Mathematics — Ganita Manjari

Chapter 8 Test 7

Predicting What Comes Next: Exploring Sequences and Progressions

Class IX | 2026–27

Time Allowed: 45 Minutes | Maximum Marks: 25

General Instructions

1. All 13 questions are compulsory. Choose one option in A; show working in B–D.
2. No calculators. Give exact answers unless an approximation is requested.
3. Term positions start at 1 unless a stage number of 0 is explicitly given.

SECTION A

(5 questions × 1 mark = 5 marks)

1. Which property best describes a fractal pattern?

(A) Similar structure at different scales
(B) Every region has equal area
(C) Only straight lines occur
(D) It has finitely many stages

2. A pattern begins with one shape at Stage 0 and triples its shape count each stage. Which rule gives the count at Stage n?

(A) 3^{n-1} (B) $3n$
(C) 3^{n} (D) $n + 3$

3. In constructing a Sierpiński triangle, each triangle loses one of four equal parts. What fraction of its area is retained?

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$
(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

4. In a Sierpiński square carpet, each retained square is replaced by how many smaller retained squares?

(A) 9 (B) 8
(C) 4 (D) 3

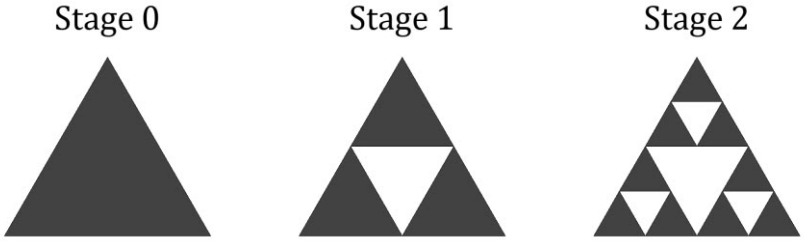
5. During successive stages of a Sierpiński triangle, what happens to the count and total area of the smallest retained triangles?

(A) Both increase
(B) Both decrease
(C) Count increases; total area decreases
(D) Count decreases; total area increases

SECTION B

(4 questions × 2 marks = 8 marks)

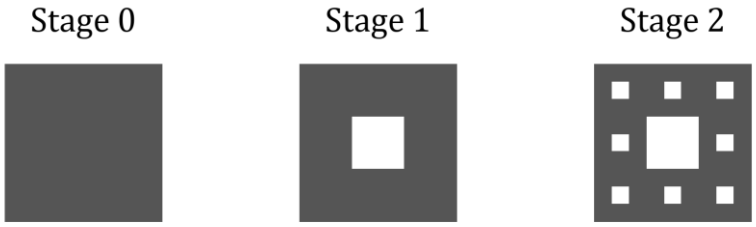
6. For the Sierpiński triangle in figure, find the count of smallest retained triangles at Stage 4. Give a recursive rule starting at Stage 0.



7. A Sierpiński triangle starts with side 32 cm at Stage 0. Each step halves the side of each small triangle. Find that side at Stage 5.

8. A Sierpiński triangle begins with area 64 cm^2. Find its total retained area and the total area removed by Stage 3.

9. The Sierpiński carpet in figure starts with area 81 cm^2. Find its retained areas at Stages 1 and 2.



SECTION C

(3 questions × 3 marks = 9 marks)

10. For a unit Sierpiński triangle, a pupil writes $A_n = (3/4)^n$ and $A_1 = 1$. Explain the indexing error and give a correct recursive rule.

11. At Stage n of a unit Sierpiński carpet, find the count and individual area of the smallest retained squares. Hence derive the total retained area.

12. Can a unit Sierpiński triangle have zero retained area at a finite stage? Explain what happens as the stages continue.

SECTION D

(1 application question × 3 marks = 3 marks)

13. A square carpet starts with area 729 cm^2. Each step removes the centre ninth of every retained square. Find the area removed during Step 3 alone.