Exercise 4.3

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

$A = 9$ $\qquad d = 17-9$

$S_n = 636$ $\qquad = 8$

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

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

$$\Rightarrow 636 = \frac{n}{2}(18 + 8n - 8)$$

$$\Rightarrow 636 = \frac{n}{2}(10 + 8n)$$

$$\Rightarrow 636 = \frac{n}{\cancel{2}}\cancel{2}(5 + 4n)$$

$$\Rightarrow 636 = n(5+4n)$$

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

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

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

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

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

$= 4n + 53 = 0$ or $n - 12 = 0$

$4n = -53$

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

$\frac{-53}{4}$ is rejected as $n = 12$

Date ______
Page ______

5. First term of AP = 5

last term of AP = 45

Sum of AP = 400

$a = 5$ $\qquad$ $n = 45$

$S_n = 400$

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

$\Rightarrow 400 = \frac{45}{2}\{2(5) + (45-1)d\}$

$\Rightarrow 400 = \frac{45}{2}\{10 + 44d\}$

$\Rightarrow \overset{80}{\cancel{400}} \times \frac{2}{\underset{9}{\cancel{45}}} = 10 + 44d$

$\Rightarrow \frac{n}{2}[a + l] = 400$

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

$\Rightarrow n = \frac{400}{25} = 16$

$a_{16} = 45$

$5 + 15d = 45$

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

so $n = 16$ and $d = \frac{8}{3}$

6) $a = 17$ $a_n = 350$ $d = 9$

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

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

$\Rightarrow 350 - 17 = 9n - 9$

$\Rightarrow 350 - 17 + 9 = 9n$

$\Rightarrow 350 - 8 = 9n$

$\Rightarrow 342 = 9n$

$\Rightarrow \frac{\cancel{342}^{38}}{\cancel{9}} = n$

$\Rightarrow n = 38$

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

$= \frac{\cancel{38}^{19}}{\cancel{2}}(2(17) + (38-1)9)$

$= 19\{34 + (37)9\}$

$= 19\{34 + 333\}$

$= 19\{367\}$

$= 6973.$

7) $d = 7$ $n = 22$ $a_n = 149$

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

$149 = a + (21)7$

$\Rightarrow 149 = a + 147$

$\Rightarrow 149 - 147 = a$

$\Rightarrow 2 = a$

Date
Page

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

$$= \frac{22^{11}}{2}(2+149)$$

$$= 11\,(151)$$

$$= 1661$$

8 Second term = 14 Third term = 18

$d = 4$

$a_2 = a + d = 14$

$a_3 = a + 2d = 18$

$\Rightarrow a + 4 = 14$

$\Rightarrow a = 10$

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

$$= \frac{51}{2}(2(10) + (51-1)4)$$

$$= \frac{51}{2}(20 + (50)4)$$

$$= \frac{51}{2}(20 + 200)$$

$$= \frac{51}{\cancel{2}}\ \cancel{220}^{110}$$

$$= 51 \times 110$$

$$= 5610.$$

9. Sum of first 7 terms of an AP = 49

$S_7 = 49$

$S_{17} = 289$

$\Rightarrow S_7 = \frac{7}{2}(2a + 6d) = 49$

$\Rightarrow 49 = \frac{7}{\cancel{2}}\cancel{2}(a + 3d)$

$\Rightarrow \frac{\cancel{49}^{7}}{\cancel{7}} = a + 3d$

$\Rightarrow a + 3d = 7$ —— (1)

$\Rightarrow S_{17} = \frac{17}{2}(2a + 16d) = 289$

$\Rightarrow 289 = \frac{17}{\cancel{2}}\cancel{2}(a + 8d)$

$\Rightarrow \frac{\cancel{289}^{17}}{\cancel{17}} = a + 8d$

$\Rightarrow a + 8d = 17$ —— (2)

Subtracting equation (1) from (2)

$a + 8d = 17$

$\underline{-a - 3d = -7}$

$5d = 10$

$d = 2$

Putting value of d in eq 2.

$a + 6 = 7$

$\Rightarrow a = 7 - 6$

$\Rightarrow = 1$

Date ______
Page ______

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

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

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

$$S_n = \frac{n}{\cancel{2}}\,\cancel{2}(n)$$

$$S_n = n^2$$

10

$$a_n = 3 + (4)n$$

For $n = 1$
$$a_1 = 3 + (4)1 = 7$$
For $n = 2$
$$a_2 = 3 + (4)2 = 11$$
For $n = 3$
$$a_3 = 3 + (4)3 = 15$$

$$AP = 7, 11, 15, \ldots$$
$$d = 11 - 7$$
$$= 4$$

~~an~~

$$S_{15} = \frac{15}{2}(2(7) + (15-1)4)$$
$$= \frac{15}{2}(14 + 56)$$
$$= \frac{15}{\cancel{2}}(\cancel{70}\;35)$$
$$S_{15} = \cancel{420}\;525$$

(ii) $a_n = 9 - 5n$

Putting $n = 1, 2, 3$

$a_1 = 9 - 5(1)$

$= 9 - 5 = 4$

$a_2 = 9 - 5(2)$

$= 9 - 10$

$= -1$

$a_3 = 9 - 5(3)$

$= 9 - 15 = -6$

AP = $4, -1, -6 \ldots\ldots$

$d = a_2 - a_1 = (-1) - (4) = -5$

$= a_3 - a_2 = -6 - (-1) = -6 + 1 = -5$

$= -5$

$a = 4$

$S_{15} = \frac{15}{2}\left(2(4) + (15-1)-5\right)$

$= \frac{15}{2}\ \cancel{(8 + 70)}\ \{8 + (-70)\}$

$= \frac{15}{\cancel{2}}\ (\cancel{62}^{\,31}) \qquad \frac{15}{\cancel{2}}\ (\cancel{-62}^{\,-31})$

$= (15)(31) = 15(-31)$

$= 465 \qquad = -465$

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

$S_1 = 4(1) - (1)^2 = 3$

$a_1 = 3 = S_1$

$S_2 = 4(2) - (2)^2 = 8 - 4 = 4$

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

$= \cancel{4 - 3}$

$=$

$S_3 = 4(3) - (3)^2 = 12 - 9 = 3$

$a_3 = S_3 - S_2 = 3 - 4 = -1$

$S_9 = 4(9) - (9)^2 = 36 - 81 = -45$

$S_{10} = 4(10) - (10)^2 = 40 - 100 = -60$

$a_{10} = S_{10} - S_9 = -60 - (-45) = -15$

$d = a_2 - a_1 = 1 - 3 = -2$

$\cancel{S_n} =$ $a_3 - a_2 = -1 - (1)$

$= -2$

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

$a_n = 3 + (-2n + 2)$

$a_n = 3 - 2n + 2$

$a_n = 5 - 2n$

$-1 = 4$

$12 - 9 = 3$

$81 = -45$

$0 = -60$

$5) = -15$

$1 - 3 = -2$

$1 - (d)$

-2

12. $6, 12, 18, \ldots\ldots a_{40}$

$a = 6$ $\qquad d = a_2 - a_1 = 12 - 6 = 6$

$\qquad\qquad\qquad a_3 - a_2 = 18 - 12 = 6$

$n = 40$

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

$a_{40} = 6 + (40-1)6$

$a_{40} = 6 + (39)(6)$

$a_{40} = \cancel{6+}240$

$\cancel{S_{40} = \frac{40}{2}(6+}$

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

& $S_{40} = \frac{40}{2}(6 + 240)$

& $S_{40} = 20\ (246)$

$\Rightarrow S_{40} = 4920$

13. ~~Sum of~~ $8, 16, 24, \ldots\ldots a_{15}$

$a = 8$ $\qquad d = 8$

$S_n = \frac{15}{2}(2(8) + (15-1)8)$

$= \frac{15}{2}(16 + 112)$

$= \frac{15}{\cancel{2}}(\overset{64}{\cancel{128}})$

$S_n = 960$

14 $1, 3, 5, 7, 9, \ldots\ldots 49$

$a = 1 \quad d = 2 \quad a_n = 49$

$S_n = \frac{49}{2}\left(2(1) + (49-1)2\right)$

$= \frac{49}{2}(2 + 96)$

$S_n = \frac{49}{2}(98)$

$= 49$

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

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

$a_{49} = 1 + (48)2$

$49 = 1 +$

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

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

$49 - 1 = 2n - 2$

$48 + 2 = 2n$

$\frac{50}{2} \; 25 = n$

$\Rightarrow 25 = n.$

$S_{25} = \frac{25}{2}\left(2(1) + (25-1)2\right)$

$= \frac{25}{2}(2 + 48)$

$S_{25} = (25)(25)$

$S_{25} = 625$

15. $200, 250, 300, \ldots\ldots a_{30}$

$a = 200 \qquad d = 50$

$a_n = 30$

$a_n = 200 + (30-1)\,50$

$= 200 + (29)\,50$

$= 200 + 1450$

$a_{30} = 1650$

~~So the co~~

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

$= 15\,(400 + 1450)$

$= 27750$

So the contractor has to pay ₹27,750

18. $S_n = 700 \qquad n = 7$

Let first prize $= a$

second prize $= a - 20$

third prize $= a - 20 - 20$

$a, (a-20), (a-40), \ldots\ldots (a-120)$

$a_1 = a. \qquad d = -20$

$S_n = \frac{7}{2}\left(2a + (7-1)-20\right)$

$700 = \frac{7}{2}\left\{2a + 6(-20)\right\}$

$700 = \frac{7}{2}\left(2a + (-120)\right)$

Date
Page

$700 = \frac{7}{2} \times (a - 60)$

$\Rightarrow \frac{\cancel{700}}{7}^{100} = a - 60$

$\Rightarrow 100 + 60 = a$

$\Rightarrow 160 = a$

AP = 160, ~~1~~140, 120, 100, 80.

17 Trees planted by 3-sec of class I = 3 × 1 = 3
Trees planted by 3-sec of class II = 3 × 2 = 6
Trees planted by 3-sec of class III = 3 × 3 = 9

Trees planted by 3-sec of class XII = 3 × 12 = 36

The A.P formed is
3, 6, 9, ---- 36
$a = 3$, $d = 3$, $n = 12$ and $l = 36$

$S_{12} = \text{Sum} = \frac{12}{2}(3 + 36) = 6 \times 39 = 234$

18 $R_1 = 0.5\,cm$, $R_2 = 1.0\,cm$, $R_3 = 1.5\,cm$

$a = 0.5\,cm$, $d = 1.0 - 0.5\,cm = 0.5\,cm$

Length of spiral = 13 consecutive semicircles
$= \pi R_1 + \pi R_2 + \pi R_3 + \dots \pi R_{13}$
$= \pi \left(\frac{13}{2}[2 \times 0.5 + (13-1)(0.5)]\right)$

$3 \times 1 = 3$

$3 \times 2 = 6$

$3 \times 3 = 9$

$3 \times 12 = 36$

$= 36$

34

5cm

rdey

$= \pi \left[\frac{13}{2} (1 + 120 \times 0.5) \right]$

$= \pi \times \left(\frac{13}{2} \times 7 \right) = \frac{22}{7} \times \frac{13}{2} \times 7$

$= 143 cm$

19. No. of logs row-wise
$20, 19, 18, 17 \ldots$

$a = 20 \quad d = -1$

Let no. of rows be n

$S_n = 200$

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

$\Rightarrow \frac{n}{2} (41 - n] = 200$

$41n - n^2 = 400$

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

$\Rightarrow n = \frac{41 \pm \sqrt{(-41)^2 - 4 \times 1 \times 400}}{2}$

$= \frac{41 \pm \sqrt{1681 - 1600}}{2} = \frac{41 \pm 9}{2}$

$\Rightarrow n = 25$ or $n = 16$

Rejecting $n = 25$ we get
$n = 16$

$= 20 + 15(-1) = 5$

Thus number of rows is 16 and the number of logs in top row is 5.

Date ____
Page ____

20. Distance betwen the 1st patato and the bucket = 5 m

next 2 patatoes = 3 m each

So A.P is

5 m, 8 m, 11 m

$a = 5\,m$ $\quad d = 8-5 = 3\,m$

Total distance = $2[5+8+11+\cdots+10\text{ term}]$

$$S_{10} = 2\left[\frac{10}{2}\{2\times 5+(10-1)3\}\right]$$

$$= 2[5(10+27)]$$

$$= 2(37\times 5) = 37\times 10 = 370\,m$$