NCERT Solutions Class 10 Maths
Chapter 5: Arithmetic Progressions
Exercise 5.1

Quick Summary: In NCERT Solutions Class 10 Maths Chapter 5 Exercise 5.1, students learn the fundamental concepts of Arithmetic Progressions (AP) including how to identify AP sequences and apply basic formulas. This exercise covers essential topics like the nth term formula and common difference calculation which are crucial for CBSE Class 10 board exams and form the foundation for advanced AP problems.

Key Takeaways:

- Understanding AP definition: A sequence where consecutive terms have constant difference $d = a_{n+1} - a_n$
- nth term formula for AP: $a_n = a + (n-1)d$ where a is first term and d is common difference
- Method to check if a sequence is AP by verifying if $a_2 - a_1 = a_3 - a_2 = a_4 - a_3$ and so on
- Practical applications in solving real-world problems involving sequences with uniform patterns

Complete Solutions

Question 1

In which of the following situations, does the list of numbers involved make an arithmetic progression, and why?

(i) The taxi fare after each km when the fare is ₹ 15 for the first km and ₹ 8 for each additional km.

(ii) The amount of air present in a cylinder when a vacuum pump removes $(1)/(4)$ of the air remaining in the cylinder at a time.

(iii) The cost of digging a well after every metre of digging, when it costs ₹ 150 for the first metre and rises by ₹ 50 for each subsequent metre.

(iv) The amount of money in the account every year, when ₹ 10000 is deposited at compound interest at 8% per annum.

SOLUTION

Recall: A list of numbers forms an *arithmetic progression (AP)* if the difference between any two consecutive terms is constant (same throughout). This constant is called the **common difference**.

(I) TAXI FARE AFTER EACH KM

• Fare for the first km = ₹15.

• For every additional km, ₹8 is added to the previous fare.

So, the total fare after:

1 km: ₹15

2 km: ₹15 + 8 = ₹23

3 km: ₹23 + 8 = ₹31

4 km: ₹31 + 8 = ₹39, and so on.

This gives the sequence: .

Check differences:

.

The difference between consecutive terms is always 8 (constant), so the list of numbers is an AP.

(II) AMOUNT OF AIR IN THE CYLINDER

• Let the initial amount of air be .

• Each time, the pump removes of the *remaining* air, so of the air remains.

After each operation, the air amounts are:

Initially:

After first removal:

After second removal:

After third removal: , and so on.

The sequence is: .

Here, each term is obtained by multiplying the previous term by , not by adding a fixed number.

So the **ratio** between successive terms is constant, not the difference. Hence this is a **geometric progression (GP)**, not an AP.

(III) COST OF DIGGING A WELL

• Cost for the first metre = ₹150.

• For each subsequent metre, cost increases by ₹50.

So, the cost after each metre:

1st metre: ₹150

2nd metre: ₹150 + 50 = ₹200

3rd metre: ₹200 + 50 = ₹250

4th metre: ₹250 + 50 = ₹300, and so on.

This gives the sequence: .

Check differences:

.

The difference between consecutive terms is constantly 50, so this is an **arithmetic progression** with common difference 50.

(IV) AMOUNT OF MONEY AT COMPOUND INTEREST

• Principal (initial deposit) = ₹10000.

• Rate of interest = 8% per annum, compounded yearly.

After 1 year, amount:

After 2 years:

After 3 years:

and so on.

The sequence is: .

Each term is obtained by multiplying the previous term by , not by adding a fixed amount.

Therefore, the list of numbers forms a **geometric progression**, not an AP.

ANSWER

(i) Yes. The total fare after each km is 15, 23, 31, ..., which forms an AP because each succeeding term is obtained by adding 8 to the preceding term.

(ii) No. The volumes of air are V, $\frac{3V}{4}$, $\left(\frac{3}{4}\right)^2 V$, ..., which form a geometric progression, not an AP.

(iii) Yes. The costs are 150, 200, 250, ..., which form an AP with common difference 50.

(iv) No. The amounts are $10000\left(1 + \frac{8}{100}\right)$, $10000\left(1 + \frac{8}{100}\right)^2$, $10000\left(1 + \frac{8}{100}\right)^3$, ..., which form a geometric progression, not an AP.

Question 2

QUESTION

Write first four terms of the AP, when the first term a and the common difference d are given as follows:

(i) a = 10,\ d = 10

(ii) a = -2,\ d = 0

(iii) a = 4,\ d = -3

(iv) a = -1,\ d = (1)/(2)

(v) a = -1.25,\ d = 0.25

SOLUTION

Recall: In an arithmetic progression (AP) with first term and common difference , the terms are:

So, the first four terms are: , , , .

(I)

First four terms: .

(II)

Here the common difference is 0, so every term is the same.

First four terms: .

(III)

First four terms: .

(IV)

First four terms: .

(V)

Starting from , each successive term changes by in the same direction, giving:

First four terms: .

ANSWER

(i) 10, 20, 30, 40

(ii) -2, -2, -2, -2

(iii) 4, 1, -2, -5

(iv) -1, $-\tfrac{1}{2}$, 0, $\tfrac{1}{2}$

(v) -1.25, -1.50, -1.75, -2.00

Question 3

For the following APs, write the first term and the common difference:

(i) 3, 1, -1, -3, ...

(ii) -5, -1, 3, 7, ...

(iii) \tfrac(1)/(3), \tfrac(5)/(3), \tfrac(9)/(3), \tfrac(13)/(3), ...

(iv) 0.6, 1.7, 2.8, 3.9, ...

SOLUTION

Recall: In an arithmetic progression (AP):

• The **first term** is the very first number in the list (denoted by).
• The **common difference** (denoted by) is the difference between any term and the previous term: .

(I)

First term: .

Common difference: subtract consecutive terms: . Check with next: , . So .

(II)

First term: .

Common difference: . Check with next: , . So .

(III)

First term: .

Common difference: . Check with next: , . So .

(IV)

First term: .

Common difference: . Check with next: , . So .

Summary: In each case, the first term is the first number, and the common difference is obtained by subtracting any term from the next one.

ANSWER

(i) First term a = 3, common difference d = -2.

(ii) First term a = -5, common difference d = 4.

(iii) First term a = $\tfrac{1}{3}$, common difference d = $\tfrac{4}{3}$.

(iv) First term a = 0.6, common difference d = 1.1.

Question 4

Which of the following are APs? If they form an AP, find the common difference d and write three more terms.

(i) 2, 4, 8, 16, ...

(ii) 2, \tfrac(5)/(2), 3, \tfrac(7)/(2), ...

(iii) -1.2, -3.2, -5.2, -7.2, ...

(iv) -10, -6, -2, 2, ...

(v) 3, 3 + √2, 3 + 2√2, 3 + 3√2, ...

(vi) 0.2, 0.22, 0.222, 0.2222, ...

(vii) 0, -4, -8, -12, ...

(viii) \tfrac(1)/(2), -\tfrac(1)/(2), \tfrac(1)/(2), -\tfrac(1)/(2), ...

(ix) 1, 3, 9, 27, ...

(x) a, 2a, 3a, 4a, ...

(xi) a, a^2, a^3, a^4, ...

(xii) √2, √8, √18, √32, ...

(xiii) √3, √6, √9, √12, ...

(xiv) 1^2, 3^2, 5^2, 7^2, ...

(xv) 1^2, 5^2, 7^2, 73, ...

SOLUTION

How to check whether a sequence is an AP?

Subtract consecutive terms. If the difference is the same throughout, the sequence is an AP. That constant value is the **common difference** . If the differences vary, it is **not** an AP.

(I)

Differences: 4 − 2 = 2, 8 − 4 = 4, 16 − 8 = 8 → not constant → **Not an AP**.

(II)

Differences: , , → constant → **AP with d =** .

Next terms: add repeatedly → .

(III)

Differences: −3.2 − (−1.2) = −2, −5.2 − (−3.2) = −2 → constant → **AP with d = −2**.

Next terms: −9.2, −11.2, −13.2.

(IV)

Differences: −6 − (−10) = 4, −2 − (−6) = 4 → constant → **AP with d = 4**.

Next terms: 6, 10, 14.

(V)

Differences: , → constant → **AP with d =** .

Next terms: .

(VI)

Differences change each time → **Not an AP**.

(VII)

Differences: −4, −4, −4 → constant → **AP with d = −4**.

Next terms: −16, −20, −24.

(VIII)

Differences: −1, +1, −1 → not constant → **Not an AP**.

(IX)

Ratios are constant (geometric), but differences are not → **Not an AP**.

(X)

Differences: 2a − a = a, 3a − 2a = a → constant → **AP with d = a**.

Next terms: 5a, 6a, 7a.

(XI)

Differences vary → **Not an AP**.

(XII)

Simplify terms: , , .

The sequence becomes: → clearly an AP with difference .

Next terms: .

(XIII)

Differences are not constant → **Not an AP**.

(XIV)

Sequence: 1, 9, 25, 49 → differences not constant → **Not an AP**.

(XV)

Sequence: 1, 25, 49, 73 → differences: 24, 24, 24 → constant → **AP with d = 24**.

Next terms: 97, 121, 145.

ANSWER

(i) No.

(ii) Yes, it is an AP with d = \tfrac(1)/(2); next three terms are 4, \tfrac(9)/(2), 5.

(iii) Yes, it is an AP with d = -2; next three terms are -9.2, -11.2, -13.2.

(iv) Yes, it is an AP with d = 4; next three terms are 6, 10, 14.

(v) Yes, it is an AP with d = √2; next three terms are 3 + 4√2, 3 + 5√2, 3 + 6√2.

(vi) No.

(vii) Yes, it is an AP with d = -4; next three terms are -16, -20, -24.

(viii) No.

(ix) No.

(x) Yes, it is an AP with d = a; next three terms are 5a, 6a, 7a.

(xi) No.

(xii) Yes, it is an AP with d = √2; next three terms are √50, √72, √98.

(xiii) No.

(xiv) No.

(xv) Yes, it is an AP with d = 24; next three terms are 97, 121, 145.

📚 Relevant Resources

Explore more NCERT solutions (click links to visit):

Resource	Visit Link
NCERT Class 10 Maths All Chapters	View Solutions →
NCERT Class 10 Science Solutions	View Solutions →
NCERT Class 10 Social Science	View Solutions →

Resource	Visit Link
NCERT Class 10 English Solutions	[View Solutions →](#)

📋 Key Formulas

Important Formulas for Exercise 5.1

Formula / Concept	Description
Arithmetic Progression (AP)	An arithmetic progression is a sequence of numbers where the difference between consecutive terms is constant. This sequence can be finite or infinite.
General Form of an AP	The general form of an AP is a, a+d, a+2d, a+3d, \dots, where a is the first term and d is the common difference.
Common Difference (d)	The constant difference between two consecutive terms in an AP is called the common difference. It can be calculated as d = a_{n+1} - a_n, where a_n is the nth term. The common difference can be positive, negative, or zero.
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 is the first term, n is the term number, 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 can be calculated using one of the following formulas: S_n = (n)/(2)[2a + (n-1)d] or S_n = (n)/(2)(a + l) where a is the first term, d is the common difference, n is the number of terms, and l is the last term (a_n).

❓ Top FAQs

Q1. How many questions are in NCERT Solutions for Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.1?

Exercise 5.1 of NCERT Solutions for Class 10 Maths Chapter 5 Arithmetic Progressions contains exactly 4 questions. These questions focus on the basic introduction to Arithmetic Progressions, helping students understand the fundamental concepts before moving to advanced exercises in the chapter.

Q2. Where can I download free PDF of NCERT Solutions for Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.1 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.1 from the official NCERT website or various educational portals offering step by step solutions. These PDFs are updated for the CBSE board exam 2025-26 session and include detailed explanations for all 4 questions, making them perfect for exam preparation and self-study.

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

Arithmetic Progressions (Chapter 5) carries 5 marks in the CBSE Class 10 Maths board exam 2025-26 as part of Unit II - Algebra. Since this weightage is shared with other algebra topics, students must thoroughly practice Exercise 5.1 and subsequent exercises to score maximum marks in this important chapter.

Q4. Which is the most difficult question in NCERT Solutions Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.1?

Question 4 is generally considered the most challenging in Exercise 5.1 of Class 10 Maths Chapter 5 Arithmetic Progressions, as it requires students to identify whether given sequences form an AP or not. However, with step by step solutions and proper understanding of AP definition and common difference concepts, students can easily master this question for the CBSE board exam 2025-26.

Q5. What is the nth Term of AP Formula explained in NCERT Solutions Class 10 Maths Chapter 5 Arithmetic Progressions Exercise 5.1?

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 term number. This fundamental formula is introduced in Exercise 5.1 and is crucial for solving problems in Arithmetic Progressions for the CBSE board exam 2025-26.

📖 More Exercises

Visit all exercises from Chapter 5:

Exercise 5.1 ✓ →

Exercise 5.2 →

Exercise 5.3 →

Exercise 5.4 (Optional) →

🌐 **Complete Chapter: Class 10 Maths Ch 5: Arithmetic Progressions →**