



SAMPLE QUESTION PAPER

CBSE Class 6 Mathematics - Chapter 1: Patterns in Mathematics

TIME 90 minutes	MAXIMUM MARKS 40	DIFFICULTY Medium
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Name: _____

Roll No.: _____

Date: _____

GENERAL INSTRUCTIONS

- All questions are compulsory.
- Show the pattern, calculation, or reason wherever required.
- Draw neat figures for shape-pattern questions, if needed.
- The question paper contains six sections: A, B, C, D, E, F:
 - Section A contains 10 MCQs of 1 Mark each
 - Section B contains 3 True or False and 3 Fill in the blanks questions of 1 mark each
 - Section C contains 3 VSA type questions of 2 marks each
 - Section D contains 2 SA type questions of 3 marks each
 - Section E contains 1 LA type questions of 4 marks
 - Section F contains 2 Assertion Reason Questions of 1 mark each and 2 Case Based Question of 3 marks each

SECTION A - OBJECTIVE TYPE QUESTIONS (10 x 1 = 10 marks)

- Find the next term: 1, 3, 6, 10, 15, ____.
(a) 18 (b) 20 (c) 21 (d) 25
- Which number completes the sequence 1, 3, 9, 27, ____?
(a) 54 (b) 72 (c) 81 (d) 90
- The seventh odd number is:
(a) 11 (b) 13 (c) 15 (d) 17
- Which number is both a triangular number and a square number?
(a) 15 (b) 25 (c) 36 (d) 49
- The next Virahanka number in 1, 2, 3, 5, 8, 13, ____ is:
(a) 18 (b) 20 (c) 21 (d) 26
- How many line segments are there in the complete graph K_5 ?
(a) 5 (b) 8 (c) 10 (d) 15
- The Koch snowflake segment sequence begins 3, 12, 48, ____.
(a) 96 (b) 144 (c) 192 (d) 240
- The sum of the first 8 odd numbers is:
(a) 36 (b) 49 (c) 64 (d) 81
- A regular nonagon has:
(a) 7 sides (b) 8 sides (c) 9 sides (d) 10 sides
- Which sequence represents cube numbers?
(a) 1, 4, 9, 16 (b) 1, 8, 27, 64 (c) 1, 3, 6, 10 (d) 1, 2, 4, 8

SECTION B - True False and Fill in the Blank Questions (6 x 1 = 6 marks)

State True or False

- The sum of two consecutive triangular numbers is always a square number.
- In the Virahanka sequence, each term is obtained by multiplying the previous two terms.
- The number of line segments in each stage of the Koch snowflake becomes four times the previous stage.

Fill in the Blanks

- The sum of the first 10 odd numbers is _____.
- The complete graph K_6 contains _____ line segments.

16. The numbers 1, 8, 27, 64, 125, ... are called _____ numbers.

SECTION C - VERY SHORT ANSWER QUESTIONS (3 x 2 = 6 marks)

17. Add the consecutive triangular numbers 10 and 15. Which square number do you obtain?
 18. Start with $1 + 2 + 4 + 8 + 16$, and then add 1. What number do you get?
 19. A sequence of stacked squares contains 1, 4, 9, 16, 25, ... little squares. How many little squares are in the 6th shape?

SECTION D - SHORT ANSWER QUESTIONS (2 x 3 = 6 marks)

20. Show that 36 belongs to both the triangular-number sequence and the square-number sequence.
 21. A stacked triangle has rows containing 1, 3, 5, and 7 small triangles. Find the total number of small triangles and identify its number sequence.

SECTION E - LONG ANSWER QUESTIONS (1 x 4 = 4 marks)

22. In the Koch snowflake pattern, the number of line segments is 3, 12, 48, 192, Find the numbers of segments in the 5th and 6th shapes and explain the rule.

SECTION F - CASE-BASED (2 x 1 = 2 marks) AND ASSERTION REASON QUESTIONS (2 x 3 = 6 marks)

CASE BASED

23. Square Tile Pattern

An art club arranges tiles in square patterns. The first four arrangements contain 1, 4, 9 and 16 tiles respectively.

- How many tiles will be required for the fifth arrangement?
- How many new tiles are added while changing the fourth arrangement into the fifth arrangement?
- How many tiles will be required for the tenth arrangement?

24. Complete Graph Pattern

Students draw complete graphs by joining every point to every other point. The graphs K_2 , K_3 , K_4 and K_5 contain 1, 3, 6 and 10 line segments respectively.

- How many line segments will K_6 contain?
- Name the number sequence represented by 1, 3, 6, 10, 15,
- How many new line segments are added while changing K_5 into K_6 ?

ASSERTION REASON BASED QUESTIONS

Choose the correct option:

- Both Assertion and Reason are true, and Reason correctly explains the Assertion.
- Both Assertion and Reason are true, but Reason does not correctly explain the Assertion.
- Assertion is true, but Reason is false.
- Assertion is false, but Reason is true.

25. **Assertion:** The sum of the first n odd numbers is n^2

Reason: Each successive square number is obtained by adding the next odd number.

26. **Assertion:** The sequence 1, 2, 4, 8, 16, ... is formed by adding the previous two terms.

Reason: Each term in this sequence is twice the preceding term.

- End of Question Paper -

TEACHER ANSWER KEY, MARKING POINTS & EXPLANATIONS

CBSE Class 6 Mathematics - Chapter 1: Patterns in Mathematics

Assessment note: Award marks according to the stated marking points. Equivalent correct reasoning may also be accepted.

SECTION A - OBJECTIVE ANSWERS (10 marks)

Q.	Correct answer	Why the answer is correct / marking point
1	(c) 21	The differences are +2, +3, +4 and +5. The next difference is +6, so $15 + 6 = 21$. [1 mark]
2	(c) 81	Each term is 3 times the previous term; therefore $27 \times 3 = 81$. [1 mark]
3	(b) 13	The n th odd number is $2n - 1$. For $n = 7$, $2 \times 7 - 1 = 13$. [1 mark]
4	(c) 36	$36 = 6 \times 6$, so it is square; also $36 = 1 + 2 + \dots + 8$, so it is triangular. [1 mark]
5	(c) 21	A Virahanka term is the sum of the previous two terms; $8 + 13 = 21$. [1 mark]
6	(c) 10	K_5 has $4 + 3 + 2 + 1 = 10$ line segments because every pair of points is joined once. [1 mark]
7	(c) 192	Every Koch stage has 4 times as many segments as the previous stage; $48 \times 4 = 192$. [1 mark]
8	(c) 64	The sum of the first n odd numbers is $n \times n$; hence the first 8 odd numbers total $8 \times 8 = 64$. [1 mark]
9	(c) 9 sides	A nonagon is a polygon having nine sides. [1 mark]
10	(b) 1, 8, 27, 64	These are 1 cubed, 2 cubed, 3 cubed and 4 cubed respectively. [1 mark]

SECTION B - TRUE/FALSE AND FILL-UP ANSWERS (6 marks)

Q.	Correct answer	Why the answer is correct / marking point
11	True	For consecutive triangular numbers, $T_n + T_{(n+1)}$ forms a square; for example, $10 + 15 = 25$. [1 mark]
12	False	Each Virahanka number is found by adding, not multiplying, the preceding two numbers. [1 mark]
13	True	In each Koch step, every old segment is replaced by four smaller segments. [1 mark]
14	100	The sum of the first 10 odd numbers equals $10 \times 10 = 100$. [1 mark]
15	15	K_5 contains $5 + 4 + 3 + 2 + 1 = 15$ line segments. [1 mark]
16	Cube numbers	The terms are 1 cubed, 2 cubed, 3 cubed, 4 cubed and 5 cubed. [1 mark]

SECTION C - VERY SHORT ANSWERS (3 x 2 = 6 marks)

17. Answer: $10 + 15 = 25 = 5 \times 5$.

Why correct: 10 and 15 are consecutive triangular numbers, and their sum forms the next square number.

Marking points: 1 mark for addition; 1 mark for identifying 25 as 5×5 .

18. Answer: $1 + 2 + 4 + 8 + 16 + 1 = 32$.

Why correct: The powers of 2 total 31; adding 1 gives the next power of 2, namely 32.

Marking points: 1 mark for obtaining 31; 1 mark for adding 1 and writing 32.

19. Answer: The 6th shape contains 36 little squares.

Why correct: Stacked-square totals are square numbers. The 6th total is $6 \times 6 = 36$.

Marking points: 1 mark for recognising the square-number rule; 1 mark for 36.

SECTION D - SHORT ANSWERS (2 x 3 = 6 marks)

20. Answer: $36 = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$, and $36 = 6 \times 6$.

Why correct: The first representation makes 36 the 8th triangular number; the second makes it the 6th square number.

Marking points: 1 mark for triangular representation; 1 mark for square representation; 1 mark for the conclusion.

21. Answer: $1 + 3 + 5 + 7 = 16$; it belongs to the square-number sequence.

Why correct: The sum of the first four odd numbers is $4 \times 4 = 16$, which is a square number.

Marking points: 1 mark for the addition; 1 mark for 16; 1 mark for identifying the square-number sequence.

SECTION E - LONG ANSWER (1 x 4 = 4 marks)

22. Answer: Rule: multiply by 4. Fifth shape = $192 \times 4 = 768$; sixth shape = $768 \times 4 = 3072$.

Why correct: At every Koch iteration, each existing line segment is replaced by four smaller line segments; therefore the total becomes four times.

Marking points: 1 mark for the rule; 1 mark for 768; 1 mark for 3072; 1 mark for the explanation.

SECTION F - CASE-BASED ANSWERS (2 x 3 = 6 marks)

23. Answer: (a) 25 tiles; (b) 9 new tiles; (c) 100 tiles.

Why correct: The n th square arrangement uses $n \times n$ tiles. Thus the 5th uses 25, the increase is $25 - 16 = 9$, and the 10th uses $10 \times 10 = 100$.

Marking points: 1 mark for each correct sub-answer.

24. Answer: (a) 15 line segments; (b) triangular-number sequence; (c) 5 new line segments.

Why correct: K_6 has $1 + 2 + 3 + 4 + 5 = 15$ lines. These totals are triangular numbers. Adding the sixth point joins it to the five existing points, so 5 lines are added.

Marking points: 1 mark for each correct sub-answer.

SECTION F - ASSERTION-REASON ANSWERS (2 x 1 = 2 marks)

25. Answer: Option (a): Both Assertion and Reason are true, and the Reason correctly explains the Assertion.

Why correct: Successive squares differ by consecutive odd numbers: $(n + 1)^2 - n^2 = 2n + 1$. Therefore adding the first n odd numbers builds n^2 .

Marking points: 1 mark for option (a).

26. Answer: Option (d): The Assertion is false, but the Reason is true.

Why correct: The terms 1, 2, 4, 8, 16, ... are obtained by doubling. They are not formed by adding the previous two terms; for example, $1 + 2 = 3$, not 4.

Marking points: 1 mark for option (d).

Total: $10 + 6 + 6 + 6 + 4 + 6 + 2 = 40$ marks