

nth Term of an AP — $a_n = a + (n - 1)d$

CBSE Class 10 Maths · NCERT Chapter 5, Section 5.3 (Exercise 5.2) · Unit II Algebra

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

Start at the first term **a** and add the common difference **d** exactly **(n - 1)** times — not n times, because the first term needs **zero** steps.

What each letter is, and where you get it

Symbol	What it is	How you find it
a_n	The nth term — the answer	What the formula gives you once a, d and n are in
a	The first term	Read it off: it is the first number in the list
d	The common difference	Any term minus the one before it — later minus earlier
n	The position, or term number	Given in the question, or the thing you solve for

The **last term** of a finite AP is written **l**, and it is just a special nth term: $l = a + (n - 1)d$, where n is the total number of terms.

Four questions, one formula

What the question says	What you do	What comes out
"Find the 20th term"	Put $n = 20$ in and simplify	A number — the term itself
"Which term is -81?"	Set $a_n = -81$, solve for n	A position, e.g. the 35th term
"3rd term 5, 7th term 9"	Two equations, solve together	a and d — then the whole AP
"Is 301 a term?"	Solve for n, then check n	Only if n is a whole number
"How many terms are there?"	Set the last term $l = a_n$	n — the count of terms

Reading the NCERT numbering — mind the offset

Arithmetic Progressions is **Chapter 5**. Its sections run 5.1 Introduction, 5.2 Arithmetic Progressions, **5.3 nth Term of an AP**, 5.4 Sum of First n Terms, 5.5 Summary. Everything on this sheet is Section 5.3.

But the exercise numbers sit **one behind** the section numbers: Section 5.2 carries Exercise 5.1, so the nth-term section carries **Exercise 5.2 — 20 questions**. Ask for "the nth-term exercise" and it is 5.2, not 5.3.

Exercise 5.1 is 4 questions on recognising an AP; **Exercise 5.3** is 20 questions on the sum of n terms; **Exercise 5.4 is marked optional** in the textbook, so its 5 questions are **not examinable**.

What CBSE says, and what it means for you

The syllabus scope, word for word: "**Motivation for studying Arithmetic Progression Derivation of the nth term and sum of the first n terms of A.P. and their application in solving daily life problems.**"

The **derivation is named**, so "why (n - 1) and not n" is examinable reasoning, not background — be able to write the two-line argument. And "**daily life problems**" is why nth-term questions arrive dressed as salaries, savings, seats and stacked logs: translating the story into a, d and n is half the marks.

Unit II **Algebra is the largest unit at 20 of the 80 theory marks** (Number Systems 6, Coordinate Geometry 6, Geometry 15, Trigonometry 12, Mensuration 10, Statistics & Probability 11), plus 20 internal = 100. CBSE sets marks **by unit, not by chapter** — chapter-wise percentage tables online are unofficial.

Key takeaways

- ▶ $a_n = a + (n - 1)d$. First term, plus the common difference added (n - 1) times.
- ▶ **(n - 1), never n**. Reaching the nth term takes (n - 1) steps from the first.
- ▶ **d is later minus earlier**. For 21, 18, 15, ... that is -3 — keep the minus sign.
- ▶ **A position must be a positive whole number**. $n = 50.33$ or $n = -4$ means the value is not a term.
- ▶ **Two given terms means two equations**. Solve for a and d, then answer what was asked.
- ▶ **Write the formula line**. The substitution step is worth a mark on its own.

Three NCERT Exercise 5.2 questions, worked

The three shapes the guide names but does not work — a distant term, two APs compared, and a daily-life AP.

NCERT EX 5.2 · Q7

Find the **31st term** of an AP whose **11th term is 38** and **16th term is 73**.

Step 1 — write both given terms with the formula. $a + 10d = 38 \dots (1)$ $a + 15d = 73 \dots (2)$

Step 2 — subtract to kill a. $(2) - (1)$ gives $5d = 35$, so $d = 7$.

Step 3 — back-substitute for a. $a + 70 = 38$, so $a = -32$. A negative first term is fine.

Step 4 — answer the question asked. $a_{31} = -32 + (31 - 1) \times 7 = -32 + 210$.

The 31st term is 178. Finding a and d is the middle of this answer, not the end of it — stopping at “ $a = -32$, $d = 7$ ” leaves the last mark on the table.

Check: $a_{11} = -32 + 10(7) = 38 \checkmark$ and $a_{16} = -32 + 15(7) = 73 \checkmark$ — both given terms reproduce.

NCERT EX 5.2 · Q12

Two APs have the **same common difference**. The difference between their **100th terms is 100**. What is the difference between their **1000th terms**?

Step 1 — name the two first terms. Call them A and B, with the shared difference d.

Step 2 — write both 100th terms. $A + 99d$ and $B + 99d$. Subtracting, the $99d$ cancels: **$A - B = 100$** .

Step 3 — do the same at 1000. $(A + 999d) - (B + 999d) = A - B$.

The 1000th terms also differ by 100. Because d is shared, it cancels at every position — the gap between the two APs never changes, so no value of d is needed and none can be found.

Why this is worth knowing: the question looks under-specified because d is missing. It is not. Spotting that the unknown cancels is the whole question, and it is a 2–3 mark answer in three lines.

NCERT EX 5.2 · Q19

Subba Rao started work in **1995** at an annual salary of **Rs 5000** and received an increment of **Rs 200** each year. **In which year did his income reach Rs 7000?**

Step 1 — translate. Salaries form an AP: $a = 5000$, $d = 200$, and $a_n = 7000$.

Step 2 — solve for n. $7000 = 5000 + (n - 1)200 \Rightarrow 2000 = 200(n - 1) \Rightarrow n = 11$.

Step 3 — turn the position back into a year. $n = 11$ is the **11th** year, and 1995 is the **1st**. So the year is $1995 + 10$, not $1995 + 11$.

His income reached Rs 7000 in 2005. The $(n - 1)$ that trips people inside the formula trips them again on the way out: the 11th year is ten years after the first.

WHERE THE MARKS ACTUALLY GO

You wrote $a_{10} = a + 10d$. Multiplying d by n instead of $(n - 1)$ — every line after it is wrong.

You took d as +3 on a falling AP. d is later minus earlier; on 21, 18, 15, ... that is -3.

You accepted $n = 50.33$ as a term number. A fractional or negative n means the value is **not** a term — say so.

You stopped at a and d. Re-read the question: it usually wants a specific term, a count, or a year.

You skipped the formula line. Writing $a_n = a + (n - 1)d$ and substituting is a mark you get for free.

NOW TRY THESE TWO

(1) Which term of the AP **3, 8, 13, 18, ...** is **78**? (NCERT Ex 5.2, Q4)

(2) The **17th term** of an AP exceeds its **10th term by 7**. Find the common difference. (NCERT Ex 5.2, Q10)

Answers at the bottom of this page. For (2), write both terms out and subtract before you reach for anything else.

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