

Symmetry & Transformations

Geometry · Grade 8

★ Hard · 11 Questions

Solve each problem. Show your work in the space provided. Write your answer on the line.

1. A shape has point symmetry. What does that mean?

Answer: _____

2. Which of these shapes has point symmetry but NO line symmetry?

A) Square B) Rectangle C) Parallelogram D) Trapezoid

Answer: _____

3. A regular hexagon is rotated 60° . Does it look the same? What about 40° ?

Answer: _____

4. A figure is reflected across the y-axis.
Point A is at (3, 5). Where is its image A'?

Answer: _____

5. A figure is reflected across the x-axis.
Point B is at (-2, 4). Where is its image B'?

Answer: _____

6. A rectangle with vertices $(0,0)$, $(4,0)$, $(4,2)$, $(0,2)$ is reflected across the line $y=2$.
Find the image vertices.

Answer: _____

7. A shape is reflected across the line $y = x$.
Point C is at $(2, 5)$. Find C' .

Answer: _____

8. Two shapes are mirror images of each other.
Shape A has vertices $(1,2)$, $(4,2)$, $(4,5)$.
If reflected across $x=4$, find Shape B's vertices.

Answer: _____

9. A star has 5 identical points equally spaced.
How many lines of symmetry does it have?
What is the angle of rotational symmetry?

Answer: _____

10. Point D is at $(-3, 6)$. It is reflected across the y-axis, then across the x-axis.
Find the final position.

Answer: _____

11. The letter Z has a rotational symmetry of order 2.
Explain what this means and identify the centre of rotation.

Answer: _____

Answer Key

Symmetry & Transformations — Hard

1. **The shape looks the same after a 180° rotation about its centre (order-2 rotational symmetry).**

Point symmetry = rotational symmetry of order 2. The shape maps onto itself after a half turn.

2. **C) Parallelogram**

A parallelogram maps onto itself after 180° rotation (point symmetry) but has no line of symmetry.

3. **60° : Yes (maps onto itself). 40° : No (40° is not a multiple of 60°).**

Regular hexagon has order-6 symmetry (maps at multiples of 60°). 60° ✓, 40° ✗.

4. **$(-3, 5)$**

Reflecting across the y -axis negates the x -coordinate: $(3, 5) \rightarrow (-3, 5)$.

5. **$(-2, -4)$**

Reflecting across the x -axis negates the y -coordinate: $(-2, 4) \rightarrow (-2, -4)$.

6. **$(0, 4)$, $(4, 4)$, $(4, 2)$, $(0, 2)$**

Reflect across $y=2$: distance above/below $y=2$ is mirrored. $(0, 0) \rightarrow (0, 4)$, $(4, 0) \rightarrow (4, 4)$, and the top vertices stay at $y=2$.

7. **$(5, 2)$**

Reflecting across $y=x$ swaps x and y coordinates: $(2, 5) \rightarrow (5, 2)$.

8. **$(7, 2)$, $(4, 2)$, $(4, 5)$**

Reflect across $x=4$: new $x = 4 + (4 - \text{old } x)$. $(1, 2) \rightarrow (7, 2)$. $(4, 2) \rightarrow (4, 2)$. $(4, 5) \rightarrow (4, 5)$.

9. **5 lines of symmetry. Rotation angle = 72° .**

5-pointed star (regular) has 5 lines of symmetry and order-5 rotation: $360 \div 5 = 72^\circ$.

10. **$(3, -6)$**

Across y -axis: $(-3, 6) \rightarrow (3, 6)$. Across x -axis: $(3, 6) \rightarrow (3, -6)$.

- 11. Order 2 means Z maps onto itself after a 180° rotation. The centre is the midpoint of the letter Z.**

Rotating Z by 180° about its centre gives the same Z shape. This is called point symmetry or order-2 rotational symmetry.
