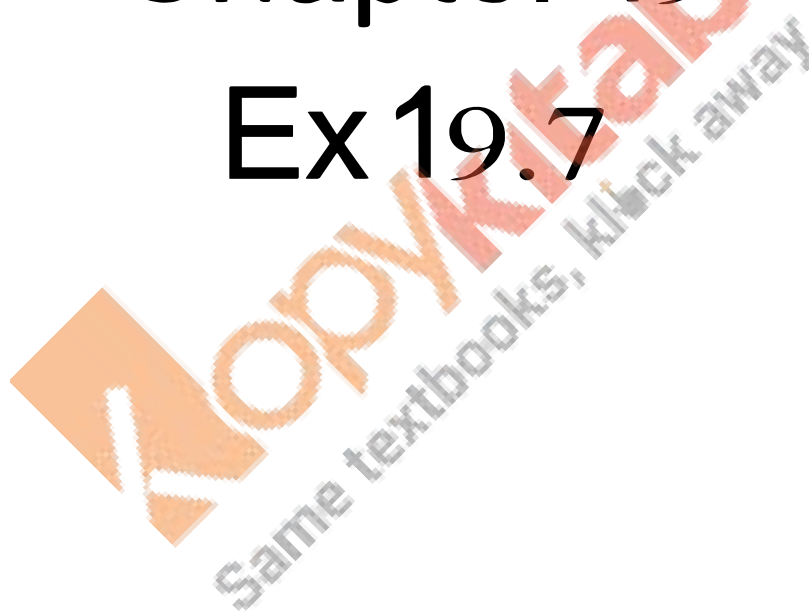


RD Sharma
Solutions
Class 11 Maths
Chapter 19
Ex 19.7



Arithmetic Progressions Ex 19.7 Q1

Let the amount saved by the man in first year be x .

Then,

A T Q

$$x + (x + 100) + (x + 200) + \dots + (x + 900) = 16500$$

As his saving increased by Rs 100 every year.

$$\therefore 10x + 100 + 200 + \dots + 900 = 16500 \quad \text{--- (i)}$$

Here,

$100 + 200 + 300 + \dots + 900$ form a series of

$$a = 100, d = 100 \text{ and } n = 9$$

So,

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

$$S_9 = \frac{9}{2}[100 + 900] = 4500 \quad \text{--- (ii)}$$

From (i) and (ii)

$$10x + (4500) = 16500$$

$$10x = 12000$$

$$\text{or } x = 1200$$

The man saved Rs 1200 in the first year.

Arithmetic Progressions Ex 19.7 Q2

Let the man save Rs 200 in n numbers of years.

Then,

A T Q

$$32 + 36 + 40 + \dots = 200$$

It forms a series of n terms, with $a = 32$ and $d = 4$

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

$$\Rightarrow 200 = \frac{n}{2}[2(32) + (n - 1)4]$$

$$\Rightarrow 400 = 60n + 4n^2$$

$$\Rightarrow n^2 + 15n - 100 = 0$$

$$\Rightarrow n = 5 \text{ or } -20$$

But, $n \neq -20$

[It can't be negative]

$\therefore n = 5$

The man will save Rs 200 in 5 years.

Arithmetic Progressions Ex 19.7 Q3

Let the 40 annual instalments form an arithmetic series of common difference d and first instalment a . Then, series so formed is

$$a + (a + d) + (a + 2d) + \dots = 3600$$

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

$$\text{or } 3600 = 20 [2a + 39d]$$

$$2a + 39d = 180$$

---(i)

and sum of first 30 terms is $\frac{2}{3}$ of 3600

$$= 2400$$

$$\Rightarrow 2400 = \frac{30}{2} [2a + (29)d]$$

$$\text{or } 2a + 29d = 160$$

---(ii)

From (i) and (ii)

$$a = 51$$

The first installment paid by this man is Rs 51.

Arithmetic Progressions Ex 19.7 Q4

Let the number of Radio manufactured increase by x each year and number of radio manufacture in first year be a . So, A.P formed ATQ is

$$a, a + x, a + 2x, \dots$$

Here,

$$a_3 = a + 2x = 600$$

---(i)

$$a_7 = a + 6x = 700$$

---(ii)

From (i) and (ii)

$$a = 550, x = 25$$

(i) 550 Radio's were manufactured in the first year.

(ii) The total produce in 7 years is sum of produce in the first 7 years.

$$S_7 = \frac{7}{2}[550 + 700] \quad \left[\because S_n = \frac{n}{2}[a + l] \right]$$
$$= 4375$$

4375 Radio's were manufactured in first 7 years.

(iii) The product in 10th year

$$a_{10} = a + 9d$$
$$= 550 + 9(25) = 775$$

775 Radio's were manufactured in the 10th year.

Arithmetic Progressions Ex 19.7 Q5

There are 25 trees at equal distance of 5 m in a line with a well(w), and the distance of the well from the nearest tree = 10 m.

Thus,

The total distance travelled by gardener to tree 1 and back is 2×10 m = 20 m

Similarly for all the 25 trees.

The distance covered by gardener is

$$= 2[10 + (10 + 5) + (10 + 2 \times 5) + (10 + 3 \times 5) + \dots + (10 + 23 \times 5)] \quad \text{--- (i)}$$

This forms a series of 1st term $a = 10$, common difference $d = 5$ and $n = 25$

$$\therefore 10 + (10 + 5) + (10 + 2 \times 5) + \dots + (10 + 24 \times 5)$$

$$\Rightarrow S_{25} = \frac{25}{2}[2 \times 10 + (24)5] = 25[10 + 60] = 1750 \text{ m} \quad \text{--- (ii)}$$

From (i) and (ii)

$$\text{Total distance} = 2 \times 1750 \text{ m} = 3500 \text{ m.}$$

Arithmetic Progressions Ex 19.7 Q6

The man counts at the rate of Rs 180 per minute for half an hour. After this he counts at the rate of Rs 3 less every minute than preceding minute.

Then, the amount counted in first 30 minute

$$= \text{Rs } 180 \times 30 = \text{Rs } 5400 \quad \text{--- (i)}$$

The amount left to be counted after 30 minute

$$= \text{Rs } 10710 - 5400 = \text{Rs } 5310 \quad \text{---(ii)}$$

ATQ

$$\text{A.P formed is } (180 - 3) + (180 - 2 \times 3) + \dots = 5310$$

Let time taken to count 5310 be t

Then,

$$S_t = \frac{t}{2} [(180 - 3) + (t - 1)(-3)]$$

$$5310 = \frac{t}{2} [200 - 3t]$$

$$\text{or } t = 59 \text{ minute}$$

Thus, the total time taken by the man to count Rs 10710 is $(59 + 30) = 89$ minutes.

Arithmetic Progressions Ex 19.7 Q7

The piece of equipment depreciates 15% in first year i.e., $\frac{15}{100} \times 600,000 = \text{Rs } 90,000$

$$\therefore \text{Value after 1st year} = 600,000 - 90,000 \\ = \text{Rs } 510,000 \quad \text{---(i)}$$

The equipment depreciates at the rate 135% in 2nd year i.e., $\frac{135}{1000} \times 600,000 = 81000$

$$\therefore \text{Value after 2nd year} = 81000$$

The value after 3rd year = $\frac{12}{100} \times 600000 = 72000$

The total depreciation in 10 years

$$\Rightarrow S_{10} = \frac{10}{2} [2 \times 81000 + (9)(-9000)] \\ = 5[81000] \quad \left[\text{Using } S_n = \frac{n}{2} [2a + (n - 1)d] \right] \\ = 405000$$

∴ The cost of machine after 10 years = Rs 600000 - 405000
= 105000.

Arithmetic Progressions Ex 19.7 Q8

Total cost of tractor

$$\begin{aligned}
 &= 6000 + [(500 + 12\% \text{ of } 6000 \text{ for 1 year}) + (500 + 12\% \text{ of } 5500 \text{ 1 year}) + \dots + 12 \text{ times}] \\
 &= 6000 + 6000 + \frac{12}{100} (6000 + 5500 + \dots + 12 \text{ times}) \\
 &= 12000 + \frac{12}{100} \left[\frac{12}{2} (6000 + 5000) \right] \\
 &= 12000 + \frac{12}{100} \times \frac{12}{2} \times 6500 \\
 &= 12000 + (72 \times 65) \\
 &= 12000 + 4680 \\
 &= 16680
 \end{aligned}$$

Total cost of tractor = Rs. 16680

Arithmetic Progressions Ex 19.7 Q9

Total cost of Scooter

$$\begin{aligned}
 &= \text{Rs } 4000 + \left[\begin{aligned} &\{ \text{Rs } 1000 + \text{S.I. on Rs Rs } 18000 \text{ for 1 year} \} \\ &+ \{ \text{Rs } 1000 + \text{S.I. on Rs Rs } 17000 \text{ for 1 year} \} \\ &+ \dots + 18 \text{ times} \end{aligned} \right] \\
 &= (4000 + 18000) + \text{S.I. for 1 year on } (18000 + 17000 + \dots \text{ to } 18 \text{ times}) \\
 &= 22000 + \text{S.I. for 1 year on } \left\{ \frac{18}{2} (18000 + 1000) \right\} \\
 &= 22000 + 9 (19000) \times \frac{10}{100} \\
 &= 22000 + 17100 \\
 &= \text{Rs } 39100
 \end{aligned}$$

Total cost of Scooter = Rs. 39100

Arithmetic Progressions Ex 19.7 Q10

First year the person income is: 300,000

Second year his income will be: $300,000 + 10,000 = 310,000$

...

...

This way he receives the amount after 20 years will be:

$$300,000 + 310,000 + \dots + 490,000$$

This is an AP with first term $a = 300000$ and common difference $d = 10,000$.

Therefore

$$\begin{aligned} S &= \frac{20}{2} [2 \cdot 300000 + (20 - 1)10000] \\ &= 10 [600000 + 190000] \\ &= 7900000 \end{aligned}$$

Arithmetic Progressions Ex 19.7 Q11

In 1st installment the man paid 100 rupees.

In 2nd installment the man paid $(100 + 5) = 105$ rupees.

...

...

Likewise he pays up to the 30th installment as follows:

$$100 + 105 + \dots + (100 + 5 \times 29)$$

This is an AP with $a = 100$ and common difference $d = 5$.

Therefore at the 30th installment the amount he will pay

$$\begin{aligned} T_{30} &= 100 + (30 - 1)(5) \\ &= 100 + 145 \\ &= 245 \end{aligned}$$

Arithmetic Progressions Ex 19.7 Q12

Suppose carpenter took n days to finish his job.

First day carpenter made five frames

$$a_1 = 5$$

Each day after first day he made two more frames

$$d=2$$

∴ On n^{th} day frames made by carpenter are,

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

$$\Rightarrow a_n = 5 + (n-1)2$$

Sum of all the frames till n^{th} day is

$$S = \frac{n}{2}[a_1 + a_n]$$

$$192 = \frac{n}{2}[5 + 5 + (n-1)2]$$

$$192 = 5n + n^2 - n$$

$$n^2 + 4n - 192 = 0$$

$$(n+16)(n-12) = 0$$

$$n = -16 \text{ or } n = 12$$

But number of days cannot be negative hence $n = 12$.

The carpenter took 12 days to finish his job.

Arithmetic Progressions Ex 19.7 Q13

We know that sum of interior angles of a polygon with n sides is given by,

$$a_n = 180^\circ(n-2)$$

Sum of interior angles of a polygon with 3 sides is given by,

$$a_3 = 180^\circ(3-2) = 180^\circ \dots\dots\dots (i)$$

Sum of interior angles of a polygon with 4 sides is given by,

$$a_4 = 180^\circ(4-2) = 360^\circ \dots\dots\dots (ii)$$

Sum of interior angles of a polygon with 5 sides is given by,

$$a_5 = 180^\circ(5-2) = 540^\circ \dots\dots\dots (iii)$$

From eqⁿ (i), eqⁿ (ii) and eqⁿ (iii) we get,

$$a_4 = 360^\circ = 180^\circ + 180^\circ = a_3 + 180^\circ = a_3 + d$$

$$a_5 = 540^\circ = 180^\circ + 360^\circ = a_4 + 180^\circ = a_4 + d$$

Hence the sums of the interior angles of polygons with 3, 4, 5, 6, ... sides form an arithmetic progression.

Sum of interior angles of 21 sided polygon

$$= 180^\circ(21-2)$$

$$= 3420^\circ$$