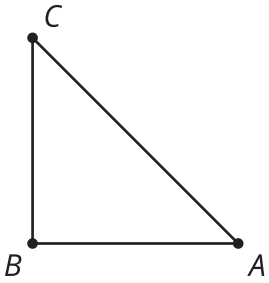
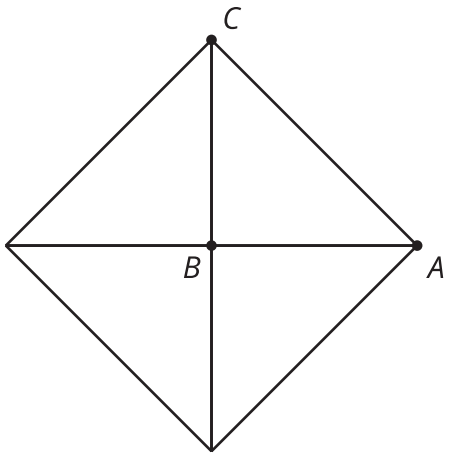
Rotation Patterns

Let's rotate figures in a plane.

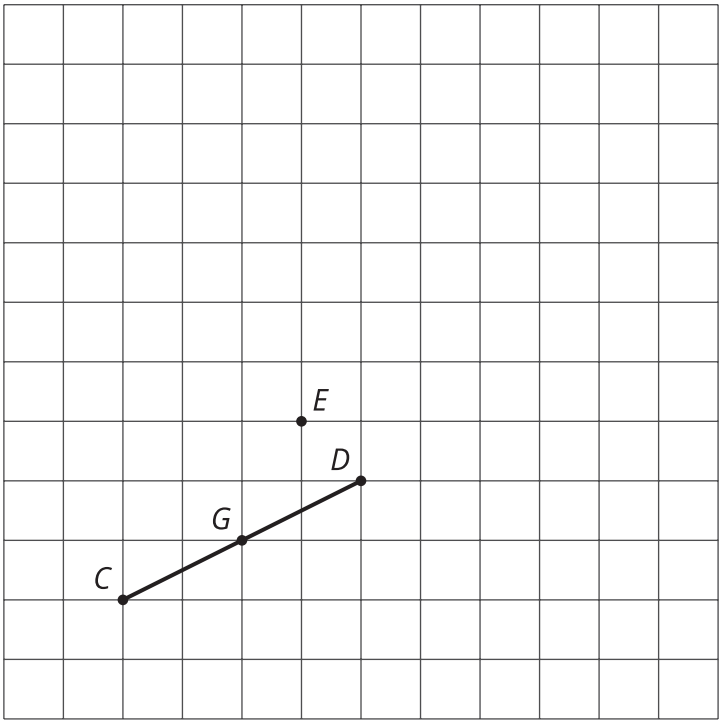
7.1 Notice and Wonder: Building a Quadrilateral

What do you notice? What do you wonder?





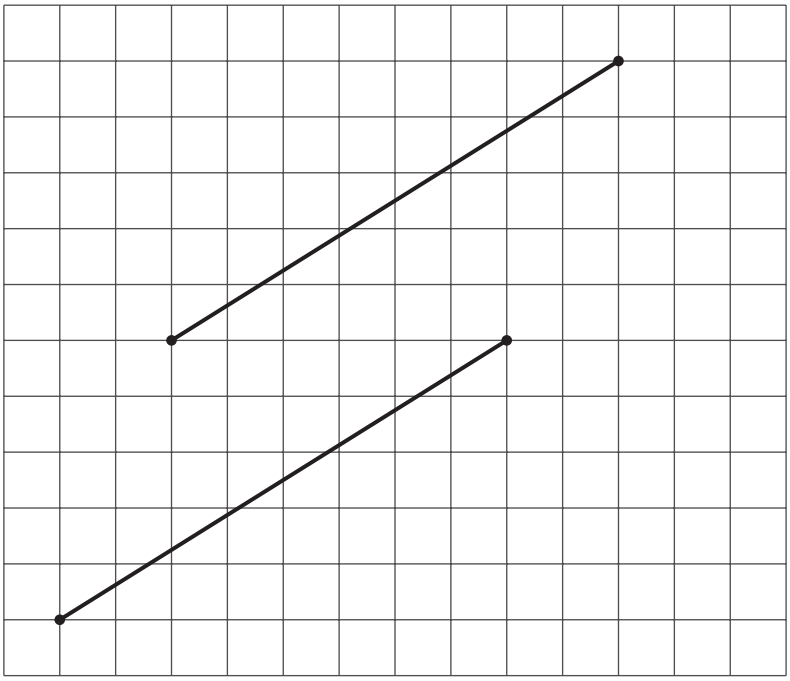
7.2 Rotating a Segment



1. Rotate segment CD 180° around point D. Draw its image and label the image of C as A.
2. Rotate segment CD 180° around point E. Draw its image and label the image of C as B and the image of D as F.
3. Rotate segment CD 180° around its midpoint, G. What is the image of C?

4. What happens when you rotate a segment 180° around a point?

Are you ready for more?



Here are two line segments. Is it possible to rotate one line segment to the other? If so, find the center of such a rotation. If not, explain why not.

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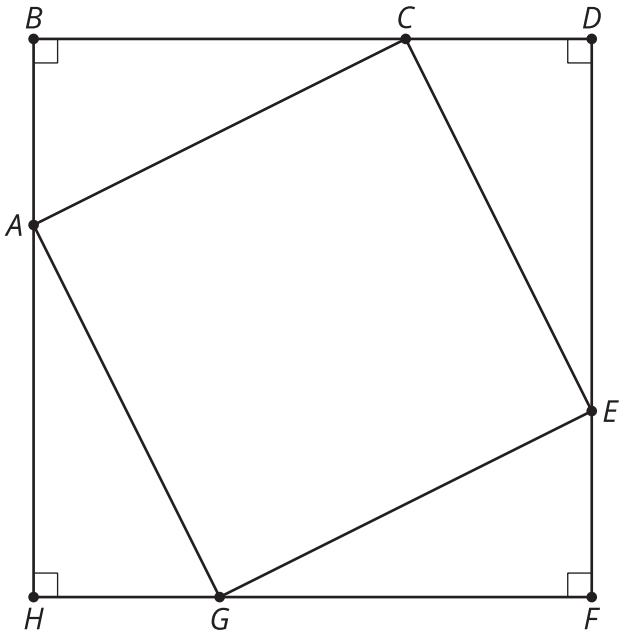
7.3 A Pattern of Four Triangles

You can use rigid transformations of a figure to make patterns. Here is a diagram built with three different transformations of triangle ABC.



1. Describe a rigid transformation that takes triangle ABC to triangle CDE.

2. Describe a rigid transformation that takes triangle ABC to triangle EFG.

3. Describe a rigid transformation that takes triangle ABC to triangle GHA.

4. Do segments AC, CE, EG, and GA all have the same length? Explain your reasoning.

Lesson 7 Summary

When we apply a 180-degree rotation to a line segment, there are several possible outcomes:

- The image of the segment maps is the same as the original (if the center of rotation is the midpoint of the segment).
- The image of the segment overlaps with the segment and lies on the same line (if the center of rotation is a point on the segment).
- The image of the segment does not overlap with the segment and is parallel to the original segment (if the center of rotation is *not* on the segment).

This can also tell us important information about a figure that has been rotated. In this example, triangle ABC has been rotated 180 degrees with point C as the center of rotation. If we think of side AB as a line segment, then we know that its image $A'B'$ must be parallel to it. If we think of side BC as a line segment, then we know that its image $B'C$ must be along the same line.