \times 1 + (12-1)1]$

$= 6[2 + 11]$

$= 6 \times 13$

$\Rightarrow S_{12} = 78$

$\therefore$ No of ~~plants~~ trees planted by 1 section of class = 78

No. of trees planted by 3 sections = $78 \times 3 = 234$

$\therefore$ 234 trees were planted by students

18. Perimeter of circle = πr

$P_1 = \pi(0.5) = \frac{\pi}{2}$ cm

$P_2 = \pi(1) = \pi$ cm

$P_3 = \pi(1.5) = \frac{3\pi}{2}$ cm

$P_4 = \pi(2) = 2\pi$ cm

P_1, P_2, P_3, P_4 are lengths of semi-circles.

AP: $\frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$

~~PQ = QR~~

$a = \frac{\pi}{2}$

$d = \pi - \frac{\pi}{2} = \frac{\pi}{2}$

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

$$S_{13} = \frac{13}{2}\left[2\left(\frac{\pi}{2}\right) + (13-1)\frac{\pi}{2}\right]$$

$$= \frac{13}{2}\left[\pi + 6\pi\right]$$

$$= \frac{13}{2} \times 7\pi$$

$$= \frac{13}{2} \times 7 \times \frac{22}{7}$$

$$= 143 \text{ cm}$$

19. No. of logs in rows are in form of an AP

AP: 20, 19, 18

$a = 20$

$d = (-1)$

$S_n = 200$

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

$$\Rightarrow 200 = \frac{n}{2}\left[2 \times 20 + (n-1)(-1)\right]$$

$$\Rightarrow 400 = n\left[40 - n + 1\right]$$

$$\Rightarrow 400 = n\left[41 - n\right]$$

$$\Rightarrow 400 = 41n - n^2$$

$n^2 - 41n + 400 = 0$

$\Rightarrow n^2 - 16n - 25n + 400 = 0$

$\Rightarrow n(n-16) - 25(n-16) = 0$

$\Rightarrow (n-25)(n-16) = 0$

$n = 25, 16$

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

$\Rightarrow a_{25} = 20 + (25-1)(-1)$

$= 20 - 24$

$= -4$

$a_{16} = 20 + (16-1)(-1)$

$= 20 - 15$

$= 5$

$\therefore$ Number of logs can't be negative.
So, 200 logs can be placed in 16 rows and no. of logs in 16^{th} row is 5.

20. Distance of potatoes from bucket are 5, 8, 11, 14 ... which is in the form of AP.

distance run by competitor for collecting these potatoes are twice of the distance at which the potatoes have been kept.

So, distances to be run with respect to distances of potatoes, could be written as:
10, 16, 22, 28 ...

$a = 10$

$d = 6$

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

$$\Rightarrow S_{10} = \frac{10}{2}[2 \times 10 + (10-1)6]$$

$$= 5[20 + 54]$$

$$= 5 \times 74$$

$$= 370$$

∴ The competitor will run a total distance of 370 m.