Class 9 Maths Chapter 8: Predicting What Comes Next: Exploring Sequences and Progressions - Notes, Important Questions and MCQs (2026-27)

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These Class 9 Maths Chapter 8 notes cover “Predicting What Comes Next: Exploring Sequences and Progressions” from the new NCERT textbook Ganita Manjari (Part I, 2026-27): sequences and terms, explicit and recursive rules, triangular numbers and the sum of the first n natural numbers, arithmetic progressions, geometric progressions, fractals and graphs of progressions – with tables, solved examples, Q&A, 10 MCQs and a free PDF.

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Chapter Overview

A sequence is an ordered list of numbers called terms. Patterns in tiles, matchsticks, savings and nature can be described by rules that let us predict any term without listing all the earlier ones.

An explicit rule gives the nth term directly from n, while a recursive rule builds each term from the previous ones. Two special sequences – arithmetic progressions (adding a fixed number) and geometric progressions (multiplying by a fixed number) – model linear and exponential growth.

Important Topics and Concepts

Sequences and Rules

- A sequence is an ordered list; terms are written $t_1, t_2, t_3, \ldots, t_n$.
- Explicit rule: t_n given in terms of n, e.g. $t_n = 2n + 1 \rightarrow 3, 5, 7, \ldots$
- Recursive rule: each term from earlier ones, e.g. $t_1 = 3$, $t_n = t_{n-1} + 2$.
- Fibonacci-type sequences use the sum of the two previous terms.

Triangular Numbers

- 1, 3, 6, 10, 15, ... – each term adds the next natural number.
- $t_n = n(n + 1)/2$.
- This also gives the sum of the first n natural numbers: $1 + 2 + \ldots + n = n(n + 1)/2$.
- Example: $1 + 2 + \ldots + 100 = 5050$.

Arithmetic Progressions (AP)

- Each term is obtained by adding a fixed number d (common difference).
- General form: a, a + d, a + 2d, ...
- nth term: $t_n = a + (n – 1)d$.
- Points (n, t_n) of an AP lie on a straight line – linear growth.

Geometric Progressions (GP)

- Each term is obtained by multiplying the previous term by a fixed number r (common ratio).
- General form: $a, ar, ar^2, \ldots$
- nth term: $t_n = ar^{n-1}$.
- Examples: doubling bacteria 1, 2, 4, 8, ...; halving 64, 32, 16, ...
- Points of a GP lie on a curve, showing rapid (exponential) growth or decay.

Fractals

- Fractals repeat the same pattern at smaller scales.
- Sierpiński triangle: at each stage the number of shaded triangles triples – 1, 3, 9, 27, ... (a GP with r = 3).
- Sierpiński carpet: shaded squares grow as 1, 8, 64, ... (r = 8).
- Fractals connect geometry with geometric progressions.

Solved Examples

Board-pattern practice.

- Find the 20th term of 7, 11, 15, ... a = 7, d = 4 → $t_{20} = 7 + 19 \times 4 = 83$.
- Which term of 3, 8, 13, ... is 98? $3 + (n – 1)5 = 98 \rightarrow n = 20$.
- Find the 6th term of 2, 6, 18, ... a = 2, r = 3 → $2 \times 3^5 = 486$.
- Sum of the first 50 natural numbers. $50 \times 51/2 = 1275$.
- Write a recursive rule for 5, 10, 20, 40, ... $t_1 = 5$, $t_n = 2t_{n-1}$.

AP vs GP

Feature	Arithmetic Progression	Geometric Progression
Next term	Add d	Multiply by r
General form	a, a + d, a + 2d, ...	a, ar, ar^2, ...
nth term	a + (n – 1)d	ar^{n-1}
Growth	Linear (straight line)	Exponential (curve)
Example	4, 7, 10, 13	3, 6, 12, 24

Important Terms and Formulas

Term	Meaning
Sequence	Ordered list of numbers
Term	Each number in a sequence
Explicit rule	Formula for t_n in terms of n
Recursive rule	Term defined from previous terms
Triangular numbers	1, 3, 6, 10, ... ; n(n + 1)/2
AP	Constant difference d
Common difference	$d = t_n - t_{n-1}$
GP	Constant ratio r
Common ratio	$r = t_n \div t_{n-1}$
Fractal	Self-repeating pattern at smaller scales

Short Answer Questions

Q1. What is a sequence?

An ordered list of numbers; each number is a term.

Q2. Distinguish explicit and recursive rules.

Explicit gives t_n from n directly; recursive gives t_n from earlier terms.

Q3. Find the 10th triangular number.

$10 \times 11/2 = 55$.

Q4. Write the nth term formula of an AP.

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

Q5. Find the common difference of 15, 11, 7, 3, ...

–4.

Q6. Write the nth term formula of a GP.

$t_n = ar^{n-1}$.

Q7. Find the common ratio of 81, 27, 9, ...

Q8. How do AP and GP graphs differ?

AP points lie on a straight line; GP points lie on a curve.

Long Answer Questions

Q1. Derive the formula for the sum of the first n natural numbers.

Let S = 1 + 2 + ... + n.

Write it backwards: S = n + (n – 1) + ... + 1.

Adding, each pair sums to n + 1, and there are n pairs.

2S = n(n + 1).

So S = n(n + 1)/2.

Q2. A matchstick pattern uses 4, 7, 10, ... sticks. Find the rule, the 15th stage and whether 200 sticks can form a stage.

It is an AP with a = 4, d = 3.

$t_n = 4 + (n – 1)3 = 3n + 1$.

$t_{15} = 46$ sticks.

$3n + 1 = 200 \rightarrow n = 199/3$, not a whole number.

So 200 sticks cannot form a complete stage.

Q3. Explain how the Sierpiński triangle leads to a GP.

Start with one shaded triangle (stage 1).

Join midpoints and remove the middle triangle – 3 shaded triangles.

Repeat on each – 9, then 27 triangles.

Numbers 1, 3, 9, 27 form a GP with r = 3.

nth stage has 3^{n-1} shaded triangles.

MCQs with Answers

1. nth term of AP is(a) a + nd (b) a + (n – 1)d (c) ar^{n-1} (d) n(n + 1)/2Answer: (b) a + (n – 1)d

2. Common difference of 2, 5, 8 is(a) 2 (b) 3 (c) 5 (d) –3Answer: (b) 3

3. Common ratio of 5, 15, 45 is(a) 3 (b) 10 (c) 5 (d) 1/3Answer: (a) 3

4. 5th triangular number(a) 10 (b) 15 (c) 21 (d) 25Answer: (b) 15

5. Sum of first 10 natural numbers(a) 45 (b) 50 (c) 55 (d) 100Answer: (c) 55

6. Which is a GP?(a) 2, 4, 6, 8 (b) 1, 4, 9, 16 (c) 3, 6, 12, 24 (d) 5, 10, 15Answer: (c) 3, 6, 12, 24

7. Graph of an AP is a(a) curve (b) straight line (c) circle (d) parabolaAnswer: (b) straight line

8. $t_1 = 2$, $t_n = t_{n-1} + 5$ is a(a) explicit rule (b) recursive rule (c) GP (d) fractalAnswer: (b) recursive rule

9. 8th term of 1, 2, 4, ...(a) 64 (b) 128 (c) 256 (d) 16Answer: (b) 128

Quick Revision Points

- Sequence, term, t_n.
- Explicit vs recursive rules.
- Triangular numbers; $\Sigma n = n(n + 1)/2$.
- AP: $t_n = a + (n – 1)d$; linear.
- GP: $t_n = ar^{n-1}$; exponential.
- Fractals: Sierpiński triangle (r = 3), carpet (r = 8).

Chapter Summary

Sequences are ordered lists described by explicit rules (using n) or recursive rules (using earlier terms). Triangular numbers 1, 3, 6, 10, … give the sum of the first n natural numbers, $n(n + 1)/2$.

An arithmetic progression adds a common difference d and has nth term $a + (n – 1)d$, showing linear growth. A geometric progression multiplies by a common ratio r and has nth term ar^{n-1}, showing exponential growth or decay, as seen in fractals like the Sierpiński triangle.

Exam Tips and PYQ Pattern

- Identify d or r before using formulas.
- Check whether a term exists by solving for n.
- Learn the AP vs GP table.
- Use the pairing trick for sums.
- Draw the first few stages of patterns.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the new NCERT Class 9 Maths textbook “Ganita Manjari” (Part I), prescribed for the 2026-27 session.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

What is the nth term of an AP and a GP?

AP: $a + (n – 1)d$; GP: ar^{n-1}.

What is the sum of the first n natural numbers?

$n(n + 1)/2$.

Conclusion

Predicting What Comes Next turns patterns into powerful rules. Learn the AP vs GP table, practise the solved examples here and save the free PDF for revision.

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE mathematics educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 9 Maths textbook, Ganita Manjari (Parts I and II, first edition 2026, NCF-SE 2023), and the CBSE syllabus for the 2026-27 session. Last checked on 24 November 2026.