UNIQUE STUDY POINT

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Class: VI	**Subject:** Mathematics	**Session:** 2025-26
Chapter: 09 - Symmetry	**Time:** 1½ Hours	**Max. Marks:** 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

Q1. A line that divides a figure into two identical halves is called:

(a) Diameter

(b) Line of symmetry

(c) Radius

(d) Perpendicular

Q2. How many lines of symmetry does an equilateral triangle have?

(a) 1

(b) 2

(c) 3

(d) 4

Q3. A square has how many lines of symmetry?

(a) 2

(b) 4

(c) 6

(d) 8

Q4. When a figure looks exactly the same after being rotated by an angle, it has:

(a) Line symmetry

(b) Rotational symmetry

(c) Both (a) and (b)

(d) None of these

Q5. A circle has how many lines of symmetry?

(a) 0

(b) 2

(c) 4

(d) Infinite

Q6. The angle of rotational symmetry for a square is:

(a) 45°

(b) 60°

(c) 90°

(d) 120°

Q7. A figure with radial arms having 4 angles of symmetry will have the smallest angle of:

(a) 45°

(b) 60°

(c) 90°

(d) 120°

Q8. How many lines of symmetry does a regular hexagon have?

(a) 4

(b) 5

(c) 6

(d) 8

Q9. A rectangle (not a square) has how many lines of symmetry?

(a) 0

(b) 2

(c) 4

(d) Infinite

Q10. Which letter has both line symmetry and rotational symmetry?

(a) F

(b) H

(c) P

(d) R

SECTION B - Short Answer Questions (2 marks each)

Q11. Draw a figure with exactly one line of symmetry that has at least one curved boundary.

Q12. If 60° is the smallest angle of symmetry of a figure, what are the other angles of symmetry? (List all angles up to 360°)

Q13. A regular pentagon has 5 equal sides and 5 equal angles. How many lines of symmetry does it have? Also, find its smallest angle of rotational symmetry.

Q14. Identify whether the following figures have line symmetry, rotational symmetry, both, or none: (i) A scalene triangle (ii) A rhombus

SECTION C - Short Answer Questions (3 marks each)

Q15. A paper is folded vertically and then a triangular cut is made from the folded edge as shown. Draw the figure that will appear when the paper is unfolded. Also, identify the line of symmetry.

Q16. Draw a triangle with exactly two lines of symmetry. If it's not possible, explain why with proper reasoning.

Q17. A figure with radial arms has exactly 5 angles of symmetry. What is its smallest angle of symmetry? List all its angles of symmetry up to 360°.

SECTION D - Long Answer Question (5 marks)

Q18. Consider a square ABCD with corners labeled A, B, C, and D in clockwise order.

(a) Draw all the lines of symmetry of the square and label them.

(b) If we rotate the square by 90° clockwise about its center, where do points A, B, C, and D move?

(c) List all the angles of rotational symmetry for the square.

(d) Does the square have reflection symmetry? Explain.

(e) Compare the number of lines of symmetry with the order of rotational symmetry. What do you observe?

SECTION E - Case Study Based Questions (4 marks each)

Q19. Case Study 1: Rangoli Designs

During Diwali festival, Priya creates beautiful rangoli designs using colored powders. She notices that many traditional rangoli patterns have symmetry. One of her designs has 8 equal petals arranged around a central point, with each petal identical to the others.

Based on the above information, answer the following:

(a) How many lines of symmetry does Priya's rangoli design have? (1 mark)

(b) What is the smallest angle of rotational symmetry for this design? (1 mark)

(c) List all the angles of rotational symmetry for this design. (1 mark)

(d) If Priya wants to create a simpler design with only 4 equal petals, what will be the smallest angle of rotational symmetry? (1 mark)

Q20. Case Study 2: Ashoka Chakra

The Ashoka Chakra appears in the center of the Indian national flag. It is a wheel with 24 equally spaced spokes radiating from the center. Each spoke divides the circle into equal parts, and the design appears identical from multiple angles.

Based on the above information, answer the following:

(a) How many lines of symmetry does the Ashoka Chakra have? (1 mark)

(b) What is the smallest angle of rotational symmetry of the Ashoka Chakra? (1 mark)

(c) How many angles of symmetry does it have in total (excluding 360°)? (1 mark)

(d) If each spoke makes an equal angle with the adjacent spoke, what is the angle between two consecutive spokes? (1 mark)

DETAILED ANSWER KEY - PAPER 01

SECTION A - Answers to MCQs

Q1. (b) Line of symmetry

A line of symmetry divides a figure into two parts that exactly overlap when folded.

Q2. (c) 3

An equilateral triangle has 3 lines of symmetry, each passing through a vertex and the midpoint of the opposite side.

Q3. (b) 4

A square has 4 lines of symmetry: 2 diagonals and 2 lines joining midpoints of opposite sides.

Q4. (b) Rotational symmetry

When a figure looks exactly the same after being rotated by an angle (other than 360°), it has rotational symmetry.

Q5. (d) Infinite

A circle has infinite lines of symmetry as any diameter is a line of symmetry.

Q6. (c) 90°

A square looks the same after rotation of 90°, 180°, 270°, and 360°. The smallest angle is 90°.

Q7. (c) 90°

If there are 4 angles of symmetry, the smallest angle = 360° ÷ 4 = 90°.

Q8. (c) 6

A regular hexagon has 6 lines of symmetry.

Q9. (b) 2

A rectangle has 2 lines of symmetry: the horizontal and vertical lines through the center.

Q10. (b) H

The letter H has 2 lines of symmetry (horizontal and vertical) and rotational symmetry of 180°.

SECTION B - Answers to Short Answer Questions

Q11.

Example: A semicircle with the diameter as the line of symmetry, or a figure like a water drop shape with one vertical line of symmetry.

Drawing should show a figure with one curved boundary and clearly marked line of symmetry.

Q12.

If 60° is the smallest angle of symmetry, the other angles are multiples of 60°:

- 60° (smallest angle)
- 120° (60° × 2)
- 180° (60° × 3)
- 240° (60° × 4)

- 300° (60° × 5)
- 360° (60° × 6)

Therefore, the other angles of symmetry are: **120°, 180°, 240°, 300°, and 360°**

Q13.

A regular pentagon has **5 lines of symmetry** (each passing through a vertex and the midpoint of the opposite side).

Smallest angle of rotational symmetry = 360° ÷ 5 = **72°**

Q14.

(i) **Scalene triangle:** Has no line symmetry and no rotational symmetry (all sides and angles are different).

(ii) **Rhombus:** Has 2 lines of symmetry (its diagonals) and rotational symmetry of 180°.

SECTION C - Answers to Short Answer Questions

Q15.

When the paper is unfolded after a triangular cut from the folded edge:

- The cut creates two identical triangular holes on either side of the fold
- The final figure will have symmetry along the vertical fold line
- Drawing should show the complete figure with two identical triangular cuts

Line of symmetry: The vertical fold line is the line of symmetry.

Q16.

It is not possible to draw a triangle with exactly two lines of symmetry.

Reasoning:

- A scalene triangle has 0 lines of symmetry
- An isosceles triangle has 1 line of symmetry
- An equilateral triangle has 3 lines of symmetry
- There is no triangle with exactly 2 lines of symmetry

This is because if a triangle has at least two lines of symmetry, it must be equilateral, which means it automatically has 3 lines of symmetry.

Q17.

For a figure with exactly 5 angles of symmetry:

Smallest angle of symmetry = 360° ÷ 5 = **72°**

All angles of symmetry:

- 72° (smallest angle)
- 144° (72° × 2)
- 216° (72° × 3)
- 288° (72° × 4)
- 360° (72° × 5)

SECTION D - Answer to Long Answer Question

Q18.

(a) **Lines of symmetry:** A square has 4 lines of symmetry:

- Two diagonals (AC and BD)

- Two lines joining midpoints of opposite sides (horizontal and vertical)

(b) **After 90° clockwise rotation:**
- Point A moves to position of B
- Point B moves to position of C
- Point C moves to position of D
- Point D moves to position of A

(c) **Angles of rotational symmetry:**
- 90° (quarter turn)
- 180° (half turn)
- 270° (three-quarter turn)
- 360° (full turn)

(d) **Reflection symmetry:** Yes, the square has reflection symmetry. When we fold it along any of its 4 lines of symmetry, the two halves overlap completely. This is called reflection symmetry.

(e) **Observation:** The number of lines of symmetry (4) equals the number of angles of rotational symmetry (4). This is true for all regular polygons.

SECTION E - Answers to Case Study Based Questions

Q19. Case Study 1: Rangoli Designs

(a) **Number of lines of symmetry = 8**
The rangoli has 8 lines of symmetry, each passing through a petal and the center.

(b) **Smallest angle of rotational symmetry = 45°**
Calculation: 360° ÷ 8 = 45°

(c) **All angles of rotational symmetry:**
45°, 90°, 135°, 180°, 225°, 270°, 315°, 360°

(d) **For 4 petals, smallest angle = 90°**
Calculation: 360° ÷ 4 = 90°

Q20. Case Study 2: Ashoka Chakra

(a) **Number of lines of symmetry = 24**
Each of the 24 spokes represents a line of symmetry passing through the center.

(b) **Smallest angle of rotational symmetry = 15°**
Calculation: 360° ÷ 24 = 15°

(c) **Total angles of symmetry (excluding 360°) = 23**
The angles are: 15°, 30°, 45°, 60°, ..., 330°, 345° (all multiples of 15° up to 345°)

(d) **Angle between two consecutive spokes = 15°**
Since the 24 spokes are equally spaced around 360°, each angle = 360° ÷ 24 = 15°
