(4) AP - 9, 17, 25 . . . .

$a = 9$, $d = \overset{a_2 - a_1}{17 - 9}$, $S_n = 636$,
$= 8$

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

$\Rightarrow 636 = \frac{n}{2}[2\times9 + (n-1)8]$

$\Rightarrow 636 = \frac{n}{2}[18 + 8n - 8]$

$\Rightarrow 636 = \frac{n}{\cancel{2}} \cancel{2}(9 + 4n - 4)$

$\Rightarrow n(4n+5)$

$$\boxed{4n^2 + 5n - 636 = 0}$$

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

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

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

$n = \frac{-53}{4}$ or $n = 12$

Therefore, $n = 12$.

5) Given =

$a = 5,\ l = 45,\ S_n = 400,\ n = ?$

$S_n = \frac{n}{2}(a + l)$

$400 = \frac{n}{2}(5 + 45)$

$800 = n(50)$

$n = \frac{\cancel{800}^{16}}{\cancel{50}} = \cancel{8}\ 16$

$\therefore \boxed{n = 16}$

We know that,

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

$$\Rightarrow 400 = \frac{16}{2}[2\times 5+(16-1)d]$$

$$\Rightarrow 400\times 2 = 16[10+15d]$$

$$\Rightarrow \frac{800}{16} = 10+15d$$

$$\Rightarrow 50-10 = 15d$$

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

(6) Here,

$a = 17$, $a_n = 350$, $d = 9$, $n = ?$, $S_n = ?$

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

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

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

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

$$\Rightarrow n = 37+1$$

$$\Rightarrow n = 38$$

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

$$\Rightarrow S_n = \frac{38}{2}[2\times 17+(38-1)9]$$

$$\Rightarrow S_n = 19(34+333)$$

$$\Rightarrow S_n = 19\times 367 = 6973.$$

(7) ~~Here,~~
$n = 22$, $d = 7$, $l = 149$,

We known that,

22^{nd} term is 149.

Hence, $a + 21d = 149$ —— (i)
$a_{22} = a + (n-1)d$
$= a + (22-1)d$

Putting the value of 'd' in eq. (i.)
$a + 21 \times 7 = 149$
$a = 149 - 147$
$a = (2)$

we can find the sum of 22 terms by - the formula.

$S_n = \frac{n}{2}(a + l)$

$S_n = \frac{22}{2}(2 + 149)$

$S_n = 11(151)$

$\boxed{\therefore S_n = 1661}$

So, the sum of the 1^{st} 22 term AP is 1661.

(8) $a_n = 51$, $d = 18 - 14 = (4)$, S_n, $a = 10$, $S_n = ?$

2nd term of AP - 14

$a + d = 14$

$\Rightarrow a + 4 = 14$

$a = 14 - 4$

$\boxed{a = 10}$

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

$a_n = 10 + (51-1)4$

$a_n = 10 + 50 \times 4$

$a_n = 210 \cancel{200} = l$

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

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

$S_n = \frac{51}{2}[10 + 210]$

$S_n = \frac{51}{\cancel{2}}(\cancel{220})^{110} = 51 \times 110$

$S_n = 5610$

So, $S_{51} = 5610$.

(9) $S_7 = 49$

$S_{17} = 289$

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

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

$49 = \frac{7}{2}(2a + 6d)$

$7 = (a+3d)$

$a+3d = 7$ —— (i)

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

$289 = \frac{17}{2}[2a+16d]$

$17 = (a+8d)$

$a+8d = 17$ —— (ii)

Subtracting eq. (i) from eq. (ii)

$5d = 10$

$d = \frac{\cancel{10}^2}{\cancel{5}} = 2$

From eq. (i)

$a+3(2) = 7$

$a+6 = 7$

$a = 7-6 = 1$

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

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

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

$= \frac{n}{2} \times 2n = n^2$

10 $a_n = 3+4n$

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

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

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

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

It can be observed that,

$a_2 - a_1 = 11 - 7 = 4$
$a_3 - a_2 = 15 - 11 = 4$
$a_4 - a_3 = 19 - 15 = 4$

i.e., $a_{k+1} - a_k$ is same every time.

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

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

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

$= \frac{15}{\cancel{2}} \times \cancel{70}^{35} = 525$.

(11) $S_n = 4n - n^2$

$S_1 = 4 - 1 = 3$
$S_2 = (4 \times 2) - (2)^2 = 4$
$S_3 = (4 \times 3) - (3)^2 = 3$

$\therefore a_3 = S_3 - S_2 = (-1)$

$\therefore a_{10} = S_{10} - S_9$
$= (-15)$

$\therefore a_n = S_n - S_{n-1}$
$a_n = 5 - 2n$.

$35 \times 15 = 175 + 350 = 525$

$15 \times 8 = 120$

$14 \times 8 = 112$

(12) The multiples of 6 are -

$a = 6$
$d = 6$
$S_{40} = ?$

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

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

$= 20(12 + 234)$
$= 20 \times 246$
$= 4920$

(13) We can get the AP as -
8, 16, 24 . . . . . . 120 .

$a = 8, d = 8, a_n = 120, n = 15$

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

$S_n = \frac{15}{2}[\cancel{30}^{16} + \cancel{(} \underbrace{14 \times 8}_{112}]$

$S_n = \frac{15}{\cancel{2}} \times \cancel{142}\ \cancel{128}^{64}$

$S_n = \cancel{1065}\ 64 \times 15$

$\therefore S_n = 960$

(14) The sum of odd no.'s between 0 and 50 can be represented by A.P. as :

1, 3, 5 49

Here, $a = 1$, $d = a_2 - a_1$, $a_n = 49$, $n =$

$3 - 1 = 2$

$a_3 - a_2$

$5 - 3 = 2$

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

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

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

$\cancel{\frac{47}{2} + 1 = n \Rightarrow n = \frac{47+2}{2}}$

$\cancel{n = \frac{49}{2}}$

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

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

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

$n = 24 + 1$

$\therefore n = 25.$

$S_n = \frac{n}{2}(a + l)$

$S_n = \frac{25}{2}(1 + 49)$

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

$S_n = 25 \times 25$, which is

$\therefore S_n = 625.$

(15) The penalty for delay in completion of the construction work is = ₹200 for 1st day.

The penalty given by construction workers due to delay in 2nd day = ₹250

The penalty given for construction work due to day in 3rd day = ₹300.

The penalty in each succiding day is more than the preceding day by = ₹50

The amount of money paid for delaying 30 days =

A/Q
Here, $a = 200$, $d = 50$, $n = 30$, $S_n = ?$

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

$$S_{30} = 15\left[400 + (29 \times 50)\right]$$

$$S_{30} = 15\left[400 + 1450\right] \Rightarrow S_{30} = 15 \times 1850$$

$$S_{30} = ₹27,750$$

So, the sum of amount paid by the workers for delaying of 30 days is = ₹27,750.

(16) The sum of amount of money for prizes (S_n) $= ₹700$.

The no. of cash prizes ~~prizes~~ ~~to be~~ given to students (n) $= 7$

Each price is 20 less than the preceding, so here $d = (-20)$

The value of each prizes =

Given that, $S_7 = 700$

$\Rightarrow \frac{7}{2}[2a + (7-1)d] = 700$

$\Rightarrow \frac{[2a + (6)(-20)]}{2} = 100$

$\Rightarrow a + 3(-20) = 100$

$\Rightarrow a - 60 = 100$

$\Rightarrow a = 160$.

So, the AP ~~are~~ - 160, 140, 120, 100, 80, 60, 40.

Therefore the value of each of prizes was - ₹160, ₹140, ₹120, ₹100, ₹80, ₹60, ₹40

(17) It can be observed that the number of trees planted by the students is in a A.P.

1, 2, 3, 4, 5 ..... 12.

$a = 1$, $d = 2 - 1 = 1$, $S_n = ?$, $n = 12$

we know that,

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

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

$S_{12} = 6(2+11)$

$S_{12} = 6(13)$

$\therefore S_{12} = 78$

Therefore, no. of trees planted by 1 section of the classes = 78.

No. of trees planted by 3 sections of the classes = 3×78
$= 234$.

Therefore, ~~no. of~~ 234 trees will be planted by the students.

(18) Semi-perimeter of circle = πr

$l_1 = \pi(0.5) = \frac{\pi}{2}$ cm.

$l_2 = \pi(1) = \pi$ cm

$l_3 = \pi(1.5) = \frac{3\pi}{2}$ cm.

So, AP – $\frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi, \ldots$

$a = \frac{\pi}{2}$, $d = \pi - \frac{\pi}{2} = \frac{\pi}{2}$, $n = 13$, $S_{13} = ?$

We know that,

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

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

$$= \frac{13}{2}\left[\pi + \frac{12\pi}{2}\right]$$

$$= \left(\frac{13}{2}\right)(7\pi)$$

$$= \frac{91\pi}{2} = \frac{\cancel{91}^{13} \times \cancel{22}^{11}}{\cancel{2} \times \cancel{7}} = 13 \times 11 = 143$$

Therefore, the length of such spiral of thirteen consecutive semi-circles will be 143 cm.

(19) It can be observed that the no. of logs in rows are in an A.P.

20, 19, 18 . . . .

$a_1 = 20$, $d = (-1)$, $S_n = ?$

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

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

$$\Rightarrow 400 = n(40 - n + 1)$$

$$\Rightarrow 400 = n(41 - n)$$

$$\Rightarrow 400 = 41n - \cancel{n^2} \qquad \Rightarrow n^2 - 41n + 400 = 0$$

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

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

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

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

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

$a_{16} = 20-15$

$a_{16} = 5$

Similarly,

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

$a_{26} = 20-24$

$a_{26} = (-4)$

Therefore, 200 logs can be placed in 16 row and the number of logs in the 16^{th} row is 5.

(20) The distance of potatoes are as follows:-

5, 8, 11, 14 . . . .

It can be observed that these distances are in A.P.

$a=5$, $d = 8-5 = 3$

~~d = 8-5 = 3~~

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

$S_{10} = \frac{10}{2}[2(5)+(10-1)3] = 5[10+9\times3]$

$S_{10} = 5(10+27) = 5(37) = 185$

Therefore, total distance that the competitor will run $= 2\times185$

$= 370$ m.

x