Lesson 1.12
Symmetry

Geometry GT

Recall

Here is a segment $\overline{AB}$.

If you translate the segment up 5 units then down 5 units, it looks the same as it did originally. What other rigid transformations create an image that fits exactly over the original segment? Are there any *single* rigid motions that do the same thing?

Definitions

Reflectional symmetry: when a figure does not change (the image and the original are the exact same figure) while undergoing a reflection
Line of symmetry: the line that passes through a shape and divides it into congruent halves
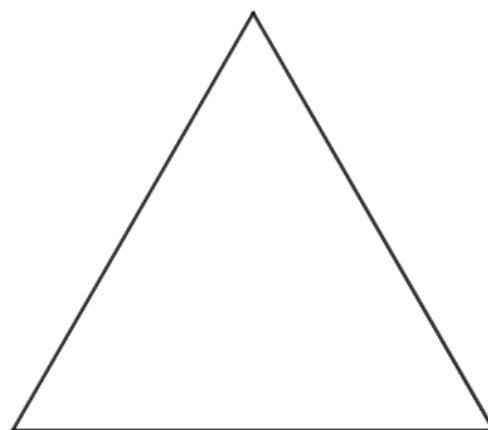
Explore

For each of the following shapes, draw each line of symmetry and describe, in words, each line of symmetry.
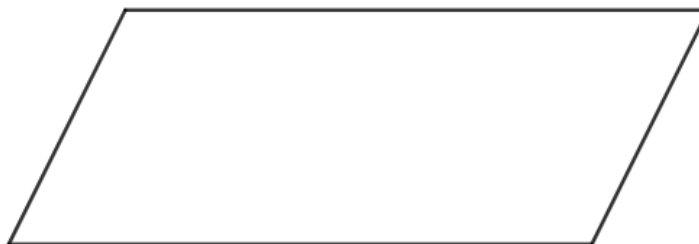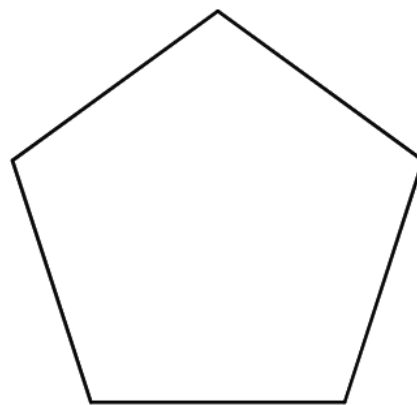
Isosceles trapezoid
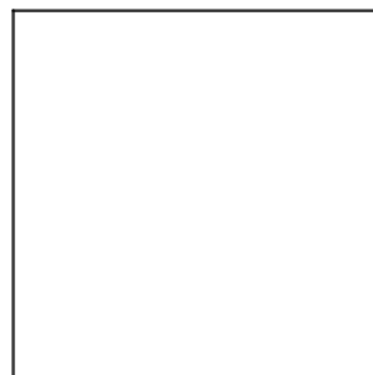
Equilateral triangle

Parallelogram

Discuss

For each of the following shapes, draw each rotation that creates symmetry and describe, in words, each rotation, including the center, angle, and direction of rotation.
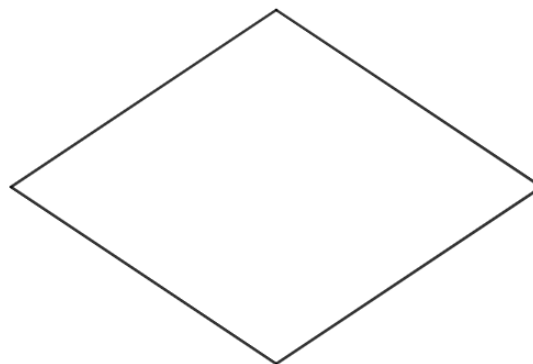
Regular pentagon

Square

Rhombus

Definition

Rotational symmetry: when a figure does not change (the image and the original are the exact same figure) while undergoing a rotation of less than 360°

Demonstrate

What happens to the diagonal of a rectangle when the rectangle is reflected across a line of symmetry? What does this suggest about the diagonals of rectangles?

Practice

1. In quadrilateral $BADC$, $\overline{AB} \cong \overline{AD}$ and $\overline{BC} \cong \overline{DC}$. The segment $\overline{AC}$ is a line of symmetry for this quadrilateral.

    A. Based on the line of symmetry, explain why the diagonals $\overline{AC}$ and $\overline{BD}$ are perpendicular.

   **B.** Based on the line of symmetry, explain why $\angle ABC$ and $\angle ADC$ have the same measure.
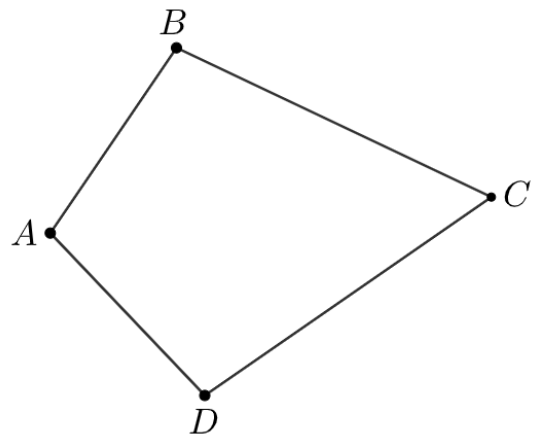
2. A triangle has rotational symmetry that can take any of its vertices to any of its other vertices. Select **all** conclusions that we can reach from this.
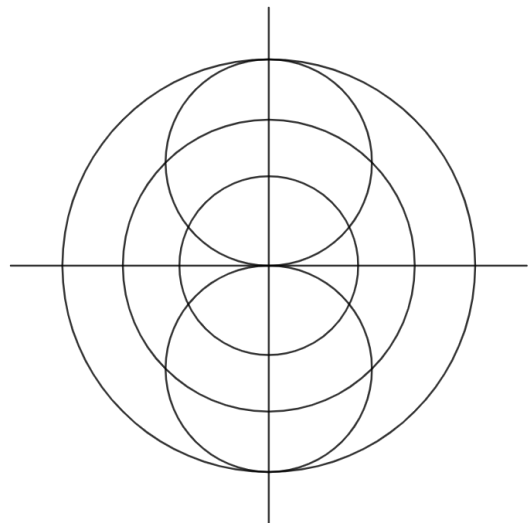
      A. All sides of the triangle have the same length

      B. All angles of the triangle have the same measure

      C. All rotations take one half of the triangle to the other half of the triangle

3. Select **all** the angles of rotation that produce symmetry for this graph.

      A. 45°

      B. 90°

      C. 135°

      D. 180°

      E. 225°

      F. 270°
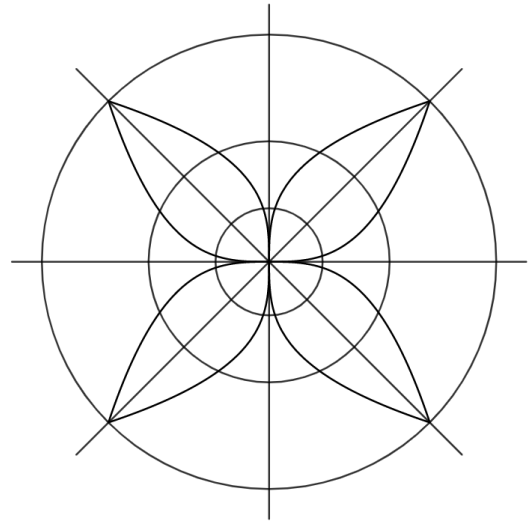
4. Identify any lines of symmetry the figure has.

5. A triangle has a line of symmetry. Select **all** conclusions that *must* be true.

    A. All sides of the triangle have the same length

    B. All angles of the triangle have the same measure

    C. No sides of the triangle have the same length

    D. No angles of the triangle have the same measure

    E. Two sides of the triangle have the same length

    F. Two angles of the triangle have the same measure