

Q.17

$$a_6 + a_8 = 40$$

$$(a+5d) + (a+7d) = 40$$

$$2a + 12d = 40$$

$$\frac{2(a+6d)}{2} = \frac{40}{2}$$

$$a + 6d = 20$$

$$a = 20 - 6d \quad \text{--- (1)}$$

$$\therefore a_4 + a_7 = 220$$

$$(a+3d) + (a+6d) = 220$$

$$a^2 + 3ad + 6ad + 18d^2 = 220$$

$$a^2 + 9ad + 18d^2 = 220$$

$$(20-6d)^2 + 9(20-6d)d + 18d^2 = 220$$

$$400 + 36d^2 - 240d + 180d - 54d^2 + 18d^2 = 220$$

$$400 - 60d = 220$$

$$400 - 220 = 60d$$

$$\frac{60d}{60} = \frac{180}{60} \quad 3$$

$$d = 3$$

$$a = 20 - 6d$$

$$a = 20 - 6(3) = 20 - 18 = 2$$

$$a_1 = 2$$

$$a_2 = 2 + 3 = 5$$

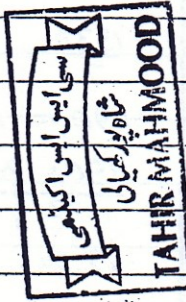
$$a_3 = 2 + 2(3) = 8$$

$$a_4 = 2 + 3(3) = 11$$

and so on

Hence the Sequence is

$$2, 5, 8, 11, \dots$$



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Q.18

(19)

$\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$  will be A.P. if

$$\frac{1}{c+a} - \frac{1}{b+c} = \frac{1}{a+b} - \frac{1}{c+a}$$

$$\frac{b+c - c - a}{(c+a)(b+c)} = \frac{c+a - a - b}{(a+b)(c+a)}$$

Multiplying by  $(c+a)$

$$(c+a) \frac{b-a}{(c+a)(b+c)} = \frac{(c-b)}{(a+b)(c+a)} \times (c+a)$$

$$\frac{b-a}{b+c} = \frac{c-b}{a+b}$$

$$(a+b)(b-a) = (c-b)(b+c)$$

$$b^2 - a^2 = c^2 - b^2 \quad \text{(Proved)}$$

This is the Common difference

of the A.P.  $a^2, b^2, c^2$

So  $\frac{1}{a+b}, \frac{1}{b+c}, \frac{1}{c+a}$  is in A.P.

## Exercise: 6.5

Q.1) 10, 15, 20, ...,  $a_n$

$$a_1 = 10 \quad d = 15 - 10 = 5 \quad n = 9$$

$$S_9 = \frac{9}{2} \{2(10) + 8(5)\}$$

$$S_9 = \frac{9}{2} \{20 + 40\}$$

$$S_9 = \frac{9}{2} \{60\}$$

$$S_9 = 270 \text{ rupees.}$$

Q.2) Some of trees = 378

$$AP = 1, 2, 3, 4, \dots, 378$$

$$a_1 = 1 \quad d = 2 - 1 = 1 \quad n = ?$$

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

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$$378 = \frac{n}{2} (2(1) + (n-1)(1))$$

$$378 \times 2 = n(2 + n - 1)$$

$$756 = n(n+1)$$

$$n^2 + n - 756 = 0$$

$$n^2 + 28n - 27n - 756 = 0$$

$$n(n+28) - 27(n+28) = 0$$

$$(n-27)(n+28) = 0$$

$$n-27 = 0 \quad \wedge \quad n+28 = 0$$

$$n = 27 \quad \wedge \quad n = -28$$

So  $n = 27$  (which is not possible)

So total number of rows = 27

$$a_{27} = a_1 + (27-1)d$$

$$a_{27} = 1 + 26(1)$$

$$a_{27} = 1 + 26$$

$$a_{27} = 27$$

Thus 27 trees are in the base of  $\Delta$

Q.3 Total Money to pay = 1100 + 230

$$S_n = 1330$$

He has to repay 1330 in 14 installment each installment being less than up coming by Rs. 10 so

$$n = 10 \text{ and } d = -10$$

$$S_n = \frac{n}{2} [2a_1 + (n-1)d]$$

$$S_{14} = \frac{14}{2} [2a_1 + 13(-10)]$$

$$1330 = 7(2a_1 - 130)$$

$$\frac{1330}{7} = 2a_1 - 130$$

$$190 = 2a_1 - 130$$

$$\frac{190 + 130}{2} = a_1$$

$$a_1 = \frac{320}{2} = 160$$

$$a_1 = 160$$

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This first installment is B. 160

Q.4 The Clock strikes according to the Sequence

$$1, 2, 3, 4, \dots, a_{12}$$

$$a_1 = 1 \quad d = 2 - 1 = 1 \quad n = 12$$

$$S_n = \frac{n}{2} [2a_1 + (n-1)d]$$

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

$$S_{12} = 6(2+11) = 6(13) = 78$$

So it strikes 78 times in 12 hours.

Q.5  $S_n = 2100$

$$a_1 = 12 \quad d = 4$$

$$S_n = \frac{n}{2} [2a_1 + (n-1)d]$$

$$2100 = \frac{n}{2} [2(12) + (n-1)4]$$

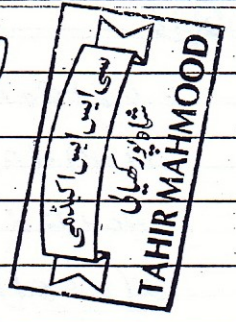
$$2100 = \frac{2n}{2} [12 + (n-1)2]$$

$$2100 = n(12 + 2n - 2)$$

$$2100 = 2n^2 + 10n$$

$$\frac{1050}{2} = \frac{2(n^2 + 5n)}{2}$$

$$1050 = n^2 + 5n$$



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$$n^2 + 5n - 1050 = 0$$

$$n^2 + 35n - 30n - 1050 = 0$$

$$n(n+35) - 30(n+35) = 0$$

$$(n+35)(n-30) = 0$$

$$n-30 = 0 \quad \wedge \quad n+35 = 0$$

$$n = 30 \quad \wedge \quad n = -35$$

$n = 30$  (which is not possible)

After 30 weeks he will collect 2100 rupees

Q.6 Sequence of falling object.

9, 27, 45, ...

(ii)  $a_1 = 9 \quad d = 27 - 9 = 18 \quad n = 5$

$$S_n = \frac{n}{2} [2a_1 + (n-1)d]$$

$$S_5 = \frac{5}{2} [2(9) + (5-1)18]$$

$$S_5 = \frac{5}{2} [9 + 4(9)]$$

$$S_5 = 5(9 + 36)$$

$$S_5 = 5(45)$$

$$S_5 = 225 \text{ meters}$$

(i)  $a_5 = ?$

$$a_5 = a_1 + 4d$$

$$a_5 = 9 + 4(18)$$

$$a_5 = 9 + 72 = 81 \text{ m}$$

It will be 81 meter away in 5th second.

Q.7  $a_1 = 6000 \quad n = 11$  (years)

$$a_{11} = 12000 \quad S_{11} = ?$$

$$a_n = a_1 + (n-1)d$$

(21)

$$12000 = 6000 + 10d$$

$$\frac{12000 - 6000}{10} = \frac{10d}{10}$$

$$d = \frac{6000}{10}$$

$$d = 600$$

So income in past 11 years.

$$S_{11} = \frac{11}{2} [2(6000) + 10 \times 600]$$

$$S_{11} = \frac{11}{2} [12000 + 6000]$$

$$S_{11} = \frac{11}{2} [18000]$$

$$S_{11} = 99000 \text{ rupees}$$

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Q.8 Sum of the angles of 3 sided polygon =  $\pi$

" " " " " 4 " " =  $2\pi$

" " " " " 5 " " =  $3\pi$

So A.P. =  $\pi, 2\pi, 3\pi, \dots, a_{14}$

$$a = \pi \quad d = 2\pi - \pi = \pi \quad n = 14$$

$$a_n = a_1 + (n-1)d$$

$$a_{14} = \pi + 13\pi$$

$$a_{14} = 14\pi$$

Q.9  $S_8 = 60,000 \quad n = 8$

$$a = 4000 \quad a_8 = ?$$

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

$$60000 = \frac{8}{2} [2(4000) + (8-1)d]$$

$$\frac{15000}{4} = \frac{8}{2} [8000 + 7d]$$

$$15000 = 8000 + 7d$$

$$7d = 15000 - 8000 = 7000$$

$$d = 1000$$

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## Geometric Sequence (G.P.): (22)

"The Sequence in which

a Common ratio is exist between two consecutive terms is called Geometric Sequence or Geometric Progression."

Common ratio is denoted by  $r$

$$r = \frac{a_n}{a_{n-1}}$$

Using the following formula we can expand the (G.P)

$$a_n = a r^{n-1}$$

## Exercise 6.6

Q.1 G.P. 3, 6, 12, ...

$$a = 3 \quad r = \frac{6}{3} = 2$$

$$a_n = a r^{n-1}$$

$$a_5 = (3)(2)^4 = 3 \times 16 = 48$$

Q.2 G.P. =  $1 + 2, 2, \frac{4}{1+2}$

$$a = 1+2 \quad r = \frac{2}{1+2}$$

$$a_n = a r^{n-1}$$

$$a_{11} = a r^{10}$$

$$a_{11} = (1+2) \left[ \frac{2}{1+2} \right]^{10}$$

$$a_{11} = (1+2) \frac{1024}{(1+2)^{10}}$$

$$a_{11} = \frac{1024}{(1+2)^9}$$

$$a_8 = a + 7d$$

$$a_8 = 4000 + 7(1000)$$

$$a_8 = 4000 + 7000$$

$$a_8 = 11000$$

The first team will receive Rs. 11,000

Q.10 Let us denote the sum of the balls of 1st, 2nd, 3rd, ... 8th layer

by  $S_1, S_2, S_3, \dots, S_8$

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

$$S_8 = 8 + 7 + 6 + \dots + 1 = \frac{8}{2} (8 + 1) \\ = 4(8 + 1) = 36$$

$$S_7 = 7 + 6 + 5 + \dots + 1 = \frac{7}{2} (7 + 1) = 28$$

$$S_6 = 6 + 5 + 4 + \dots + 1 = \frac{6}{2} (6 + 1) = 21$$

$$S_5 = 5 + 4 + 3 + 2 + 1 = \frac{5}{2} (5 + 1) = 15$$

$$S_4 = 4 + 3 + 2 + 1 = \frac{4}{2} (4 + 1) = 10$$

$$S_3 = 3 + 2 + 1 = \frac{3}{2} (3 + 1) = 6$$

$$S_2 = 2 + 1 = 3$$

$$S_1 = 1$$

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This Total number of balls

$$1 + 3 + 6 + 10 + 15 + 21 + 28 + 36 = 120 \text{ balls}$$

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