

Maharashtra Board Solutions for Class 10-Maths (Part 1): Chapter 3- Arithmetic Progression



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Maharashtra Board Solutions for Class 10-Maths (Part 1): Chapter 3- Arithmetic Progression

Class 10: Maths Chapter 3 solutions. Complete Class 10 Maths Chapter 3 Notes.

Maharashtra Board Solutions for Class 10-Maths (Part 1): Chapter 3- Arithmetic Progression

Maharashtra Board 10th Maths Chapter 3, Class 10 Maths Chapter 3 solutions

Practice Set 3.1

Question 1.

Which of the following sequences are A.P.? If they are A.P. find the common difference.

- i. $2, 4, 6, 8, \dots$
- ii. $2, \frac{5}{2}, 3, \frac{7}{2}, \dots$
- iii. $-10, -6, -2, 2, \dots$
- iv. $0.3, 0.33, 0.333, \dots$
- v. $0, -4, -8, -12, \dots$
- vi. $-\frac{1}{5}, -\frac{1}{5}, -\frac{1}{5}, \dots$
- vii. $3, 3 + \sqrt{2}, 3 + 2\sqrt{2}, 3 + 3\sqrt{2}, \dots$
- viii. $127, 132, 137, \dots$

Solution:

- i. The given sequence is $2, 4, 6, 8, \dots$

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Here, $t_1 = 2$, $t_2 = 4$, $t_3 = 6$, $t_4 = 8$

$$\therefore t_2 - t_1 = 4 - 2 = 2$$

$$t_3 - t_2 = 6 - 4 = 2$$

$$t_4 - t_3 = 8 - 6 = 2$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = 2 = d = \text{constant}$$

The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P. and common difference (d) = 2.

ii. The given sequence is $2, \frac{5}{2}, 3, \frac{7}{2}, \dots$

$$\text{Here, } t_1 = 2, t_2 = \frac{5}{2}, t_3 = 3, t_4 = \frac{7}{2}$$

$$\therefore t_2 - t_1 = \frac{5}{2} - 2 = \frac{5-4}{2} = \frac{1}{2}$$

$$t_3 - t_2 = 3 - \frac{5}{2} = \frac{6-5}{2} = \frac{1}{2}$$

$$t_4 - t_3 = \frac{7}{2} - 3 = \frac{7-6}{2} = \frac{1}{2}$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = \frac{1}{2} = d = \text{constant}$$

The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P. and common difference (d) = 12.

iii. The given sequence is -10, -6, -2, 2,...

$$\text{Here, } t_1 = -10, t_2 = -6, t_3 = -2, t_4 = 2$$

$$\therefore t_2 - t_1 = -6 - (-10) = -6 + 10 = 4$$

$$t_3 - t_2 = -2 - (-6) = -2 + 6 = 4$$

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$$t_4 - t_3 = 2 - (-2) = 2 + 2 = 4$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = 4 = d = \text{constant}$$

The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P. and common difference $(d) = 4$.

iv. The given sequence is 0.3, 0.33, 0.333,...

$$\text{Here, } t_1 = 0.3, t_2 = 0.33, t_3 = 0.333$$

$$\therefore t_2 - t_1 = 0.33 - 0.3 = 0.03$$

$$t_3 - t_2 = 0.333 - 0.33 = 0.003$$

$$\therefore t_2 - t_1 \neq t_3 - t_2$$

The difference between two consecutive terms is not constant.

$\therefore$ The given sequence is not an A.P.

v. The given sequence is 0, -4, -8, -12,...

$$\text{Here, } t_1 = 0, t_2 = -4, t_3 = -8, t_4 = -12$$

$$\therefore t_2 - t_1 = -4 - 0 = -4$$

$$t_3 - t_2 = -8 - (-4) = -8 + 4 = -4$$

$$t_4 - t_3 = -12 - (-8) = -12 + 8 = -4$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = -4 = d = \text{constant}$$

The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P. and common difference $(d) = -4$.

vi. The given sequence is $-\frac{1}{5}, -\frac{1}{5}, -\frac{1}{5}, \dots$

$$\text{Here, } t_1 = -\frac{1}{5}, t_2 = -\frac{1}{5}, t_3 = -\frac{1}{5}$$

$$\therefore t_2 - t_1 = -\frac{1}{5} - \left(-\frac{1}{5}\right) = -\frac{1}{5} + \frac{1}{5} = 0$$

$$t_3 - t_2 = -\frac{1}{5} - \left(-\frac{1}{5}\right) = -\frac{1}{5} + \frac{1}{5} = 0$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = 0 = d = \text{constant}$$

The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P. and common difference $(d) = 0$.

vii. The given sequence is

$$3, 3 + \sqrt{2}, 3 + 2\sqrt{2}, 3 + 3\sqrt{2}, \dots$$

$$\text{Here, } t_1 = 3, t_2 = 3 + \sqrt{2}, t_3 = 3 + 2\sqrt{2},$$

$$t_4 = 3 + 3\sqrt{2}$$

$$\therefore t_2 - t_1 = 3 + \sqrt{2} - 3 = \sqrt{2}$$

$$t_3 - t_2 = 3 + 2\sqrt{2} - (3 + \sqrt{2}) = \sqrt{2}$$

$$t_4 - t_3 = 3 + 3\sqrt{2} - (3 + 2\sqrt{2}) = \sqrt{2}$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = \sqrt{2} = d = \text{constant}$$

The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P. and common difference $(d) = \sqrt{2}$.

viii. The given sequence is 127, 132, 137,...

$$\text{Here, } t_1 = 127, t_2 = 132, t_3 = 137$$

$$\therefore t_2 - t_1 = 132 - 127 = 5$$

$$t_3 - t_2 = 137 - 132 = 5$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = 5 = d = \text{constant}$$

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The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P. and common difference $(d) = 5$.

Question 2.

Write an A.P. whose first term is a and common difference is d in each of the following.

i. $a = 10, d = 5$

ii. $a = -3, d = 0$

iii. $a = -7, d = 12$

iv. $a = -1.25, d = 3$

v. $a = 6, d = -3$

vi. $a = -19, d = -4$

Solution:

i. $a = 10, d = 5 \dots$ [Given]

$\therefore t_1 = a = 10$

$t_2 = t_1 + d = 10 + 5 = 15$

$t_3 = t_2 + d = 15 + 5 = 20$

$t_4 = t_3 + d = 20 + 5 = 25$

$\therefore$ The required A.P. is 10, 15, 20, 25,...

ii. $a = -3, d = 0 \dots$ [Given]

$\therefore t_1 = a = -3$

$t_2 = t_1 + d = -3 + 0 = -3$

$t_3 = t_2 + d = -3 + 0 = -3$

$t_4 = t_3 + d = -3 + 0 = -3$

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∴ The required A.P. is -3, -3, -3, -3,...

iii. $a = -7, d = \frac{1}{2}$...[Given]

∴ $t_1 = a = -7$

$$t_2 = t_1 + d = -7 + \frac{1}{2} = \frac{-14+1}{2} = \frac{-13}{2} = -6.5$$

$$t_3 = t_2 + d = -6.5 + \frac{1}{2} = -6.5 + 0.5 = -6$$

$$t_4 = t_3 + d = -6 + \frac{1}{2} = \frac{-12+1}{2} = \frac{-11}{2} = -5.5$$

∴ The required A.P. is -7, -6.5, -6, -5.5,

iv. $a = -1.25, d = 3$...[Given]

$t_1 = a = -1.25$

$$t_2 = t_1 + d = -1.25 + 3 = 1.75$$

$$t_3 = t_2 + d = 1.75 + 3 = 4.75$$

$$t_4 = t_3 + d = 4.75 + 3 = 7.75$$

∴ The required A.P. is -1.25, 1.75, 4.75, 7.75,...

v. $a = 6, d = -3$...[Given]

∴ $t_1 = a = 6$

$$t_2 = t_1 + d = 6 - 3 = 3$$

$$t_3 = t_2 + d = 3 - 3 = 0$$

$$t_4 = t_3 + d = 0 - 3 = -3$$

∴ The required A.P. is 6, 3, 0, -3,...

vi. $a = -19, d = -4$...[Given]

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$$t_1 = a = -19$$

$$t_2 = t_1 + d = -19 - 4 = -23$$

$$t_3 = t_2 + d = -23 - 4 = -27$$

$$t_4 = t_3 + d = -27 - 4 = -31$$

∴ The required A.P. is -19, -23, -27, -31,...

Question 3.

Find the first term and common difference for each of the A.P.

i. 5, 1, -3, -7, ...

ii. 0.6, 0.9, 1.2, 1.5, ...

iii. 127, 135, 143, 151, ...

iv. $\frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4}, \dots$

Solution:

i. The given A.P. is 5, 1, -3, -7, ...

Here, $t_1 = 5$, $t_2 = 1$

∴ $a = t_1 = 5$ and

$$d = t_2 - t_1 = 1 - 5 = -4$$

∴ first term (a) = 5,

common difference (d) = -4

ii. The given A.P. is 0.6, 0.9, 1.2, 1.5, ...

Here, $t_1 = 0.6$, $t_2 = 0.9$

∴ $a = t_1 = 0.6$ and

$$d = t_2 - t_1 = 0.9 - 0.6 = 0.3$$

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$\therefore$ first term (a) = 0.6,

common difference (d) = 0.3

iii. The given A.P. is 127, 135, 143, 151,...

Here, $t_1 = 127$, $t_2 = 135$

$\therefore a = t_1 = 127$ and

$d = t_2 - t_1 = 135 - 127 = 8$

$\therefore$ first term (a) = 127,

common difference (d) = 8

iv. The given A.P. is $\frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4}, \dots$

Here, $t_1 = \frac{1}{4}$, $t_2 = \frac{3}{4}$

$\therefore a = t_1 = \frac{1}{4}$ and

$d = t_2 - t_1 = \frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

$\therefore$ first term (a) = $\frac{1}{4}$,

common difference (d) = $\frac{1}{2}$

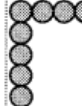
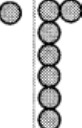
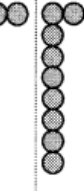
Question 1.

Complete the given pattern. Look at the pattern of the numbers. Try to find a rule to obtain the next number from its preceding number. Write the next numbers. (Textbook pg, no. 55 and 56)

Answer:

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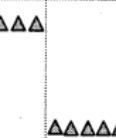
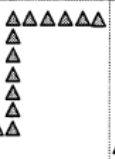
i.

Pattern									
Number of circles	1	3	5	7	9	11	13	15	17

Every pattern is formed by adding a circle in horizontal and vertical rows to the preceding pattern.

∴ The sequence for the above pattern is 1, 3, 5, 7, 9, 11, 13, 15, 17,

ii.

Pattern							
Number of triangles	5	8	11	14	17	20	23

Every pattern is formed by adding 2 triangles horizontally and 1 triangle vertically to the preceding pattern.

∴ The sequence for the above pattern is 5, 8, 11, 14, 17, 20, 23, ...

Question 2.

Some sequences are given below. Show the positions of the terms by $t_1, t_2, t_3, \dots$

Answer:

i. $7, 7, 7, 7, \dots$ Here $t_1 = 7, t_2 = \boxed{7}, t_3 = \boxed{7}, \dots$

ii. $-2, -6, -10, -14, \dots$ Here $t_1 = -2, t_2 = \boxed{-6}, t_3 = \boxed{-10}, \dots$

Question 3.

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Some sequences are given below. Check whether there is any rule among the terms. Find the similarity between two sequences. To check the rule for the terms of the sequence look at the arrangements and fill the empty boxes suitably. (Textbook pg. no. 56 and 57)

i. 1, 4, 7, 10, 13, ...

ii. 6, 12, 18, 24, ...

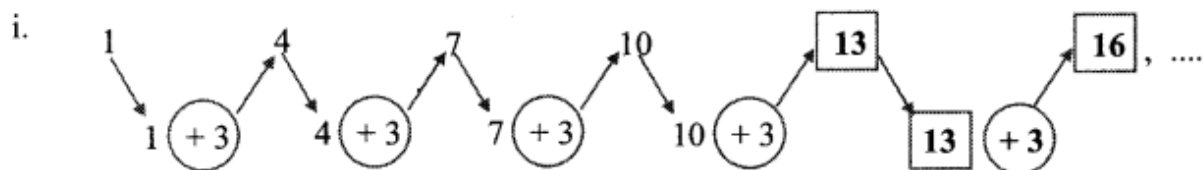
iii. 3, 3, 3, 3, ...

iv. 4, 16, 64, ...

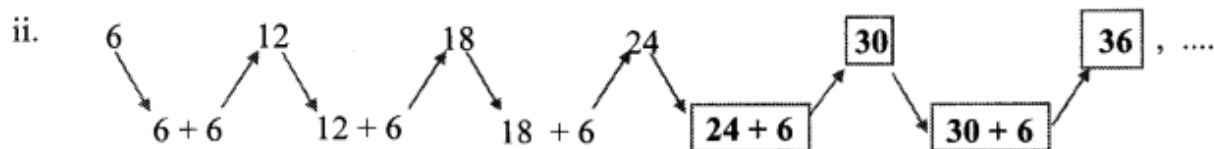
v. -1, -1.5, -2, -2.5, ...

vi. 1^3 , 2^3 , 3^3 , 4^3

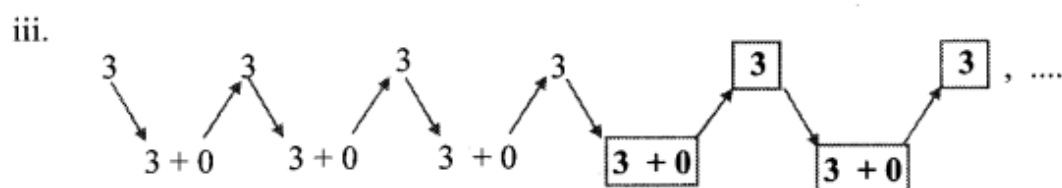
Answer:



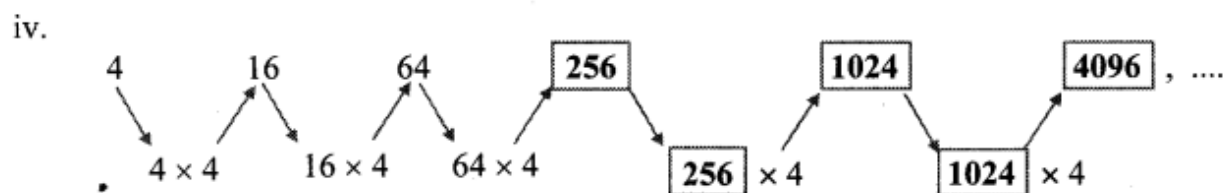
By adding 3 in each term, we get the next term of the sequence.



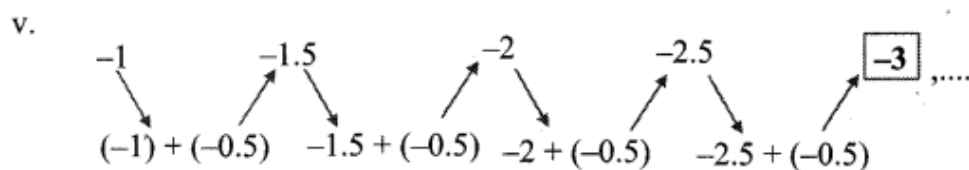
By adding 6 in each term, we get the next term of the sequence.



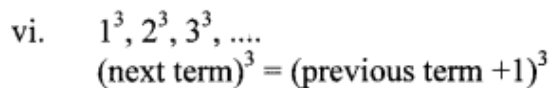
By adding 0 in each term, we get the next term of the sequence.



By multiplying each term by 4, we get the next term of the sequence.



By adding -0.5 in each term, we get the next term of the sequence.



The similarity in the sequences i., ii., iii. and v. is that the next term is obtained by adding a particular fixed number to the previous term.

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Note : A Geometric Progression is a sequence in which the ratio of any two consecutive terms is a constant,

$$\text{i.e. in a G.P., } \frac{t_2}{t_1} = \frac{t_3}{t_2} = \dots = \frac{t_n}{t_{n-1}} = \text{constant}$$

Sequence iv. is a geometric progression.

Question 4.

Write one example of finite and infinite A.P. each. (Textbook pg. no. 59)

Answer:

Finite A.P.:

Even natural numbers from 4 to 50:

4, 6, 8, 50.

Infinite A. P.:

Positive multiples of 5:

5, 10, 15,

Practice Set 3.2

Question 1.

Write the correct number in the given boxes from the following A.P.

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i. 1, 8, 15, 22, ...

Here $a = \square$, $t_1 = \square$, $t_2 = \square$, $t_3 = \square$, ...

$$t_2 - t_1 = \square - \square = \square$$

$$t_3 - t_2 = \square - \square = \square \therefore d = \square$$

ii. 3, 6, 9, 12, ...

Here $t_1 = \square$, $t_2 = \square$, $t_3 = \square$, $t_4 = \square$, ...

$$t_2 - t_1 = \square, t_3 - t_2 = \square \therefore d = \square$$

iii. -3, -8, -13, -18, ...

Here $t_1 = \square$, $t_2 = \square$, $t_3 = \square$, $t_4 = \square$, ...

$$t_2 - t_1 = \square, t_3 - t_2 = \square \therefore a = \square, d = \square$$

iv. 70, 60, 50, 40, ...

Here $t_1 = \square$, $t_2 = \square$, $t_3 = \square$, ...

$$\therefore a = \square, d = \square$$

Solution:



i. 1, 8, 15, 22, ...

Here $a = \boxed{1}$, $t_1 = \boxed{1}$, $t_2 = \boxed{8}$, $t_3 = \boxed{15}$, ...

$$t_2 - t_1 = \boxed{8} - \boxed{1} = \boxed{7}$$

$$t_3 - t_2 = \boxed{15} - \boxed{8} = \boxed{7} \therefore d = \boxed{7}$$

ii. 3, 6, 9, 12, ...

Here $t_1 = \boxed{3}$, $t_2 = \boxed{6}$, $t_3 = \boxed{9}$, $t_4 = \boxed{12}$, ...

$$t_2 - t_1 = \boxed{3}, t_3 - t_2 = \boxed{3} \therefore d = \boxed{3}$$

iii. -3, -8, -13, -18, ...

Here $t_1 = \boxed{-3}$, $t_2 = \boxed{-8}$, $t_3 = \boxed{-13}$, $t_4 = \boxed{-18}$, ...

$$t_2 - t_1 = \boxed{-5}, t_3 - t_2 = \boxed{-5} \therefore a = \boxed{-3}, d = \boxed{-5}$$

iv. 70, 60, 50, 40, ...

Here $t_1 = \boxed{70}$, $t_2 = \boxed{60}$, $t_3 = \boxed{50}$, ...

$$\therefore a = \boxed{70}, d = \boxed{-10}$$

Question 2.

Decide whether following sequence is an A.P., if so find the 20th term of the progression.

-12, -5, 2, 9, 16, 23, 30, ...

Solution:

i. The given sequence is

-12, -5, 2, 9, 16, 23, 30, ...

Here, $t_1 = -12$, $t_2 = -5$, $t_3 = 2$, $t_4 = 9$

$$\therefore t_2 - t_1 = -5 - (-12) = -5 + 12 = 7$$

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$$t_3 - t_2 = 2 - (-5) = 2 + 5 = 7$$

$$\therefore t_4 - t_3 - 9 - 2 = 7$$

$$\therefore t_2 - t_1 = t_3 - t_2 = \dots = 7 = d = \text{constant}$$

The difference between two consecutive terms is constant.

$\therefore$ The given sequence is an A.P.

$$\text{ii. } t_n = a + (n - 1)d$$

$$\therefore t_{20} = -12 + (20 - 1)7 \dots [\because a = -12, d = 7]$$

$$= -12 + 19 \times 7$$

$$= -12 + 133$$

$$\therefore t_{20} = 121$$

$\therefore$ 20th term of the given A.P. is 121.

Question 3.

Given Arithmetic Progression is 12, 16, 20, 24, ... Find the 24th term of this progression.

Solution:

The given A.P. is 12, 16, 20, 24, ...

Here, $a = 12$, $d = 16 - 12 = 4$ Since,

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

$$\therefore t_{24} = 12 + (24 - 1)4$$

$$= 12 + 23 \times 4$$

$$= 12 + 92$$

$$\therefore t_{24} = 104$$

$\therefore$ 24th term of the given A.P. is 104.

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Question 4.

Find the 19th term of the following A.P. 7,13,19,25.....

Solution:

The given A.P. is 7, 13, 19, 25,...

Here, $a = 7$, $d = 13 - 7 = 6$

Since, $t_n = a + (n - 1)d$

$$\therefore t_{19} = 7 + (19 - 1)6$$

$$= 7 + 18 \times 6$$

$$= 7 + 108$$

$$\therefore t_{19} = 115$$

$\therefore$ 19th term of the given A.P. is 115.

Question 5.

Find the 27th term of the following A.P. 9,4,-1,-6,-11,...

Solution:

The given A.P. is 9, 4, -1, -6, -11,...

Here, $a = 9$, $d = 4 - 9 = -5$

Since, $t_n = a + (n - 1)d$

$$\therefore t_{27} = 9 + (27 - 1)(-5)$$

$$= 9 + 26 \times (-5)$$

$$= 9 - 130$$

$$\therefore t_{27} = -121$$

$\therefore$ 27th term of the given A.P. is -121.

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Question 6.

Find how many three digit natural numbers are divisible by 5.

Solution:

The three digit natural numbers divisible by

5 are 100, 105, 110, ..., 995

The above sequence is an A.P.

$$\therefore a = 100, d = 105 - 100 = 5$$

Let the number of terms in the A.P. be n .

$$\text{Then, } t_n = 995$$

$$\text{Since, } t_n = a + (n - 1)d$$

$$\therefore 995 = 100 + (n - 1)5$$

$$\therefore 995 - 100 = (n - 1)5$$

$$\therefore 895 = (n - 1)5$$

$$\therefore n - 1 = 8955$$

$$\therefore n - 1 = 179$$

$$\therefore n = 179 + 1 = 180$$

$\therefore$ There are 180 three digit natural numbers which are divisible by 5.

Question 7.

The 11th term and the 21st term of an A.P. are 16 and 29 respectively, then find the 41st term of that A.P.

Solution:

For an A.P., let a be the first term and d be the common difference,

$$t_{11} = 16, t_{21} = 29 \dots [\text{Given}]$$

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

$$\therefore t_{11} = a + (11 - 1)d$$

$$\therefore 16 = a + 10d$$

$$\text{i.e. } a + 10d = 16 \dots (i)$$

$$\text{Also, } t_{21} = a + (21 - 1)d$$

$$\therefore 29 = a + 20d$$

$$\text{i.e. } a + 20d = 29 \dots (ii)$$

Subtracting equation (i) from (ii), we get a

$$\begin{array}{r} a + 20d = 29 \\ a + 10d = 16 \\ \hline \end{array}$$

$$10d = 13$$

$$\therefore d = \frac{13}{10}$$

Substituting $d = \frac{13}{10}$ in equation (i), we get

$$a + 10\left(\frac{13}{10}\right) = 16$$

$$\therefore a + 13 = 16$$

$$\therefore a = 16 - 13 = 3$$

$$t_{41} = 3 + (41 - 1)\left(\frac{13}{10}\right)$$

$$= 3 + 40 \times \frac{13}{10}$$

$$= 3 + 52$$

$$\therefore t_{41} = 55$$

$$\therefore \text{41}^{\text{st}} \text{ term of the A.P. is 55.}$$

Question 8.

<https://www.indcareer.com/schools/maharashtra-board-solutions-for-class-10-maths-part-1-chapter-3-arithmetic-progression/>

8. 11, 8, 5, 2, ... In this A.P. which term is number-151?

Solution:

The given A.P. is 11, 8, 5, 2,...

Here, $a = 11$, $d = 8 - 11 = -3$

Let the n^{th} term of the given A.P. be -151.

Then, $t_n = -151$

Since, $t_n = a + (n - 1)d$

$$\therefore -151 = 11 + (n - 1)(-3)$$

$$\therefore -151 - 11 = (n - 1)(-3)$$

$$\therefore -162 = (n - 1)(-3)$$

$$\therefore n - 1 = -162 \div -3$$

$$\therefore n - 1 = 54$$

$$\therefore n = 54 + 1 = 55$$

$\therefore$ 55th term of the given A.P. is -151.

Question 9.

In the natural numbers from 10 to 250, how many are divisible by 4?

Solution:

The natural numbers from 10 to 250 divisible

by 4 are 12, 16, 20, ..., 248

The above sequence is an A.P.

$$\therefore a = 12, d = 16 - 12 = 4$$

Let the number of terms in the A.P. be n .

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Then, $t_n = 248$

Since, $t_n = a + (n - 1)d$

$$\therefore 248 = 12 + (n - 1)4$$

$$\therefore 248 - 12 = (n - 1)4$$

$$\therefore 236 = (n - 1)4$$

$$\therefore n - 1 = 236/4$$

$$\therefore n - 1 = 59$$

$$\therefore n = 59 + 1 = 60$$

$\therefore$ There are 60 natural numbers from 10 to 250 which are divisible by 4.

Question 10.

In an A.P. 17th term is 7 more than its 10th term. Find the common difference.

Solution:

For an A.P., let a be the first term and d be the common difference.

According to the given condition,

$$t_{17} = t_{10} + 7$$

$$\therefore a + (17 - 1)d = a + (10 - 1)d + 7 \dots [\because t_n = a + (n - 1)d]$$

$$\therefore a + 16d = a + 9d + 7$$

$$\therefore a + 16d - a - 9d = 7$$

$$\therefore 7d = 7$$

$$\therefore d = 7/7 = 1$$

$\therefore$ The common difference is 1.

Question 1.

<https://www.indcareer.com/schools/maharashtra-board-solutions-for-class-10-maths-part-1-chapter-3-arithmetic-progression/>

Kabir's mother keeps a record of his height on each birthday. When he was one year old, his height was 70 cm, at 2 years he was 80 cm tall and 3 years he was 90 cm tall. His aunt Meera was studying in the 10th class. She said, "it seems like Kabir's height grows in Arithmetic Progression". Assuming this, she calculated how tall Kabir will be at the age of 15 years when he is in 10th! She was shocked to find it. You too assume that Kabir grows in A.P. and find out his height at the age of 15 years. (Textbook pg. no. 63)

Solution:

Height of Kabir when he was 1 year old = 70 cm Height of Kabir when he was 2 years old = 80 cm

Height of Kabir when he was 3 years old = 90 cm The heights of Kabir form an A.P.

Here, $a = 70$, $d = 80 - 70 = 10$

We have to find height of Kabir at the age of 15 years i.e. t_{15} .

Now, $t_n = a + (n - 1)d$

$$\therefore t_{15} = 70 + (15 - 1)10$$

$$= 70 + 14 \times 10 = 70 + 140$$

$$\therefore t_{15} = 210$$

$\therefore$ The height of Kabir at the age of 15 years will be 210 cm.

Question 2.

Is 5, 8, 11, 14, an A.P.? If so then what will be the 100th term? Check whether 92 is in this A.P.? Is number 61 in this A.P.? (Textbook pg. no, 62)

Solution:

i. The given sequence is

5, 8, 11, 14, ...

Here, $t_1 = 5$, $t_2 = 8$, $t_3 = 11$, $t_4 = 14$

$$\therefore t_2 - t_1 = 8 - 5 = 3$$

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$$t_3 - t_2 = 11 - 8 = 3$$

$$t_4 - t_3 = 14 - 11 = 3$$

$$\therefore t_2 - t_1 = t_3 - t_2 = t_4 - t_3 = 3 = d = \text{constant}$$

The difference between two consecutive terms is constant

$\therefore$ The given sequence is an A.P.

$$\text{ii. } t_n = a + (n - 1)d$$

$$\therefore t_{100} = 5 + (100 - 1)3 \dots [\because a = 5, d = 3]$$

$$= 5 + 99 \times 3$$

$$= 5 + 297$$

$$\therefore t_{100} = 302$$

$\therefore$ 100th term of the given A.P. is 302.

iii. To check whether 92 is in given A.P., let $t_n = 92$

$$\therefore t_n = a + (n - 1)d$$

$$\therefore 92 = 5 + (n - 1)3$$

$$\therefore 92 = 5 + 3n - 3$$

$$\therefore 92 = 2 + 3n$$

$$\therefore 90 = 3n$$

$$\therefore n = 90 \div 3 = 30$$

$\therefore$ 92 is the 30th term of given A.P.

iv. To check whether 61 is in given A.P., let $t_n = 61$

$$61 = 5 + (n - 1)3$$

$$\therefore 61 = 5 + 3n - 3$$

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$$\therefore 61 = 2 + 3n$$

$$\therefore 61 - 2 = 3n$$

$$\therefore 59 = 3n$$

$$\therefore n = 593$$

But, n is natural number 59

$$\therefore n \neq 593$$

$\therefore 61$ is not in given A.P.

Practice Set 3.3

First term and common difference of an A.P. are 6 and 3 respectively; find S_{27} .

Solution:

$$a = 6, d = 3, S_{27} = ?$$

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

$$\begin{aligned}\therefore S_{27} &= \frac{27}{2} [12 + (27-1)3] \\ &= \frac{27}{2} \times 90 \\ &= 27 \times 45 = 1215\end{aligned}$$

Find the sum of first 123 even natural numbers.

Solution:

The even natural numbers are 2, 4, 6, 8, ...

The above sequence is an A.P.

$$\therefore a = 2, d = 4 - 2 = 2, n = 123$$

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

$$\begin{aligned}\therefore S_n &= \frac{123}{2} [2(2) + (123 - 1)(2)] \\ &= \frac{123}{2} [2(2) + 122(2)] \\ &= \frac{123}{2} \times 2[2 + 122] \\ &= 123 \times 124 \\ &= 15252\end{aligned}$$

$\therefore$ The sum of first 123 even natural numbers is 15252.

Find the sum of all even numbers between 1 and 350.

Solution:

The even numbers between 1 and 350 are 2, 4, 6, ..., 348.

The above sequence is an A.P.

$$\therefore a = 2, d = 4 - 2 = 2, t_n = 348$$

$$\text{Since, } t_n = a + (n - 1)d$$

$$\therefore 348 = 2 + (n - 1)2$$

$$\therefore 348 - 2 = (n - 1)2$$

$$\therefore 346 = (n - 1)2$$

$$\therefore n - 1 = 346/2$$

$$\therefore n - 1 = 173$$

$$\therefore n = 173 + 1 = 174$$

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

$$\therefore S_{174} = \frac{174}{2} [2(2) + (174 - 1)2]$$

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$$= 87(4 + 173 \times 2)$$

$$= 87(4 + 346)$$

$$= 87 \times 350$$

$$\therefore S_{174} = 30450$$

$\therefore$ The sum of all even numbers between 1 and 350 is 30450.

In an A.P. 19th term is 52 and 38th term is 128, find sum of first 56 terms.

Solution:

For an A.P., let a be the first term and d be the common difference.

$$t_{19} = 52, t_{38} = 128 \dots [\text{Given}]$$

$$\text{Since, } t_n = a + (n - 1)d$$

$$\therefore t_{19} = a + (19 - 1)d$$

$$\therefore 52 = a + 18d$$

$$\text{i.e. } a + 18d = 52 \dots (i)$$

$$\text{Also, } t_{38} = a + (38 - 1)d$$

$$\therefore 128 = a + 37d$$

$$\text{i.e. } a + 37d = 128 \dots (ii)$$

Adding equations (i) and (ii), we get

$$\begin{array}{rcl} a + 18d & = & 52 \\ + & & \\ a + 37d & = & 128 \\ \hline 2a + 55d & = & 180 \end{array} \quad \dots(\text{iii})$$

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

$$\begin{aligned} \therefore S_{56} &= \frac{56}{2} [2a + (56 - 1)d] \\ &= 28(2a + 55d) \\ &= 28 \times 180 \quad \dots[\text{From (iii)}] \end{aligned}$$

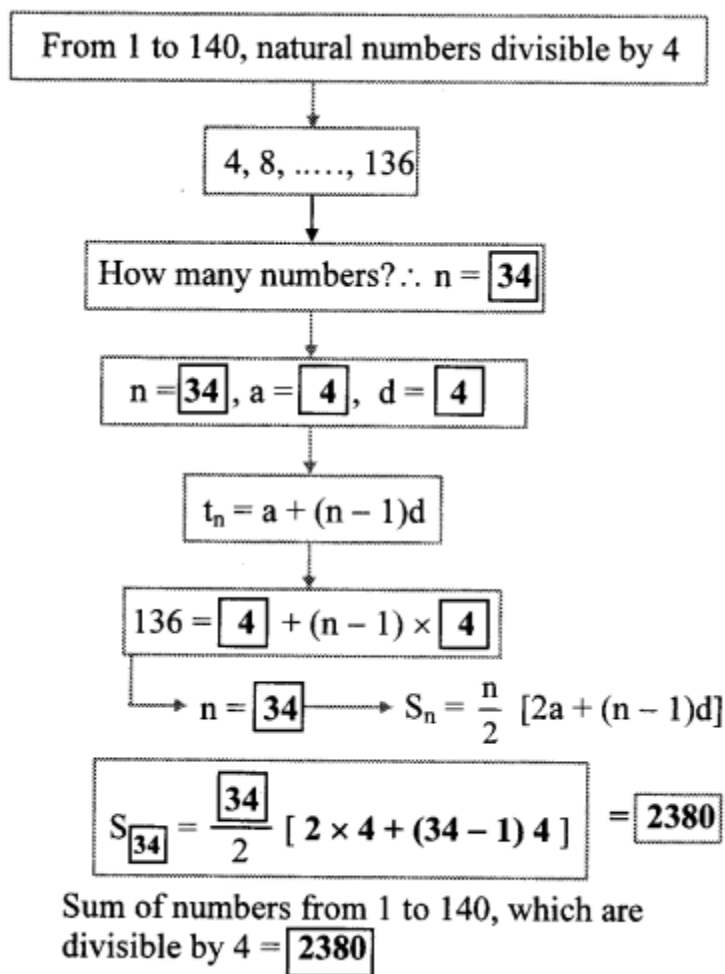
$$\therefore S_{56} = 5040$$

$\therefore$ The sum of first 56 terms is 5040.

Complete the following activity to find the sum of natural numbers between 1 to 140 which are divisible by 4.

Solution:

<https://www.indcareer.com/schools/maharashtra-board-solutions-for-class-10-maths-part-1-chapter-3-arithmetic-progression/>



Sum of first 55 terms in an A.P. is 3300, find its 28th term.

Solution:

For an A.P., let a be the first term and d be the common difference.

$$S_{55} = 3300 \dots [\text{Given}]$$

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

$$\therefore S_{55} = \frac{55}{2} [2a + (55 - 1)d]$$

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$$\therefore 3300 = \frac{55}{2} (2a + 54d)$$

$$\therefore 3300 = \frac{55}{2} \times 2(a + 27d)$$

$$\therefore 3300 = 55(a + 27d)$$

$$\therefore a + 27d = \frac{3300}{55}$$

$$\therefore a + 27d = 60 \quad \dots(i)$$

$$\text{Now, } t_n = a + (n - 1)d$$

$$\therefore t_{28} = a + (28 - 1)d = a + 27d$$

$$\therefore t_{28} = 60 \quad \dots[\text{From (i)}]$$

$$\therefore \text{28}^{\text{th}} \text{ term of the A.P. is 60.}$$

Arithmetic Practice Set Question 7.

In an A.P. sum of three consecutive terms is 27 and their product is 504, find the terms.
(Assume that three consecutive terms in A.P. are $a - d$, a , $a + d$.)

Solution:

Let the three consecutive terms in an A.P. be

$a - d$, a and $a + d$.

According to the first condition,

$$a - d + a + a + d = 27$$

$$\therefore 3a = 27$$

$$\therefore a = 9$$

$$\therefore a = 9 \dots(i)$$

According to the second condition,

$$(a - d) a (a + d) = 504$$

$$\therefore a(a^2 - d^2) = 504$$

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$$\therefore 9(a^2 - d^2) = 504 \dots [\text{From (i)}]$$

$$\therefore 9(81 - d^2) = 504$$

$$\therefore 81 - d^2 = 5049$$

$$\therefore 81 - d^2 = 56$$

$$\therefore d^2 = 81 - 56$$

$$\therefore d^2 = 25$$

Taking square root of both sides, we get

$$d = \pm 5$$

When $d = 5$ and $a = 9$,

$$a - d = 9 - 5 = 4$$

$$a = 9$$

$$a + d = 9 + 5 = 14$$

When $d = -5$ and $a = 9$,

$$a - d = 9 - (-5) = 9 + 5 = 14$$

$$a = 9$$

$$a + d = 9 - 5 = 4$$

$\therefore$ The three consecutive terms are 4, 9 and 14 or 14, 9 and 4.

10th Maths 1 Practice Set 3.3 Question 8.

Find four consecutive terms in an A.P. whose sum is 12 and sum of 3rd and 4th term is 14.
(Assume the four consecutive terms in A.P. are $a - d$, a , $a + d$, $a + 2d$.)

Solution:

Let the four consecutive terms in an A.P. be

$$a - d, a, a + d \text{ and } a + 2d.$$

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According to the first condition,

$$a - d + a + a + d + a + 2d = 12$$

$$\therefore 4a + 2d = 12$$

$$\therefore 2(2a + d) = 12$$

$$\therefore 2a + d = 6$$

$$\therefore 2a + d = 6 \dots (i)$$

According to the second condition,

$$a + d + a + 2d = 14$$

$$\therefore 2a + 3d = 14 \dots (ii)$$

Subtracting equation (i) from (ii), we get

$$\begin{array}{r} 2a + 3d = 14 \\ 2a + d = 6 \\ \hline 2d = 8 \\ \therefore d = \frac{8}{2} = 4 \end{array}$$

Substituting $d = 4$ in equation (i), we get

$$\begin{array}{l} 2a + 4 = 6 \\ \therefore 2a = 6 - 4 = 2 \\ \therefore a = \frac{2}{2} = 1 \\ \therefore a - d = 1 - 4 = -3 \\ a = 1 \\ a + d = 1 + 4 = 5 \\ a + 2d = 1 + 2(4) \\ \quad = 1 + 8 = 9 \end{array}$$

$\therefore$ The four consecutive terms are -3, 1, 5 and 9.

Math 1 Practice Set 3.3 Question 9.

<https://www.indcareer.com/schools/maharashtra-board-solutions-for-class-10-maths-part-1-chapter-3-arithmetic-progression/>

If the 9th term of an A.P. is zero, then show that the 29th term is twice the 19th term.

To prove: $t_{29} = 2t_{19}$

Proof:

For an A.P., let a be the first term and d be the common difference.

$$t_9 = 0 \dots [\text{Given}]$$

$$\text{Since, } t_n = a + (n - 1)d$$

$$\therefore t_9 = a + (9 - 1)d$$

$$\therefore 0 = a + 8d$$

$$\therefore a = -8d \dots (i)$$

$$\text{Also, } t_{19} = a + (19 - 1)d$$

$$= a + 18d$$

$$= -8d + 18d \dots [\text{From (i)}]$$

$$\therefore t_{19} = 10d \dots (ii)$$

$$\text{and } t_{29} = a + (29 - 1)d$$

$$= a + 28d$$

$$= -8d + 28d \dots [\text{From (i)}]$$

$$\therefore t_{29} = 20d = 2(10d)$$

$$\therefore t_{29} = 2(t_{19}) \dots [\text{From (ii)}]$$

$\therefore$ The 29th term is twice the 19th term.

10 Class Math Part 1 Practice Set 3.3 Question 1.

Find the sum of all odd numbers from 1 to 150. (Textbook pg, no. 71)

Solution:

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Odd numbers from 1 to 150 are 1, 3, 5, 7, ..., 149

Here, difference between any two consecutive terms is 2.

∴ It is an A.P.

∴ $a = 1$, $d = 2$

Let us find how many odd numbers are there from 1 to 150, i.e. find the value of n if

$$t_n = 149$$

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

$$\therefore 149 = 1 + (n - 1)2$$

$$\therefore 149 - 1 = (n - 1)2$$

$$\therefore 148 = 2(n - 1)$$

$$\therefore 74 = n - 1$$

$$\therefore n = 74 + 1 = 75$$

ii. Now, let's find the sum of 75 numbers

i. e. $1 + 3 + 5 + 7 + \dots + 149$

Method I:

Here, $a = 1$, $d = 2$, $n = 75$

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

$$\therefore S_{75} = \frac{75}{2} [2(1) + (75 - 1)2]$$

$$= \frac{75}{2} (2 + 74 \times 2)$$

$$= \frac{75}{2} (2 + 148)$$

$$= \frac{75}{2} (150)$$

$$= \boxed{75} \times \boxed{75}$$

$$\therefore S_{75} = \boxed{5625}$$

Method II:

Here, $t_1 = a = 1$, $t_n = 149$, $n = 75$

$$S_n = \frac{n}{2} (t_1 + t_n)$$

$$\therefore S_{75} = \frac{75}{2} (1 + 149)$$

$$= \frac{75}{2} \times 150$$

$$= \boxed{75} \times \boxed{75}$$

$$\therefore S_{75} = \boxed{5625}$$

Practice Set 3.4**Question 1.**

On 1st Jan 2016, Sanika decides to save ₹ 10, ₹ 11 on second day, ₹ 12 on third day. If she decides to save like this, then on 31st Dec 2016 what would be her total saving?

Solution:

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- i. Sanika's daily savings of 2016 are as follows:

10, 11, 12,

The above sequence is an A.P.

$$\therefore a = 10, d = 11 - 10 = 1,$$

$$n = 366 \quad \dots [\because 2016 \text{ is a leap year}]$$

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

$$\therefore S_{366} = \frac{366}{2} [2(10) + (366 - 1)1]$$

$$= 183 (20 + 365 \times 1)$$

$$= 183 (20 + 365)$$

$$= 183 \times 385$$

$$\therefore S_{366} = 70455$$

$\therefore$ Sanika's total saving on 31st December 2016 would be ₹ 70455.

Question 2.

A man borrows ₹ 8000 and agrees to repay with a total interest of ₹ 1360 in 12 monthly instalments. Each instalment being less than the preceding one by ₹ 40. Find the amount of the first and last instalment.

Solution:

- i. The instalments are in A.P.

Amount repaid in 12 instalments (S_{12})

= Amount borrowed + total interest

$$= 8000 + 1360$$

$$\therefore S_{12} = 9360$$

Number of instalments (n) = 12

Each instalment is less than the preceding one by ₹ 40.

$$\therefore d = -40$$

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$$\begin{aligned}\text{ii. } S_n &= \frac{n}{2} [2a + (n-1)d] \\ \therefore S_{12} &= \frac{12}{2} [2a + (12-1)(-40)] \\ \therefore 9360 &= 6[2a + (11)(-40)] \\ \therefore 9360 &= 6(2a - 440) \\ \therefore \frac{9360}{6} &= 2a - 440 \\ \therefore 1560 &= 2a - 440 \\ \therefore 1560 + 440 &= 2a \\ \therefore 2000 &= 2a \\ \therefore a &= \frac{2000}{2} \\ \therefore a &= 1000 \\ \text{iii. } t_n &= a + (n-1)d \\ \therefore t_{12} &= 1000 + (12-1)(-40) \\ &= 1000 + 11(-40) \\ &= 1000 - 440 \\ \therefore t_{12} &= 560\end{aligned}$$

$\therefore$ Amount of the first instalment is ₹ 1000 and that of the last instalment is ₹ 560.

Question 3.

Sachin invested in a national saving certificate scheme. In the first year he invested ₹ 5000, in the second year ₹ 7000, in the third year ₹ 9000 and so on. Find the total amount that he invested in 12 years.

Solution:

i. Amount invested by Sachin in each year are as follows:

5000, 7000, 9000, ...

The above sequence is an A.P.

$\therefore a = 5000, d = 7000 - 5000 = 2000, n = 12$

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$$\begin{aligned}\text{ii. } S_n &= \frac{n}{2} [2a + (n-1)d] \\ \therefore S_{12} &= \frac{12}{2} [2(5000) + (12-1)2000] \\ &= 6(10000 + 11 \times 2000) \\ &= 6(10000 + 22000) \\ &= 6(32000) \\ \therefore S_{12} &= 192000\end{aligned}$$

$\therefore$ The total amount invested by Sachin in 12 years is ₹ 1,92,000.

Question 4.

There is an auditorium with 27 rows of seats. There are 20 seats in the first row, 22 seats in the second row, 24 seats in the third row and so on. Find the number of seats in the 15th row and also find how many total seats are there in the auditorium?

Solution:

i. The number of seats arranged row-wise are as follows:

20, 22, 24,

The above sequence is an A.P.

$$\therefore a = 20, d = 22 - 20 = 2, n = 27$$

$$\text{ii. } t_n = a + (n-1)d$$

$$\therefore t_{15} = 20 + (15-1)2$$

$$= 20 + 14 \times 2$$

$$= 20 + 28$$

$$\therefore t_{15} = 48$$

$\therefore$ The number of seats in the 15th row is 48.

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$$\begin{aligned}\text{iii. } S_n &= \frac{n}{2} [2a + (n-1)d] \\ \therefore S_{27} &= \frac{27}{2} [2(20) + (27-1)2] \\ &= \frac{27}{2} (40 + 26 \times 2) \\ &= \frac{27}{2} (40 + 52) \\ &= \frac{27}{2} \times 92 \\ &= 27 \times 46 \\ \therefore S_{27} &= 1242\end{aligned}$$

$\therefore$ Total seats in the auditorium are 1242.

Question 5.

Kargil's temperature was recorded in a week from Monday to Saturday. All readings were in A.P. The sum of temperatures of Monday and Saturday was 5°C more than sum of temperatures of Tuesday and Saturday. If temperature of Wednesday was -30° Celsius then find the temperature on the other five days.

Solution:

Let the temperatures from Monday to Saturday in A.P. be

$a, a + d, a + 2d, a + 3d, a + 4d, a + 5d.$

According to the first condition,

$$(a) + (a + 5d) = (a + d) + (a + 5d) + 5^\circ$$

$$\therefore d = -5^\circ$$

According to the second condition,

$$a + 2d = -30^\circ$$

$$\therefore a + 2(-5^\circ) = -30^\circ$$

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$$\therefore a - 10^\circ = -30^\circ$$

$$\therefore a = -30^\circ + 10^\circ = -20^\circ$$

$$\therefore a + d = -20^\circ - 5^\circ = -25^\circ$$

$$a + 3d = -20^\circ + 3(-5^\circ) = -20^\circ - 15^\circ = -35^\circ$$

$$a + 4d = -20^\circ + 4(-5^\circ) = -20^\circ - 20^\circ = -40^\circ$$

$$a + 5d = -20^\circ + 5(-5^\circ) = -20^\circ - 25^\circ = -45^\circ$$

$\therefore$ The temperatures on the other five days are

-20°C , -25°C , -35°C , -40°C and -45°C .

Question 6.

On the world environment day tree plantation programme was arranged on a land which is triangular in shape. Trees are planted such that in the first row there is one tree, in the second row there are two trees, in the third row three trees and so on. Find the total number of trees in the 25 rows.

Solution:

i. The number of trees planted row-wise are as follows:

1, 2, 3, ...

The above sequence is an A.P.

$$\therefore a = 1, d = 2 - 1 = 1, n = 25$$

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

$$\begin{aligned}\therefore S_{25} &= \frac{25}{2} [2(1) + (25 - 1)1] \\ &= \frac{25}{2} (2 + 24) = \frac{25}{2} \times 26 = 25 \times 13 = 325\end{aligned}$$

$\therefore$ The total number of trees in 25 rows are 325.

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Maharashtra Board Solutions

Class 10 Maths (Part 1)

- Chapter 1- Linear Equations in Two Variables
- Chapter 2- Quadratic Equations
- Chapter 3- Arithmetic Progression
- Chapter 4- Financial Planning
- Chapter 5- Probability
- Chapter 6- Statistics

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The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

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Who developed the Maharashtra State board books?

As of now, the MSCERT and Balbharti are responsible for the syllabus and textbooks of Classes 1 to 8, while Classes 9 and 10 are under the Maharashtra State Board of Secondary and Higher Secondary Education (MSBSHSE).

How many state boards are there in Maharashtra?

The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

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