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 shape has both line symmetry and rotational symmetry?

(a) Scalene triangle

(b) Kite

(c) Regular pentagon

(d) Letter L

Q2. An angle of symmetry is always a factor of:

(a) 90°

(b) 180°

(c) 270°

(d) 360°

Q3. How many lines of symmetry does a regular decagon (10 sides) have?

(a) 5

(b) 10

(c) 15

(d) 20

Q4. Which of the following has exactly 2 lines of symmetry?

(a) Equilateral triangle

(b) Rectangle

(c) Regular pentagon

(d) Circle

Q5. The term used when two halves of a figure overlap exactly upon folding is:

(a) Congruent halves

(b) Mirror halves

(c) Equal halves

(d) Similar halves

Q6. A figure with 3 radial arms equally spaced has smallest angle of symmetry:

(a) 60°

(b) 90°

(c) 120°

(d) 180°

Q7. Which letter has no line of symmetry?

(a) A

(b) B

(c) O

(d) R

Q8. If a figure has 180° as its smallest angle of rotational symmetry, it has how many angles of symmetry?

(a) 1

(b) 2

(c) 3

(d) 4

Q9. A figure is said to have reflection symmetry if it has:

(a) At least one line of symmetry

(b) Rotational symmetry

(c) Point symmetry

(d) No symmetry

Q10. The order of rotational symmetry of an equilateral triangle is:

(a) 1

(b) 2

(c) 3

(d) 6

SECTION B - Short Answer Questions (2 marks each)

Q11. List three English capital letters that have exactly one line of symmetry (vertical).

Q12. A figure has exactly 3 angles of symmetry. What is the smallest angle? List all three angles.

Q13. Draw a figure with at least one curved boundary that has both line symmetry and rotational symmetry.

Q14. State whether true or false with justification: "Every regular polygon has the same number of lines of symmetry as its number of sides."

SECTION C - Short Answer Questions (3 marks each)

Q15. A rectangular piece of paper is folded horizontally once. Then a semicircular cut is made from the folded edge. Draw and describe the shape that will appear when the paper is unfolded. Also identify all lines of symmetry.

Q16. On a squared paper, draw a figure that has:

(a) Both horizontal and vertical lines of symmetry

(b) Rotational symmetry of 90°

Label all lines of symmetry

Q17. A figure has radial arms with smallest angle of symmetry of 40°. Answer the following:

(a) How many radial arms does it have?

(b) List all angles of symmetry

(c) Does it have line symmetry? If yes, how many?

SECTION D - Long Answer Question (5 marks)

Q18. Consider a rhombus PQRS with diagonals PR and QS.

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

(b) Are the diagonals the lines of symmetry? Explain why.

(c) Does a rhombus have rotational symmetry? If yes, what is the angle?

(d) If we reflect the rhombus along diagonal PR, where will vertices P, Q, R, and S move?

(e) Compare the symmetries of a rhombus and a square. Which has more symmetries and why?

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

Q19. Case Study 1: Star Pattern on Flag

Many countries use stars on their flags. A five-pointed star (pentagram) is a common symbol. Each point of the star is identical, and the star has several lines of symmetry passing through its center. The star can also be rotated to look the same at certain angles.

Based on the above information, answer the following:

(a) How many lines of symmetry does a regular five-pointed star have? (1 mark)

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

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

(d) If the star had 6 points instead of 5, what would be the smallest angle of rotational symmetry? (1 mark)

Q20. Case Study 2: Ferris Wheel

A Ferris wheel at an amusement park has 16 equally spaced cabins attached around its circular frame. When viewed from the front, the wheel appears to have perfect symmetry. As it rotates, the pattern of cabins repeats at regular intervals.

Based on the above information, answer the following:

(a) How many lines of symmetry does the Ferris wheel have when viewed from front? (1 mark)

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

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

(d) How many times does the wheel coincide with itself in one complete rotation? (1 mark)

DETAILED ANSWER KEY - PAPER 04

SECTION A - Answers to MCQs

Q1. (c) Regular pentagon

A regular pentagon has both 5 lines of symmetry and rotational symmetry (72°, 144°, etc.).

Q2. (d) 360°

Any angle of symmetry must be a factor of 360° because a complete rotation is 360°.

Q3. (b) 10

A regular polygon with n sides has n lines of symmetry. So a decagon has 10 lines.

Q4. (b) Rectangle

A rectangle (not square) has exactly 2 lines of symmetry: horizontal and vertical through center.

Q5. (b) Mirror halves

When a figure is folded along a line of symmetry and the halves overlap exactly, they are called mirror halves.

Q6. (c) 120°

For 3 equally spaced radial arms: 360° ÷ 3 = 120°.

Q7. (d) R

The letter R has no line of symmetry and no rotational symmetry.

Q8. (b) 2

If smallest angle is 180°, then angles are: 180° and 360°. Total = 2 angles.

Q9. (a) At least one line of symmetry

A figure has reflection symmetry if it has at least one line of symmetry.

Q10. (c) 3

Order of rotational symmetry = 360° ÷ 120° = 3.

SECTION B - Answers to Short Answer Questions

Q11.

Three English capital letters with exactly one vertical line of symmetry:

1. **A** (vertical line through apex)
2. **M** (vertical line through center)
3. **T** (vertical line through center)
4. **U** (vertical line through center)
5. **V** (vertical line through apex)
6. **W** (vertical line through center)
7. **Y** (vertical line through junction)

Any three of these are correct.

Q12.

If a figure has exactly 3 angles of symmetry:

Smallest angle = 120°
Calculation: 360° ÷ 3 = 120°

All three angles: 120°, 240°, 360°

Q13.

Examples of figures with curved boundary, line symmetry, and rotational symmetry:

1. **Circle** - Infinite lines of symmetry and all angles are angles of symmetry
2. **Regular flower with even petals** - Has multiple lines and rotational symmetry
3. **Yin-Yang symbol** - Has rotational symmetry of 180° but no line symmetry

Best example: A circle or a flower with 4/6/8 equal curved petals.

Drawing should show the figure with marked lines of symmetry.

Q14.

TRUE

Justification:

- Every regular polygon with n sides has exactly n lines of symmetry
- For example: Equilateral triangle (3 sides) has 3 lines
- Square (4 sides) has 4 lines
- Regular pentagon (5 sides) has 5 lines
- This is always true for regular polygons

SECTION C - Answers to Short Answer Questions

Q15.

When a rectangular paper is folded horizontally and a semicircle is cut from the folded edge:

Result: When unfolded, you will get a **complete circle** (or an oval/ellipse depending on the cut).

Description:

- The semicircular cut on the fold creates two semicircles
- When unfolded, these two semicircles join to form a complete circle
- The hole will be circular in shape

Lines of symmetry:

- The original fold line (horizontal)
- A vertical line through the center of the circle
- Total: 2 main lines of symmetry (actually infinite for a perfect circle)

Drawing should show the rectangular paper with a circular hole and marked symmetry lines.

Q16.

A figure with both horizontal and vertical lines of symmetry AND 90° rotational symmetry:

Examples:

- **Square** - Has 4 lines of symmetry and 90° rotation
- **Plus sign (+)** - Has 4 lines of symmetry and 90° rotation
- **Cross (×)** - Has 4 lines of symmetry and 90° rotation

Drawing should show:

- A symmetric figure on squared paper
- Horizontal line of symmetry marked
- Vertical line of symmetry marked
- The figure should look the same after 90° rotation

Q17.

Given: Smallest angle of symmetry = 40°

(a) **Number of radial arms = 9**
Calculation: 360° ÷ 40° = 9 arms

(b) **All angles of symmetry:**
40°, 80°, 120°, 160°, 200°, 240°, 280°, 320°, 360°

(c) **Yes**, it has line symmetry.
Number of lines = 9 (each line passes through a radial arm and the center)

SECTION D - Answer to Long Answer Question

Q18.

(a) **Lines of symmetry = 2**

- Both diagonals PR and QS are lines of symmetry
- Drawing should show rhombus PQRS with both diagonals marked

(b) **Yes, diagonals are lines of symmetry**

Explanation:

- In a rhombus, all sides are equal
- The diagonals bisect each other at right angles
- When folded along either diagonal, the two halves overlap exactly
- Therefore, both diagonals are lines of symmetry

(c) **Yes**, a rhombus has rotational symmetry.
Angle = 180° (the rhombus looks the same after a half turn)

(d) **Reflection along diagonal PR:**

- P remains at P (it's on the line)
- Q moves to position of S
- R remains at R (it's on the line)
- S moves to position of Q

(e) **Comparison:**

- Rhombus: 2 lines of symmetry, rotational symmetry of 180°
- Square: 4 lines of symmetry, rotational symmetry of 90°, 180°, 270°, 360°
- Square has more symmetries because it has more angles of rotation and more lines of symmetry
- A square is a special rhombus with all angles equal to 90°, giving it additional symmetries

SECTION E - Answers to Case Study Based Questions

Q19. Case Study 1: Star Pattern on Flag

(a) **Number of lines of symmetry = 5**

Each line passes through one point of the star and the center.

(b) **Smallest angle of rotational symmetry = 72°**
Calculation: 360° ÷ 5 = 72°

(c) **First four angles of rotational symmetry:**
72°, 144°, 216°, 288°

(d) **For 6 points, smallest angle = 60°**
Calculation: 360° ÷ 6 = 60°

Q20. Case Study 2: Ferris Wheel

(a) **Number of lines of symmetry = 16**
Each line passes through opposite cabins (or between cabins if odd spacing).

(b) **Smallest angle of rotational symmetry = 22.5°**
Calculation: 360° ÷ 16 = 22.5°

(c) **Angle between consecutive cabins = 22.5°**
The 16 cabins divide the 360° circle into 16 equal parts.

(d) **Number of coincidences = 16 times**
The wheel coincides with itself at every 22.5° rotation, giving 16 positions in one full rotation.
