CLASS IX – MATHEMATICS

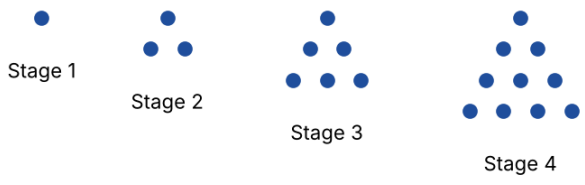
Chapter Test: Predicting What Comes Next – Exploring Sequences and Progressions

(Ganita Manjari, Grade 9, Part I – Chapter 8)

Time: 1½ Hours **M. M.: 40**

General Instructions:

1. This paper contains 21 questions. All questions are compulsory.
2. This paper is divided into 5 sections: **A, B, C, D** and **E**.
3. In **Section A**, Questions no. **1** to **10** are MCQs and questions no. **11** and **12** are Assertion-Reason based questions of 1 mark each.
4. In **Section B**, Questions no. **13** to **16** are Very Short Answer type questions carrying 2 marks each.
5. In **Section C**, Questions no. **17** and **18** are Short Answer type questions carrying 3 marks each.
6. In **Section D**, Questions no. **19** and **20** are Long Answer type questions carrying 5 marks each.
7. In **Section E**, Question no. **21** is a case based question carrying 4 marks. Internal choice is provided in the 2 marks part of the case study.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 1 part of Section E.
9. Show all the steps of your working. Write the formula you use.
10. Use of calculator is **not** allowed.

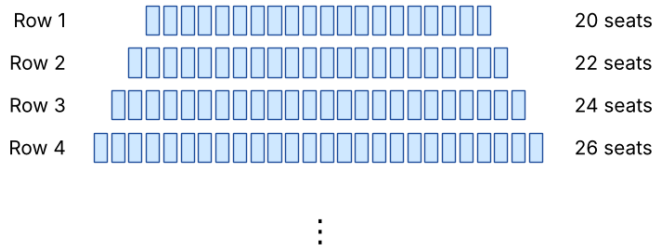
Q. No.	Section – A	Marks
1.	The 5^{th} term of the sequence $t_n = 3n - 7$ is (A) 6 (B) 8 (C) 10 (D) 22	**[1]**
2.	The common difference of the arithmetic progression 11, 7, 3, −1, … is (A) −4 (B) 4 (C) 18 (D) −18	**[1]**
3.	The 10^{th} term of the AP 4, 9, 14, 19, … is (A) 45 (B) 54 (C) 49 (D) 50	**[1]**
4.	The common ratio of the geometric progression 81, 27, 9, 3, … is (A) 3 (B) −3 (C) 1/27 (D) 1/3	**[1]**
5.	The sum of the first 20 natural numbers is (A) 190 (B) 200 (C) 210 (D) 420	**[1]**
6.	A sequence is given by the recursive rule $t_1 = 2$, $t_n = 3t_{n-1} - 1$ for $n \geq 2$. The third term t_3 is (A) 5 (B) 14 (C) 8 (D) 41	**[1]**
7.	Which of the following sequences is a geometric progression? (A) 2, 6, 18, 54, … (B) 1, 4, 9, 16, … (C) 3, 5, 7, 9, … (D) 1, 1, 2, 3, …	**[1]**
8.	The figure shows the first four stages of a pattern of dots. The number of dots in Stage 6 will be  (A) 15 (B) 21 (C) 28 (D) 18	**[1]**

Q. No.	Section – A	Marks
9.	Which term of the AP 7, 13, 19, 25, ... is 139? (A) 21^{st} (B) 22^{nd} (C) 24^{th} (D) 23^{rd}	**[1]**
10.	The 6^{th} term of the GP 2, 6, 18, 54, ... is (A) 486 (B) 162 (C) 1458 (D) 54	**[1]**
	Questions number 11 and 12 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below. (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A). (C) Assertion (A) is true but Reason (R) is false. (D) Assertion (A) is false but Reason (R) is true.	
11.	**Assertion (A):** The sequence 1, 4, 9, 16, 25, ... of square numbers is an arithmetic progression. **Reason (R):** In an arithmetic progression the difference between any two consecutive terms is constant.	**[1]**
12.	**Assertion (A):** The sum 1 + 2 + 3 + ... + 100 is equal to 5050. **Reason (R):** The first n natural numbers 1, 2, 3, ..., n form a geometric progression.	**[1]**

Q. No.	Section – B	Marks
13.	Write the first five terms of the sequence defined by the recursive rule $t_1 = 4,\ t_n = 2t_{n-1} - 3$ for $n \geq 2$.	**[2]**
14.	(A) Determine whether 150 and 173 are terms of the sequence $t_n = 4n - 6$. Give reasons. **OR** (B) Find the 9^{th} term of the geometric progression 5, 10, 20, 40, ...	**[2]**
15.	Using the formula for the sum of the first n natural numbers, find the value of 21 + 22 + 23 + ... + 50.	**[2]**
16.	(A) For the AP 9, 13, 17, 21, ..., write the explicit rule for the n^{th} term and the recursive rule. **OR** (B) A taxi company charges a fixed booking fee of ₹50 plus ₹12 per kilometre. Write the sequence of total fares for 1 km, 2 km and 3 km, and write the n^{th} term of this sequence, where n is the distance in km.	**[2]**

Q. No.	Section – C	Marks
17.	(A) The 4^{th} term of an AP is 17 and its 9^{th} term is 42. Find the AP and its 25^{th} term. **OR** (B) How many three-digit numbers are divisible by 8?	**[3]**
18.	(A) The 3^{rd} term of a GP is 12 and its 6^{th} term is 96. Find the first term, the common ratio and the 8^{th} term. **OR** (B) A culture has 500 bacteria at the start and the number of bacteria doubles every hour. Find the number of bacteria after 3 hours and after 6 hours. Also write the number of bacteria after n hours.	**[3]**

Q. No.	Section – D	Marks
19.	(A) An AP has 40 terms. Its 5^{th} term is 23 and its last term is 198. Find the first term and the common difference of the AP. Hence find its 27^{th} term and the position of the term 108. **OR** (B) Logs are stacked so that the bottom row has 24 logs, the next row has 23 logs, the next 22 logs, and so on, up to the top row which has 1 log. (i) How many rows are there in the stack? (ii) How many logs are there in the whole stack? (iii) How many logs are there in the bottom 10 rows?	**[5]**
20.	(A) A ball is dropped from a height of 128 m. Each time it hits the ground, it bounces back to half of the height from which it fell. (i) What height does the ball reach after the 5^{th} bounce? (ii) Write the explicit rule and the recursive rule for the height after the n^{th} bounce. (iii) After how many bounces does the ball first reach a height below 1 m? **OR** (B) A fractal is made in stages. At Stage 0 there is one shaded triangle of area 64 square units. At each stage, every shaded triangle is replaced by 3 smaller shaded triangles, each having ¼ of the area of the triangle it replaces. (i) How many shaded triangles are there at Stages 1, 2 and 3? Write the rule for Stage n. (ii) Find the total shaded area at Stages 1, 2 and 3. (iii) Write the rule for the total shaded area at Stage n, find it for Stage 4 and say what happens to it as n increases.	**[5]**

Q. No.	Section – E	Marks
21.	**Case Study:** A new auditorium is being designed. The first row has 20 seats and every next row has 2 seats more than the row in front of it, so the numbers of seats in the rows form an arithmetic progression.  (i) How many seats are there in the 6^{th} row? **[1]** (ii) Which row of the auditorium has 50 seats? **[1]** (iii) (A) The auditorium has 25 rows. How many seats are there in the last row? **[2]** **OR** (iii) (B) The manager says that one of the rows will have exactly 75 seats. Is he correct? Justify your answer. **[2]**	**[4]**