

Lesson 2.07 Symmetry Transformations

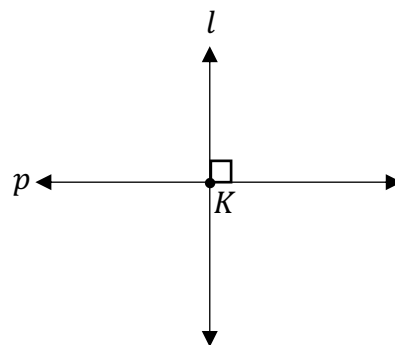
Students will be able to:

- **Content Objective:** Given a regular or irregular polygon, describe the rotations and reflections (symmetries) that carry the polygon onto itself.
- **Language Objective:** Identify and explain the line and rotational symmetries of a trapezoid.



Warm Up

Line l is perpendicular to line p shown below. The point where these lines intersect is K . What transformation will map line l onto line p ? What is the **fixed point** of this transformation?



Vocabulary Review

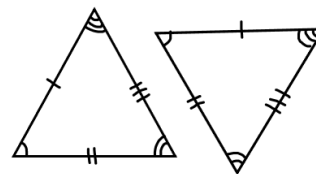
Fill in the blank.

Congruence & Rigid Motion

Congruent: Two figures are congruent if they have sides that are the same _____ and angles that are _____ in measure.

Rigid Motion: Transformations that preserve _____ and _____ measure.

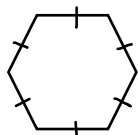
Congruent Triangles: Two triangles are congruent if and only if corresponding pairs of _____ and corresponding pairs of _____ are congruent.



Graphic Organizer

Regular Polygon

A shape whose side lengths are all **the same** and whose angle measures are all **equal**.



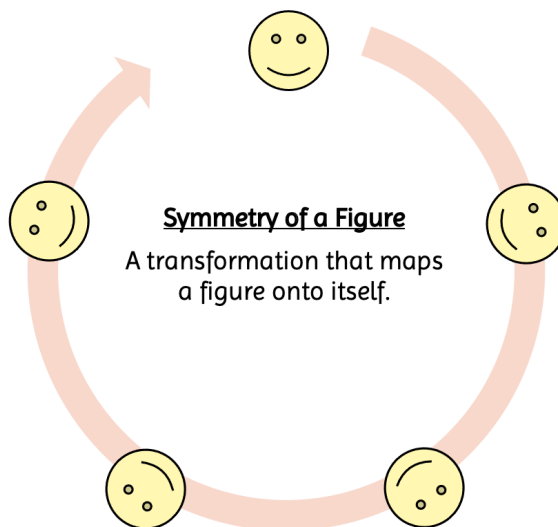
Give formal names for the regular polygons below:

Regular Triangle

Regular quadrilateral

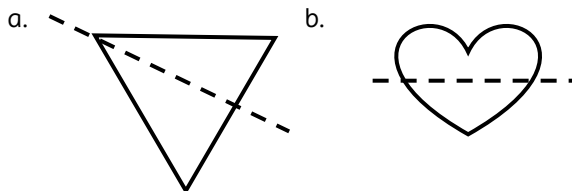
Symmetry of a Figure

A transformation that maps a figure onto itself.

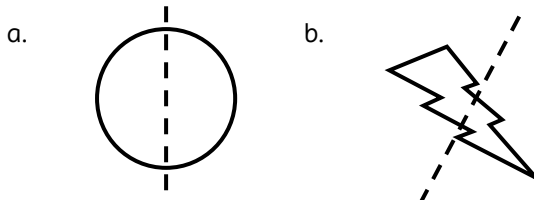



Skill 1: Line Symmetry

Are the following shapes symmetric over the given lines? Yes or no.

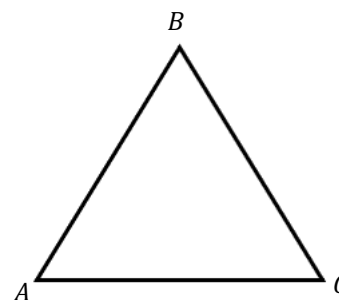

Exercise 1: Line Symmetry

Are the following shapes symmetric over the given lines? Yes or no.


Skill 2: Identifying Lines of Symmetry

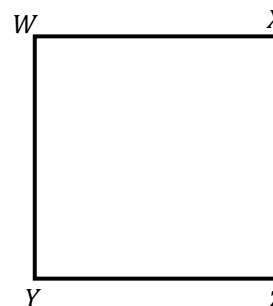
Shown below is equilateral triangle, $\triangle ABC$.

- How would you describe the line(s) of symmetry of this figure?
- How many lines of symmetry are there? Draw them on the figure.


Exercise 2: Identifying Lines of Symmetry

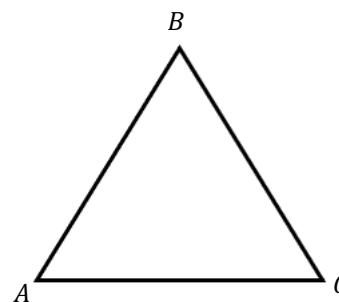
Given below is regular quadrilateral (square) $WXYZ$.

- How would you describe the line(s) of symmetry of this figure?
- How many lines of symmetry are there? Are there more or less than in skill 2? Draw them on the figure.


Skill 3: Identifying Rotational Symmetry

Consider the same equilateral triangle from Skill 2.

- Identify the minimum rotation needed to map $\triangle ABC$ onto itself and center of rotation. Use tracing paper to verify.
- Describe the other rotational symmetries including the center and angle(s) of rotation.

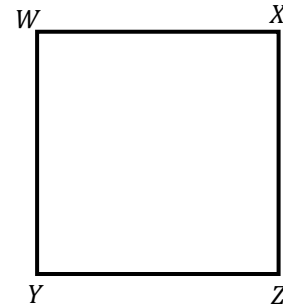




Exercise 3: Identifying Rotational Symmetry

Consider the same regular quadrilateral from Exercise 2.

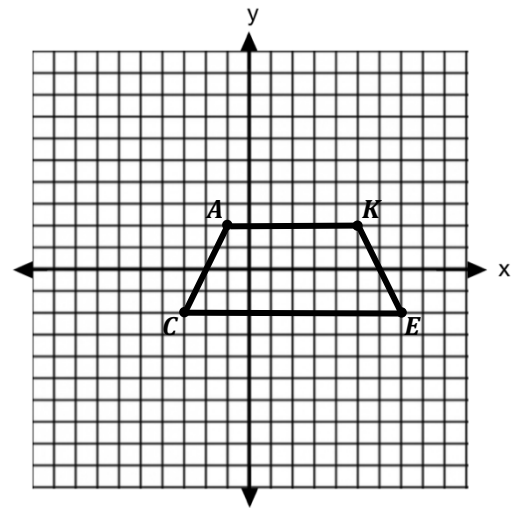
- Identify the minimum rotation needed to map $WXZY$ onto itself and center of rotation. Use tracing paper to verify.
- Describe the other rotational symmetries including the center and angle(s) of rotation.



Talk it Out

A trapezoid is a quadrilateral with at least one pair of parallel sides. Consider trapezoid $CAKE$ graphed on the set of axes below.

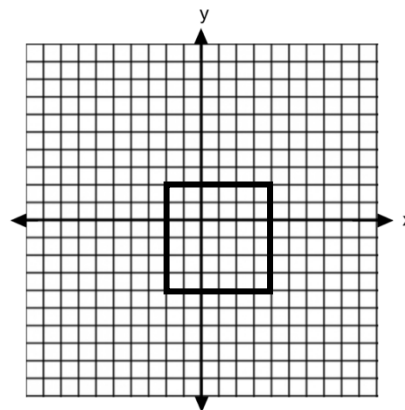
- What two segments are parallel? How do you know?
- How many lines of symmetry are there? List them as equations.
- What is the minimum rotation needed to map trapezoid $CAKE$ onto itself? State the center of rotation.



Check Point

In the diagram below, a regular quadrilateral is graphed in the coordinate plane. A reflection over which line does *not* carry the square onto itself?

- $x = 1$
- $y = -1$
- $y = -x$
- $x = 3$



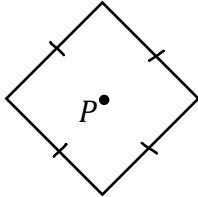


2.07- Problem Set

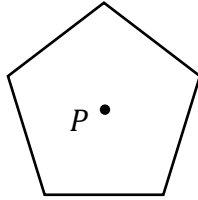
Name: _____

1. Identify the minimum rotation needed around point P (the center) to map each of the figures below onto themselves. Use tracing paper if necessary.

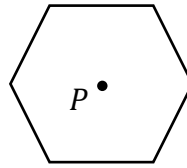
a.



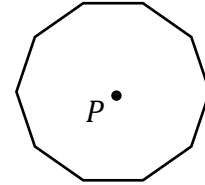
b.



c.



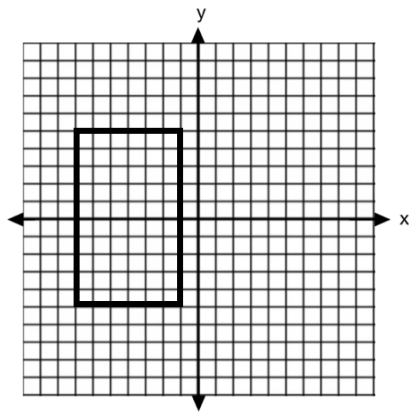
d.



2. Which regular polygon has a minimum rotation of 45° to carry the polygon onto itself?

- 1) Pentagon
- 2) Decagon
- 3) Hexagon
- 4) Octagon

3. A rectangle is shown graphed below.



Which transformation would not map the rectangle onto itself?

- 1) A reflection over the x -axis
 - 2) A rotation of 180° about the origin
 - 3) A reflection over the line $y = 0$
 - 4) A rotation of 180° about the point $(-4,0)$
4. What is the minimum rotation necessary to rotate a decagon about the center onto itself? How many rotational symmetries does a decagon have?