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. Which of the following letters has vertical line of symmetry?

(a) F

(b) G

(c) J

(d) M

Q2. The order of rotational symmetry of a regular octagon is:

(a) 4

(b) 6

(c) 8

(d) 12

Q3. A figure has rotational symmetry if it looks the same after rotation by:

(a) Only 360°

(b) Less than 360°

(c) More than 360°

(d) 180° only

Q4. How many lines of symmetry does the letter Z have?

(a) 0

(b) 1

(c) 2

(d) 4

Q5. If the smallest angle of rotational symmetry is 72°, how many angles of symmetry does the figure have?

(a) 3

(b) 4

(c) 5

(d) 6

Q6. The diagonals of which quadrilateral are its lines of symmetry?

(a) Parallelogram

(b) Rectangle

(c) Rhombus

(d) Trapezium

Q7. A semicircle has how many lines of symmetry?

(a) 0

(b) 1

(c) 2

(d) Infinite

Q8. Which shape has the greatest number of lines of symmetry?

(a) Equilateral triangle

(b) Square

(c) Regular hexagon

(d) Circle

Q9. A figure with 6 radial arms arranged equally will have smallest angle of symmetry:

(a) 30°

(b) 45°

(c) 60°

(d) 90°

Q10. The point about which a figure is rotated is called:

(a) Center point

(b) Center of rotation

(c) Focal point

(d) Origin

SECTION B - Short Answer Questions (2 marks each)

Q11. Draw all possible lines of symmetry for a regular pentagon. How many are there?

Q12. A square piece of paper is folded along its diagonal and then a small square is cut from the folded corner. What shape will you get when the paper is unfolded?

Q13. If 120° is an angle of symmetry and there are two angles of symmetry less than 120°, find the smallest angle of symmetry and list all angles up to 360°.

Q14. Name two English capital letters that have both horizontal and vertical lines of symmetry.

SECTION C - Short Answer Questions (3 marks each)

Q15. Draw a quadrilateral that has:

(a) Exactly one line of symmetry

(b) No line of symmetry but has rotational symmetry

Q16. Complete the following figure on squared paper so that it has exactly two lines of symmetry (one horizontal and one vertical). The red portion is already given.

Q17. A windmill has 4 blades arranged equally around its center. Find:

(a) The smallest angle of rotational symmetry

(b) All angles of rotational symmetry

(c) Whether it has line symmetry or not

SECTION D - Long Answer Question (5 marks)

Q18. Consider an equilateral triangle ABC with equal sides and equal angles.

(a) How many lines of symmetry does it have? Draw them.

(b) What is the smallest angle of rotational symmetry?

(c) If we rotate the triangle by 120° about its center, describe the new position of vertices A, B, and C.

(d) List all angles of rotational symmetry.

(e) Compare an equilateral triangle with a square in terms of their symmetries. Which has more lines of symmetry and why?

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

Q19. Case Study 1: Clock Face

A circular clock face has 12 equally spaced hour markings. The hour hand, minute hand, and second hand rotate around the center point. Raj observes that the clock face appears identical when rotated by certain angles.

Based on the above information, answer the following:

(a) How many lines of symmetry does the clock face have? (1 mark)

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

(c) What is the angle between two consecutive hour markings? (1 mark)

(d) How many times will the clock face coincide with itself in one complete rotation? (1 mark)

Q20. Case Study 2: Lotus Temple

The Lotus Temple in Delhi is designed in the shape of a lotus flower. The structure consists of 27 petals arranged in groups of three to form nine sides. Each group of petals is identical, creating a beautiful symmetric pattern when viewed from above.

Based on the above information, answer the following:

(a) How many lines of symmetry does the nine-sided structure have? (1 mark)

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

(c) List the first three angles of rotational symmetry. (1 mark)

(d) What is the angle between two consecutive sides of the nine-sided structure? (1 mark)

DETAILED ANSWER KEY - PAPER 02

SECTION A - Answers to MCQs

Q1. (d) M

The letter M has a vertical line of symmetry through its center.

Q2. (c) 8

A regular octagon has 8 angles of rotational symmetry (360° ÷ 8 = 45° is the smallest).

Q3. (b) Less than 360°

A figure has rotational symmetry if it looks the same after rotation by an angle less than 360°.

Q4. (a) 0

The letter Z has no line of symmetry but has rotational symmetry of 180°.

Q5. (c) 5

If smallest angle is 72°, then 360° ÷ 72° = 5 angles of symmetry.

Q6. (c) Rhombus

The diagonals of a rhombus are its lines of symmetry.

Q7. (b) 1

A semicircle has one line of symmetry along the diameter.

Q8. (d) Circle

A circle has infinite lines of symmetry (every diameter is a line of symmetry).

Q9. (c) 60°

For 6 equal radial arms: 360° ÷ 6 = 60°.

Q10. (b) Center of rotation

The fixed point about which a figure is rotated is called the center of rotation.

SECTION B - Answers to Short Answer Questions

Q11.

A regular pentagon has **5 lines of symmetry**.

Each line of symmetry passes through:

- One vertex
- The midpoint of the opposite side

Drawing should show a regular pentagon with all 5 lines marked.

Q12.

When the paper is unfolded, you will get **a square hole rotated 45°** (a diamond shape).

Explanation: Folding along the diagonal creates two layers. Cutting a square from the corner creates identical cuts on both layers, resulting in a diamond-shaped hole when unfolded.

Q13.

If 120° is an angle and there are two angles less than 120°:

The angles must be: 40°, 80°, 120°, ...

Smallest angle of symmetry = 40°

All angles: 40°, 80°, 120°, 160°, 200°, 240°, 280°, 320°, 360°

Q14.

Two letters with both horizontal and vertical lines of symmetry:

- **H** (has both horizontal and vertical symmetry)
- **I** (has both horizontal and vertical symmetry)
- **O** (has both horizontal and vertical symmetry)
- **X** (has both horizontal and vertical symmetry)

Any two of these letters are correct answers.

SECTION C - Answers to Short Answer Questions

Q15.

(a) **Quadrilateral with exactly one line of symmetry:**

- Kite (one diagonal is the line of symmetry)
- Isosceles trapezium (vertical line through center)

Drawing should show the quadrilateral with one line of symmetry marked.

(b) **Quadrilateral with no line symmetry but rotational symmetry:**

- Parallelogram (has 180° rotational symmetry but no line symmetry)

Drawing should show a parallelogram.

Q16.

To complete the figure with two lines of symmetry (horizontal and vertical):

- Reflect the given red portion across the vertical line
- Then reflect both portions across the horizontal line
- The final figure will have complete symmetry in all four quadrants

Drawing should show a symmetric figure with both horizontal and vertical symmetry.

Q17.

For a windmill with 4 equal blades:

(a) **Smallest angle of rotational symmetry = 90°**
Calculation: 360° ÷ 4 = 90°

(b) **All angles of rotational symmetry:**
90°, 180°, 270°, 360°

(c) **Line symmetry:** The windmill may or may not have line symmetry depending on blade design. If blades are symmetric, it will have 4 lines of symmetry; if asymmetric, it will have no line symmetry.

SECTION D - Answer to Long Answer Question

Q18.

(a) **Lines of symmetry = 3**

- Each line passes through a vertex and the midpoint of the opposite side
- Drawing should show triangle ABC with all 3 lines marked

(b) **Smallest angle of rotational symmetry = 120°**
Calculation: 360° ÷ 3 = 120°

(c) **Position after 120° rotation:**
- Vertex A moves to position of B
- Vertex B moves to position of C
- Vertex C moves to position of A

(d) **All angles of rotational symmetry:**
120°, 240°, 360°

(e) **Comparison:**
- Equilateral triangle: 3 lines of symmetry
- Square: 4 lines of symmetry
- Square has more lines of symmetry because it has more sides (4 vs 3) and is a regular polygon with 4 vertices

SECTION E - Answers to Case Study Based Questions

Q19. Case Study 1: Clock Face

(a) **Number of lines of symmetry = 12**
Each line passes through opposite hour markings (12-6, 1-7, 2-8, etc.)

(b) **Smallest angle of rotational symmetry = 30°**
Calculation: 360° ÷ 12 = 30°

(c) **Angle between consecutive hour markings = 30°**
The 12 hour markings divide 360° into 12 equal parts.

(d) **Number of coincidences = 12 times**
The clock face coincides with itself at every 30° rotation.

Q20. Case Study 2: Lotus Temple

(a) **Number of lines of symmetry = 9**
Each line passes through the center and bisects one of the nine sides.

(b) **Smallest angle of rotational symmetry = 40°**
Calculation: 360° ÷ 9 = 40°

(c) **First three angles of rotational symmetry:**
40°, 80°, 120°

(d) **Angle between consecutive sides = 40°**
The nine equal sides divide the complete angle of 360° into 9 equal parts.
