NCERT Solutions Class 10 Maths
Chapter 5: Arithmetic Progressions
Exercise 5.3

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Quick Summary: In NCERT Solutions Class 10 Maths Chapter 5 Exercise 5.3, students learn to calculate the sum of first n terms of arithmetic progressions using fundamental formulas. This exercise covers essential AP sum formulas and their applications, which are crucial for CBSE Class 10 board exams and form the foundation for higher-level mathematics concepts.

Key Takeaways:

- Master the sum formula $S_n = (n)/(2)[2a + (n-1)d]$ where a is first term and d is common difference
- Apply the alternative sum formula $S_n = (n)/(2)(a + l)$ when the last term l is known
- Use the nth term formula $a_n = a + (n-1)d$ in combination with sum formulas for complex problems
- Solve real-world applications involving arithmetic sequences like salary increments, savings patterns, and construction problems

Complete Solutions

Question 1

Find the sum of the following APs:

1. 2, 7, 12, …, to 10 terms.
2. −37, −33, −29, …, to 12 terms.
3. 0.6, 1.7, 2.8, …, to 100 terms.
4. (1)/(15), (1)/(12), (1)/(10), …, to 11 terms.

SOLUTION

Formula used: For an AP with first term , common difference and terms, the sum of the first terms is

We first identify , and for each AP, then apply the formula.

(I) , TO 10 TERMS

First term:

Common difference:

Number of terms:

Sum:

So, sum = 245.

(II) , TO 12 TERMS

First term:

Common difference:

Number of terms:

Sum:

So, sum = -180.

(III) , TO 100 TERMS

First term:

Common difference:

Number of terms:

Sum:

So,

So, sum = 5505.

(IV) , TO 11 TERMS

First term:

Common difference:

Number of terms:

Sum:

So inside the brackets:

Thus,

So, sum = .

Question 2

Find the sums given below:

1. 7 + 10(1)/(2) + 14 + … + 84
2. 34 + 32 + 30 + … + 10
3. −5 + (−8) + (−11) + … + (−230)

SOLUTION

Recall: For an AP with first term , common difference , and terms,

(I)

First, write the terms in decimal or fraction form:

First term: .

Second term: . So the common difference is

We know the last term . Use :

Now use the sum formula:

So, the sum is .

(II)

Sequence: .

First term: .

Common difference:

Last term: .

Use :

Now find the sum:

So, the sum is .

(III)

Sequence: .

First term: .

Common difference:

Last term: .

Use :

Now find the sum:

So, the sum is .

ANSWER

(i) 1046(1)/(2)

(ii) 286

(iii) -8930

Question 3

In an AP:

1. given a = 5, d = 3, a_n = 50, find n and S_n.
2. given a = 7, a_13 = 35, find d and S_13.
3. given a_12 = 37, d = 3, find a and S_12.
4. given a_3 = 15, S_10 = 125, find d and a_10.
5. given d = 5, S_9 = 75, find a and a_9.
6. given a = 2, d = 8, S_n = 90, find n and a_n.
7. given a = 8, a_n = 62, S_n = 210, find n and d.
8. given a_n = 4, d = 2, S_n = -14, find n and a.
9. given a = 3, n = 8, S_n = 192, find d.
10. given l = 28, S_n = 144, and there are total 9 terms. Find a.

SOLUTION

Formulas used for an AP:

nth term:

Sum of first n terms: , where is the nth term.

(I) GIVEN , ,

Use :

Now

(II) GIVEN ,

Now

(III) GIVEN ,

(IV) GIVEN ,

From , we get .

Also, .

Substitute :

Then .

10th term: .

(V) GIVEN ,

(VI) GIVEN , ,

So,

Discriminant: .

Then .

(VII) GIVEN , ,

From :

Now .

(VIII) GIVEN , ,

Use :

Also, .

Then , so:

Discriminant: .

Then .

(IX) GIVEN , ,

(X) GIVEN , ,

Use :

Summary: Each part uses combinations of the AP nth-term and sum formulas, then solves simple linear or quadratic equations to find the required unknowns.

ANSWER

(i) n = 16,\ S_n = 440

(ii) d = (7)/(3),\ S_13 = 273

(iii) a = 4,\ S_12 = 246

(iv) d = -1,\ a_10 = 8

(v) a = -(35)/(3),\ a_9 = (85)/(3)

(vi) n = 5,\ a_n = 34

(vii) n = 6,\ d = (54)/(5)

(viii) n = 7,\ a = -8

(ix) d = 6

(x) a = 4

Question 4

How many terms of the AP 9, 17, 25, ... must be taken to give a sum of 636?

SOLUTION

Step 1: Identify , and .

The AP is .

First term:

Common difference:

Required sum:

Step 2: Use the sum formula for an AP.

For an AP, the sum of first terms is

Substitute , , :

Step 3: Simplify inside the bracket.

So,

Thus,

Step 4: Form the quadratic equation in .

Multiply both sides by 2:

Expand the right side:

Bring all terms to one side:

Divide the whole equation by 2 to simplify:

Step 5: Solve the quadratic equation.

Use the quadratic formula for :

Compute the discriminant:

So,

This gives two values:

Step 6: Choose the valid value of .

Since is the *number of terms*, it must be a positive integer. The value is negative and not acceptable.

Therefore, we take .

Conclusion: We must take **12 terms** of the AP to get a sum of 636.

12.

By putting a = 9, d = 8, S = 636 in the formula S = (n)/(2)[2a + (n - 1)d], we get the quadratic equation 4n^2 + 5n - 636 = 0.

On solving, we get n = -(53)/(4), 12. Out of these two roots only one root 12 is admissible.

Question 5

QUESTION

The first term of an AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

SOLUTION

Given: First term , last term , sum of all terms .

We need to find the **number of terms** and the **common difference** .

STEP 1: USE THE SUM FORMULA WITH FIRST AND LAST TERM

For an AP, the sum of terms is:

Substitute the given values:

So,

Number of terms: .

STEP 2: USE THE NTH TERM FORMULA TO FIND

The last term is the th term:

Here, , , .

So,

Subtract 5 from both sides:

Common difference: .

Conclusion: The AP has **16 terms** and common difference .

ANSWER

n = 16,\ d = (8)/(3)

Question 6

The first and the last terms of an AP are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum?

SOLUTION

Given: First term , last term , common difference .

We need to find the **number of terms** and their **sum** .

STEP 1: USE THE NTH TERM FORMULA TO FIND .

For an AP, the nth term is

Here the last term is . So:

Subtract 17 from both sides:

Divide by 9:

So,

Number of terms: .

STEP 2: FIND THE SUM OF ALL TERMS.

Sum of first terms of an AP:

Substitute , , :

Compute the product:

Sum of all terms: .

Conclusion: The AP has **38 terms** and their sum is **6973**.

ANSWER

n = 38,\ S = 6973

Question 7

Find the sum of first 22 terms of an AP in which d = 7 and the 22nd term is 149.

SOLUTION

Given: Common difference , 22nd term . We need .

Step 1: Recall the formulas.

nth term of an AP:

Sum of first n terms: , where is the nth (last) term.

Step 2: Find the first term .

For the 22nd term:

Substitute and :

So, the first term is .

Step 3: Use the sum formula.

We know , , and the last term .

Conclusion: The sum of the first 22 terms of the AP is .

ANSWER

Sum = 1661

Question 8

Find the sum of first 51 terms of an AP whose second and third terms are 14 and 18 respectively.

SOLUTION

Step 1: Recall the basic formulas for an AP.

nth term:

Sum of first n terms:

Here, is the first term and is the common difference.

STEP 2: USE THE GIVEN SECOND AND THIRD TERMS.

The second term and the third term .

Write them using the nth-term formula:

STEP 3: FIND THE COMMON DIFFERENCE .

Subtract the first equation from the second:

STEP 4: FIND THE FIRST TERM .

Use :

STEP 5: FIND THE SUM OF FIRST 51 TERMS.

We need . Use the sum formula:

Substitute and :

Conclusion: The sum of the first 51 terms of the AP is .

ANSWER

S_51 = 5610

Question 9

If the sum of first 7 terms of an AP is 49 and that of 17 terms is 289, find the sum of first n terms.

SOLUTION

Recall formulas for an AP:

Sum of first terms:

where is the first term and is the common difference.

STEP 1: USE THE CONDITION ON THE SUM OF FIRST 7 TERMS

Given :

Multiply both sides by 2:

Divide by 7:

Divide by 2:

STEP 2: USE THE CONDITION ON THE SUM OF FIRST 17 TERMS

Given :

Multiply both sides by 2:

Divide by 17:

Divide by 2:

STEP 3: SOLVE THE TWO EQUATIONS FOR AND

Subtract (1) from (2):

Substitute into (1):

STEP 4: FIND THE GENERAL EXPRESSION FOR

Now use the sum formula with and :

Simplify inside the bracket:

So,

Conclusion: The sum of the first terms of the AP is .

ANSWER

S_n = n^2

Question 10

Show that a_1, a_2, ..., a_n, ... form an AP where a_n is defined as below :

(i) a_n = 3 + 4n

(ii) a_n = 9 - 5n

Also find the sum of the first 15 terms in each case.

SOLUTION

Recall: A sequence is an arithmetic progression (AP) if the difference between any term and its previous term is constant: . The sum of the first terms is

(I)

Step 1: Show it is an AP.

First few terms:

Check the common difference:

In general,

Since the difference is always 4, the sequence forms an AP with

Step 2: Find .

Use with :

So, .

(II)

Step 1: Show it is an AP.

First few terms:

Check the common difference:

In general,

So the sequence is an AP with

Step 2: Find .

First find the 15th term:

Now use :

So, .

ANSWER

(i) $S_{15} = 525$

(ii) $S_{15} = -465$

Question 11

The sum of the first terms of an AP is given as:

$S_1 = 3,\ S_2 = 4$. Find:

$a_2 = S_2 - S_1$, S_3, $a_3 = S_3 - S_2$, $a_{10} = S_{10} - S_9$, and $a_n = S_n - S_{n-1}$.

SOLUTION

Key facts:

• In any sequence, the nth term can be found from sums using: .
• For an AP, the terms differ by a constant common difference .

STEP 1: USE THE GIVEN PARTIAL SUMS TO FIND THE FIRST FEW TERMS

We know:

So, .

Also,

So,

Hence, , .

The common difference is:

STEP 2: WRITE THE GENERAL TERM

For an AP,

Substitute and :

So,

This also matches the required form .

STEP 3: FIND AND

First find using :

Now,

Check with difference:

which agrees with our value.

STEP 4: FIND

Using the general term:

By definition, , so:

STEP 5: SUMMARY OF ALL REQUIRED RESULTS

-
-
-
-
• General term: .

Question 12

Find the sum of the first 40 positive integers divisible by 6.

SOLUTION

Step 1: Identify the AP.

The positive integers divisible by 6 form the sequence:

This is an AP with:

First term:
Common difference:

Step 2: We need the sum of the first 40 terms.

Use the sum formula for an AP:

Substitute :

Simplify inside the bracket:

So,

Step 3: Multiply to get the final answer.

Conclusion: The sum of the first 40 positive integers divisible by 6 is **4920**.

ANSWER

4920

Question 13

Find the sum of the first 15 multiples of 8.

SOLUTION

Step 1: Recognise the AP.

The multiples of 8 form an arithmetic progression:

Here, the first term and the common difference .

We need the sum of the first 15 terms, i.e., .

Step 2: Use the formula for the sum of the first n terms of an AP.

Substitute , , and :

Step 3: Simplify inside the brackets.

So:

Step 4: Final computation.

Conclusion: The sum of the first 15 multiples of 8 is **960**.

ANSWER

960

Question 14

Find the sum of the odd numbers between 0 and 50.

SOLUTION

Step 1: Identify the sequence of odd numbers.

The odd numbers between 0 and 50 are:

This is an arithmetic progression (AP) with:

First term , common difference , last term .

Step 2: Find the number of terms.

Use the nth-term formula:

Put :

So, there are 25 odd numbers.

Step 3: Use the sum formula for an AP.

Substitute , , :

Conclusion: The sum of all odd numbers between 0 and 50 is **625**.

ANSWER

625

Question 15

A contract on a construction job specifies a penalty for delay of completion beyond a certain date as follows: Rs 200 for the first day, Rs 250 for the second day, Rs 300 for the third day, etc., the penalty for each succeeding day being Rs 50 more than for the preceding day. How much money has the contractor to pay as penalty if he has delayed the work by 30 days?

SOLUTION

Step 1: Recognise the pattern as an AP.

The penalties form an arithmetic progression (AP):

First day: Rs 200
Second day: Rs 250
Third day: Rs 300
...

Each day the penalty increases by Rs 50.

So, first term and common difference .

The contractor is late by 30 days, so the number of terms .

Step 2: Recall the sum formula for an AP.

The sum of the first terms of an AP is:

Here, we need .

Step 3: Substitute the known values.

First simplify each part:

Now add inside the bracket:

So,

Step 4: Multiply to get the total penalty.

Conclusion: The contractor has to pay a total penalty of **Rs 27,750**.

ANSWER

Rs 27750

Question 16

A sum of Rs 700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is Rs 20 less than its preceding prize, find the value of each of the prizes.

SOLUTION

Step 1: Recognise the AP pattern.

We have 7 prizes and each prize is Rs 20 less than the previous one. So the prizes form a decreasing arithmetic progression (AP).

Let the **first (highest) prize** be rupees. Then the common difference is:

Step 2: Write the 7 prizes as AP terms.

The 7 prizes (terms of the AP) will be:

Step 3: Use the sum condition.

Total money to be distributed is Rs 700. So, the sum of these 7 terms is 700.

Sum of first terms of an AP is:

Here, , , . Substitute:

Step 4: Solve for .

Multiply both sides by 2:

Divide by 7:

Add 120 to both sides:

So, the highest prize is Rs 160.

Step 5: List all prize amounts.

Now generate the remaining six prizes by subtracting 20 each time:

1st prize:
2nd prize:
3rd prize:
4th prize:
5th prize:
6th prize:
7th prize:

Step 6: Quick check of the sum.

Add them: . The total matches the given sum.

Conclusion: The seven prizes are **Rs 160, 140, 120, 100, 80, 60, 40**.

ANSWER

The prize amounts are 160, 140, 120, 100, 80, 60, 40.

Question 17

In a school, students thought of planting trees in and around the school to reduce air pollution. It was decided that the number of trees, that each section of each class will plant, will be the same as the class, in which they are studying, e.g., a section of Class I will plant 1 tree, a section of Class II will plant 2 trees and so on till Class XII. There are three sections of each class. How many trees will be planted by the students?

SOLUTION

Step 1: Understand the pattern.

For each class from I to XII, every section plants trees equal to the class number.

- Class I: each section plants 1 tree.
- Class II: each section plants 2 trees.
- ...
- Class XII: each section plants 12 trees.

There are 3 sections in **each** class.

Step 2: Trees planted by one class.

For Class (where):

- Trees per section = .
- Number of sections = 3.
- Total trees for that class = .

Step 3: Total trees for all classes.

Add trees for Classes I to XII:

Factor out 3:

Step 4: Use sum of first 12 natural numbers.

Sum of first natural numbers:

Here :

Step 5: Multiply by 3 for the sections.

Conclusion: The students will plant a total of **234 trees**.

ANSWER

234

Question 18

A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, . . . as shown in Fig. 5.4. What is the total length of such a spiral made up of thirteen consecutive semicircles? (Take π = (22)/(7))

SOLUTION

Idea: The spiral is formed by joining semicircles. The length of each semicircle is half the circumference of a full circle, i.e. . Add these lengths for all 13 semicircles.

STEP 1: LIST THE RADII AS AN AP

The radii given are:

This is an arithmetic progression (AP) with:

First term

Common difference

Number of semicircles .

The nth radius is:

So the radii for 13 semicircles are:

STEP 2: LENGTH OF ONE SEMICIRCLE

Circumference of a full circle of radius is .

Length of a semicircle (half circle) is:

So each semicircle of radius has length .

STEP 3: TOTAL LENGTH OF 13 SEMICIRCLES

Total length is:

We must find the sum of all radii.

Since , the sum of radii is:

Now,

So,

Therefore,

STEP 4: SUBSTITUTE

Simplify step by step:

Now, , so:

Conclusion: The total length of the spiral formed by thirteen semicircles is .

ANSWER

143\text cm

Question 19

200 logs are stacked so that the bottom row contains 20 logs, the next contains 19, then 18, and so on. In how many rows are the 200 logs placed and how many logs are in the top row?

SOLUTION

Step 1: Observe that the rows form an AP.

The number of logs in each row forms an arithmetic progression:

So, first term , common difference .

Let there be rows, and let the last row (top row) have logs.

STEP 2: USE THE SUM OF AP FORMULA.

Total logs = sum of all terms of the AP:

We are given and . Also, since , the nth term is:

So the sum becomes:

STEP 3: FORM AND SOLVE THE QUADRATIC EQUATION.

Multiply both sides by 2:

Rearrange:

Factorise: find two numbers whose product is 400 and sum is 41. These are 16 and 25:

So,

STEP 4: CHOOSE THE VALID VALUE OF .

The number of logs in the nth row is . For :

(not possible, logs cannot be negative).

So, the only valid solution is .

STEP 5: FIND THE NUMBER OF LOGS IN THE TOP ROW.

Top row logs = nth term:

Conclusion: The 200 logs are stacked in **16 rows**, and the **top row has 5 logs**.

ANSWER

16 rows, 5 logs in the top row.

Question 20

QUESTION

In a potato race, a bucket is placed at the starting point. The first potato is 5 m away, and each subsequent potato is 3 m apart in a straight line. There are ten potatoes. A competitor picks each potato one at a time, returns to the bucket, and continues. Find the total distance the competitor runs.

SOLUTION

Idea: For each potato, the competitor runs from the bucket to the potato and back to the bucket. So, if a potato is at distance metres, the distance run for that potato is metres. We add this for all 10 potatoes.

STEP 1: WRITE THE DISTANCES OF THE POTATOES FROM THE BUCKET

The first potato is 5 m away. Each next potato is 3 m further than the previous one.

So the distances form an AP:

Here, first term , common difference , and number of potatoes .

STEP 2: FIND THE SUM OF DISTANCES TO ALL POTATOES

Sum of first terms of an AP:

For , , :

So, the sum of all one-way distances to the potatoes is 185 m.

STEP 3: ACCOUNT FOR GOING AND COMING BACK

For each potato, the competitor goes to the potato and comes back to the bucket. So the distance for each potato is doubled.

Total distance run:

CONCLUSION

The competitor runs a total distance of .

ANSWER

370\text m

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📋 Key Formulas

Important Formulas for Exercise 5.3

Formula / Concept	Description
Arithmetic Progression (AP)	A sequence of numbers where the difference between consecutive terms is constant. This constant difference is called the common difference.
Common Difference (d)	The fixed number added to each term to get the next term in an AP. It can be positive, negative, or zero. It is calculated as $d = a_2 - a_1$, where a_1 and a_2 are the first and second terms, respectively.
General Form of an AP	An AP is generally written as $a, a+d, a+2d, a+3d, \dots$, where 'a' is the first term and 'd' is the common difference.
n^th Term of an AP	The formula to find the nth term (or the general term) of an AP is: $a_n = a + (n-1)d$ where a_n is the nth term, a is the first term, n is the number of terms, and d is the common difference.
Sum of the First n Terms of an AP	The sum (S_n) of the first n terms of an AP is given by the formula: $S_n = (n)/(2)[2a + (n-1)d]$ where n is the number of terms, a is the first term, and d is the common difference.
Sum of the First n Terms of an AP (when the last term is known)	If the first term a and the last term l (or a_n) of a finite AP are known, the sum of n terms can also be calculated as: $S_n = (n)/(2)(a + l)$ or $S_n = (n)/(2)(a + a_n)$
Finding the nth Term from the Sum of Terms	The nth term of an AP can also be found if the sum of the first n terms (S_n) is known. It is the difference between the sum of the first n terms and the sum of the first (n-1) terms. $a_n = S_n - S_{n-1}$

📌 Top FAQs

Q1. How many questions are in NCERT Solutions Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.3?

Exercise 5.3 of NCERT Solutions for Class 10 Maths Chapter 5 Arithmetic Progressions contains exactly 20 questions. These questions focus on the sum of first n terms of AP and apply the nth term formula extensively. All 20 questions with step by step solutions are available for CBSE board exam 2025-26 preparation.

Q2. Where can I download free PDF of NCERT Solutions for Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.3?

You can download the free PDF of NCERT Solutions for Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.3 from the official NCERT website or various educational platforms. The PDF contains all 20 questions with detailed step by step solutions for CBSE board exam 2025-26. These solutions are updated according to the latest CBSE syllabus and available in downloadable format.

Q3. How many marks does Arithmetic Progressions Chapter 5 carry in CBSE Class 10 board exam 2025-26?

Arithmetic Progressions Chapter 5 carries 5 marks in CBSE Class 10 board exam 2025-26 as part of Unit II - Algebra. Exercise 5.3 focusing on sum of n terms of AP is crucial for scoring these marks. Students should practice all 20 questions from Exercise 5.3 with step by step solutions to secure full marks in this chapter.

Q4. Which is the most difficult question in NCERT Solutions Exercise 5.3 of Class 10 Maths Chapter 5 Arithmetic Progressions?

Questions 18-20 in NCERT Solutions Exercise 5.3 of Class 10 Maths Chapter 5 Arithmetic Progressions are considered most difficult as they involve application-based problems on sum of n terms. These questions require understanding of both nth term of AP formula and sum of n terms formula simultaneously. Practicing these with step by step solutions is essential for CBSE board exam 2025-26.

Q5. What is the nth Term of AP Formula in NCERT Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.3?

The nth term of AP formula in NCERT Class 10 Maths Chapter 5 is $a_n = a + (n-1)d$, where 'a' is the first term, 'd' is the common difference, and 'n' is the number of terms. Exercise 5.3 extensively uses this formula along with the sum of n terms formula $S_n = n/2[2a + (n-1)d]$ or $S_n = n/2(a + l)$. These formulas are critical for solving all 20 questions in Exercise 5.3 for CBSE board exam 2025-26.

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