LESSON MAKER PRO

Symmetry Moves

Rotations and reflections that match a shape to itself

HIGH SCHOOL · HSG-CO.A.3

CCSS.Math.Content.HSG-CO.A.3 "Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself."

NAME _____ DATE _____

SYMMETRY RULES

A symmetry rotation turns a shape around its center so it matches exactly. A reflection flips a shape across a line so both sides match. A regular n-sided polygon has rotations of multiples of 360/n degrees and n reflection lines.

WORKED EXAMPLE

Use the regular hexagon shown. List its nonidentity rotations and state its number of reflection lines.



1. The hexagon has 6 equal sides.
2. Divide 360 by 6: 360/6 = 60.
3. Use nonzero multiples of 60 less than 360.
4. A regular hexagon has 6 reflection lines.

Answer: Rotations: 60°, 120°, 180°, 240°, 300°. Reflection lines: 6.

PRACTICE 4 problems

1 A rectangle is not a square. List its nonidentity rotations and its reflection lines.

ANSWER _____

2 A parallelogram is not a rectangle or a rhombus. List its nonidentity rotations and its reflection lines.

ANSWER _____

3 An isosceles trapezoid has exactly one pair of parallel sides. List its nonidentity rotations and its reflection lines.

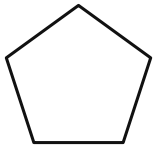
ANSWER _____

4 A regular decagon is turned about its center. List its nonidentity rotations and state its number of reflection lines.

ANSWER _____

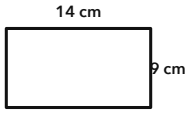
APPLY IT Show your work

1 A gaming club uses the regular pentagon badge shown. List its nonidentity rotations and state its number of reflection lines.



ANSWER _____

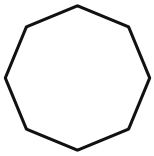
2 A video thumbnail has the rectangular shape shown. What nonidentity rotation and reflection lines carry it onto itself?



ANSWER _____

CHALLENGE One step up

Use the regular octagon shown. A student says every reflection line passes through two opposite vertices. Is the student correct? Explain, then list all nonidentity rotations.



WORK SPACE AND ANSWER

Symmetry Moves

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A rectangle is not a square. List its nonidentity rotations and its reflection lines.	**Rotation: 180°. Reflection lines: the horizontal and vertical lines through the center.**
2	A parallelogram is not a rectangle or a rhombus. List its nonidentity rotations and its reflection lines.	**Rotation: 180°. Reflection lines: none.**
3	An isosceles trapezoid has exactly one pair of parallel sides. List its nonidentity rotations and its reflection lines.	**Rotations: none. Reflection lines: 1, the line through the midpoints of the parallel sides.**
4	A regular decagon is turned about its center. List its nonidentity rotations and state its number of reflection lines.	**Rotations: 36°, 72°, 108°, 144°, 180°, 216°, 252°, 288°, 324°. Reflection lines: 10.**

PART 2 · APPLY IT

1. **Rotations: 72°, 144°, 216°, 288°. Reflection lines: 5.** A regular pentagon has 5 equal positions. Divide 360 by 5 to get 72°, then use its nonzero multiples.
2. **Rotation: 180°. Reflection lines: the horizontal and vertical lines through the center.** Because the rectangle is not a square, a quarter-turn does not match it. A half-turn and the two center lines do match it.

CHALLENGE

No. Four reflection lines pass through opposite vertices, and four pass through midpoints of opposite sides. Rotations: 45°, 90°, 135°, 180°, 225°, 270°, 315°.

Accept equivalent descriptions of reflection lines, such as vertical and horizontal center lines for a rectangle. For regular polygons, accept rotations listed in any order.