

RD SHARMA
Solutions
Class 10 Maths
Chapter 9
Ex 9.5

1. Find the sum of the following arithmetic progressions:

- (i) 50, 46, 42, ... to 10 terms
- (ii) 1, 3, 5, 7, ... to 12 terms
- (iii) $3, 9/2, 6, 15/2, \dots$ to 25 terms
- (iv) 41, 36, 31, ... to 12 terms
- (v) $a + b, a - b, a - 3b, \dots$ to 22 terms
- (vi) $(x - y)^2, (x^2 + y^2), (x + y)^2, \dots$ to n terms
- (vii) $\frac{x-y}{x+y}, \frac{3x-2y}{x+y}, \frac{5x-3y}{x+y}, \dots$ to n terms
- (viii) $-26, -24, -22, \dots$ to 36 terms

Sol:

In an A.P let first term = a , common difference = d , and there are n terms. Then, sum of n terms is,

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

- (i) Given progression is,
50, 46, 42,to 10 term.
First term (a) = 50
Common difference (d) = $46 - 50 = -4$
 n^{th} term = 10
Then $S_{10} = \frac{10}{2}\{2.50 + (10 - 1) - 4\}$
 $= 5\{100 - 9.4\}$
 $= 5\{100 - 36\}$
 $= 5 \times 64$
 $\therefore S_{10} = 320$

- (ii) Given progression is,
 1, 3, 5, 7,to 12 terms
 First term difference (d) = 3 - 1 = 2
 n^{th} term = 12

$$\begin{aligned} \text{Sum of } n^{\text{th}} \text{ terms } S_{12} &= \frac{12}{2} \times \{2 \cdot 1 + (12 - 1) \cdot 2\} \\ &= 6 \times \{2 + 22\} = 6 \cdot 24 \\ \therefore S_{12} &= 144. \end{aligned}$$

- (iii) Given expression is

$3, \frac{9}{2}, 6, \frac{15}{2}, \dots$ to 25 terms

First term (a) = 3

Common difference (d) = $\frac{9}{2} - 3 = \frac{3}{2}$

Sum of n^{th} terms S_n , given $n = 25$

$$S_{25} = \frac{n}{2} (2a + (n - 1) \cdot d)$$

$$S_{25} = \frac{25}{2} \left(2 \cdot 3 + (25 - 1) \cdot \frac{3}{2} \right)$$

$$= \frac{25}{2} \left(6 + 24 \cdot \frac{3}{2} \right)$$

$$= \frac{25}{2} (6 + 36)$$

$$= \frac{25}{2} (42)$$

$$\therefore S_{25} = 525$$

- (iv) Given expression is,

41, 36, 31, to 12 terms.

First term (a) = 41

Common difference (d) = 36 - 41 = - 5

Sum of n^{th} terms S_n , given $n = 12$

$$S_{12} = \frac{n}{2} (2a + (n - 1) \cdot d)$$

$$= \frac{12}{6} (2 \cdot 41 + (12 - 1) \cdot (-5))$$

$$= 6(82 + 11 \cdot (-5))$$

$$= 6(27)$$

$$= 162$$

$$\therefore S_{12} = 162.$$

(v) $a + b, a - b, a - 3b, \dots$ to 22 terms

First term (a) = $a + b$

Common difference (d) = $a - b - a - b = -2b$

Sum of n^{th} terms $S_n = \frac{n}{2} \{2a(n-1) + d\}$

Here $n = 22$

$$S_{22} = \frac{22}{2} \{2(a+b) + (22-1) \cdot -2b\}$$

$$= 11 \{2(a+b) - 22b\}$$

$$= 11 \{2a - 20b\}$$

$$= 22a - 440b$$

$$\therefore S_{22} = 22a - 440b$$

(vi) $(x-y)^2, (x^2+y^2), (x+y)^2, \dots$ to n terms

First term (a) = $(x-y)^2$

Common difference (d) = $x^2 + y^2 - (x-y)^2$

$$= x^2 + y^2 - (x^2 + y^2 - 2xy)$$

$$= x^2 + y^2 - x^2 - y^2 + 2xy$$

$$= 2xy$$

Sum of n^{th} terms $S_n = \frac{n}{2} \{2a(n-1) + d\}$

$$= \frac{n}{2} \{2(x-y)^2 + (n-1) \cdot 2xy\}$$

$$= n \{(x-y)^2 + (n-1)xy\}$$

$$\therefore S_n = n \{(x-y)^2 + (n-1)xy\}$$

(vii) $\frac{x-y}{x+y}, \frac{3x-2y}{x+y}, \frac{5x-3y}{x+y}, \dots$ to n terms

First term (a) = $\frac{x-y}{x+y}$

Common difference (d) = $\frac{3x-2y}{x+y} - \frac{x-y}{x+y}$

$$= \frac{3x-2y-x+y}{x+y}$$

$$= \frac{2x-y}{x+y}$$

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

$$= \frac{n}{2} \left\{ 2 \cdot \frac{x-y}{x+y} + (n-1) \cdot \frac{2x-y}{x+y} \right\}$$

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

$$= \frac{n}{2(x+y)} \{2x - 2y + 2nx - ny - 2x + y\}$$

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

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

(viii) Given expression $-26, -24, -22, \dots$ To 36 terms

First term $(a) = -26$

Common difference $(d) = -24 - (-26) = -24 + 26 = 2$

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

Sum of n terms $S_n = \frac{36}{2}\{2 \cdot -26 + (36 - 1)2\}$

$= 18[-52 + 70]$

$= 18 \cdot 18$

$= 324$

$\therefore S_n = 324$

2. Find the sum to n term of the A.P. $5, 2, -1, -4, -7, \dots$

Sol:

Given AP is $5, 2, -1, -4, -7, \dots$

$a = 5, d = 2 - 5 = -3$

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

$= \frac{n}{2}\{2 \cdot 5 + (n - 1) - 3\}$

$= \frac{n}{2}\{10 - 3(n - 1)\}$

$= \frac{n}{2}\{13 - 3n\}$

$\therefore S_n = \frac{n}{2}(13 - 3n)$

3. Find the sum of n terms of an A.P. whose n th term is given by $a_n = 5 - 6n$.

Sol:

Given n th term $a_n = 5 - 6n$

Put $n = 1, a_1 = 5 - 6 \cdot 1 = -1$

We know, first term $(a_1) = -1$

Last term $(a_n) = 5 - 6n = 1$

Then $S_n = \frac{n}{2}(-1 + 5 - 6n)$

$= \frac{n}{2}(4 - 6n) = \frac{n}{2}(2 - 3n)$

4. If the sum of a certain number of terms starting from first term of an A.P. is 25, 22, 19, ... is 116. Find the last term.

Sol:

Given AP is 25, 22, 19,

First term (a) = 25, d = 22 - 25 = -3.

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

$$116 = \frac{n}{2}(2 \times 25 + (n-1) - 3)$$

$$232 = n(50 - 3(n-1))$$

$$232 = n(53 - 3n)$$

$$232 = 53n - 3n^2$$

$$3n^2 - 53n + 232 = 0$$

$$(3n - 29)(n - 8) = 0$$

$$\therefore n = 8$$

$$\Rightarrow a_8 = 25 + (8-1) - 3$$

$$\therefore n = 8, a_8 = 4$$

$$= 25 - 21 = 4$$

5. (i) How many terms of the sequence 18, 16, 14, ... should be taken so that their
(ii) How many terms are there in the A.P. whose first and fifth terms are -14 and 2 respectively and the sum of the terms is 40?
(iii) How many terms of the A.P. 9, 17, 25, ... must be taken so that their sum is 636?

- (iv) How many terms of the A.P. 63, 60, 57, ... must be taken so that their sum is 693?

Sol:

- (i) Given sequence, 18, 16, 14, ...

$$a = 18, d = 16 - 18 = -2.$$

Let, sum of n terms in the sequence is zero

$$S_n = 0$$

$$\frac{n}{2}(2a + (n-1)d) = 0$$

$$\frac{n}{2}(2 \cdot 18 + (n-1) - 2) = 0$$

$$n(18 - (n-1)) = 0$$

$$n(19 - n) = 0$$

$$n = 0 \text{ or } n = 19$$

- (ii) $\because n = 0$ is not possible. Therefore, sum of 19 numbers in the sequence is zero.

Given, a = -14, a 5 = 2

$$a + (5-1)d = 2$$

$$-14 + 4d = 2$$

$$4d = 16 \Rightarrow d = 4$$

Sequence is -14, -10, -6, -2, 2,

Given $S_n = 40$

$$40 = \frac{n}{2}\{2(-14) + (n-1)4\}$$

$$80 = n(-28 + 4n - 4)$$

$$80 = n(-32 + 4n)$$

$$4(20) = 4n(-8 + n)$$

$$n^2 - 8n - 20 = 0$$

$$(n-10)(n+2) = 0$$

$$n = 10 \text{ or } n = -2$$

\therefore Sum of 10 numbers is 40 (Since -2 is not a natural number)

(iii) Given AP 9, 17, 25,

$$a = 9, d = 17 - 9 = 8, \text{ and } S_n = 636$$

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

$$1272 = n(18 - 8 + 8n)$$

$$1272 = n(10 + 8n)$$

$$2 \times 636 = 2n(5 + 4n)$$

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

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

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

$$\therefore n = 12 \text{ (Since } n = \frac{-53}{4} \text{ is not a natural number)}$$

Therefore, value of n is 12.

(iv) Given AP, 63, 60, 57,

$$a = 63, d = 60 - 63 = -3, S_n = 693$$

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

$$693 = \frac{n}{2}(2 \cdot 63 + (n - 1) - 3)$$

$$1386 = n(126 - 3n + 3)$$

$$1386 = (129 - 3n)n$$

$$3n^2 - 129n + 1386 = 0$$

$$n^2 - 43n + 462 = 0$$

$$n = 21, 22$$

\therefore Sum of 21 or 22 term is 693