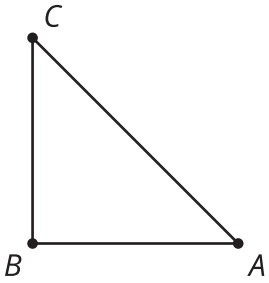
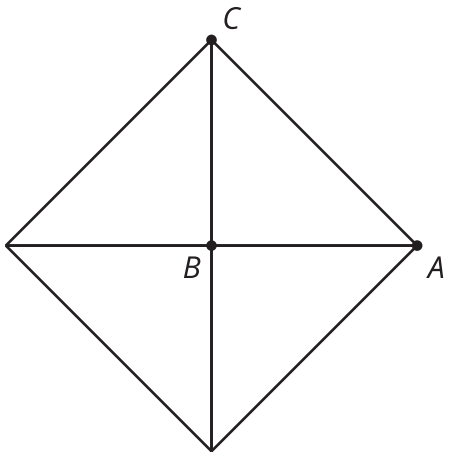
# Rotation Patterns

Let's rotate figures in a plane.

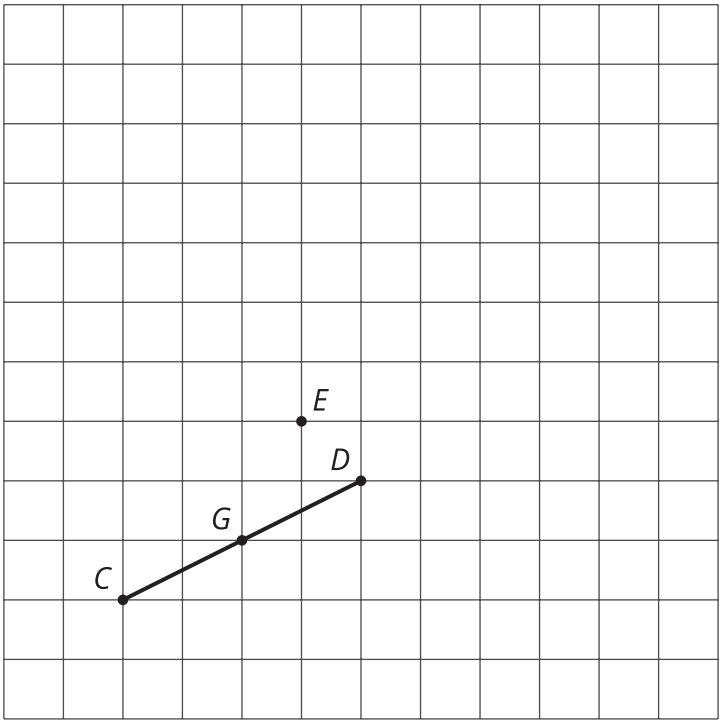
## 7.1 Notice and Wonder: Building a Quadrilateral

What do you notice? What do you wonder?



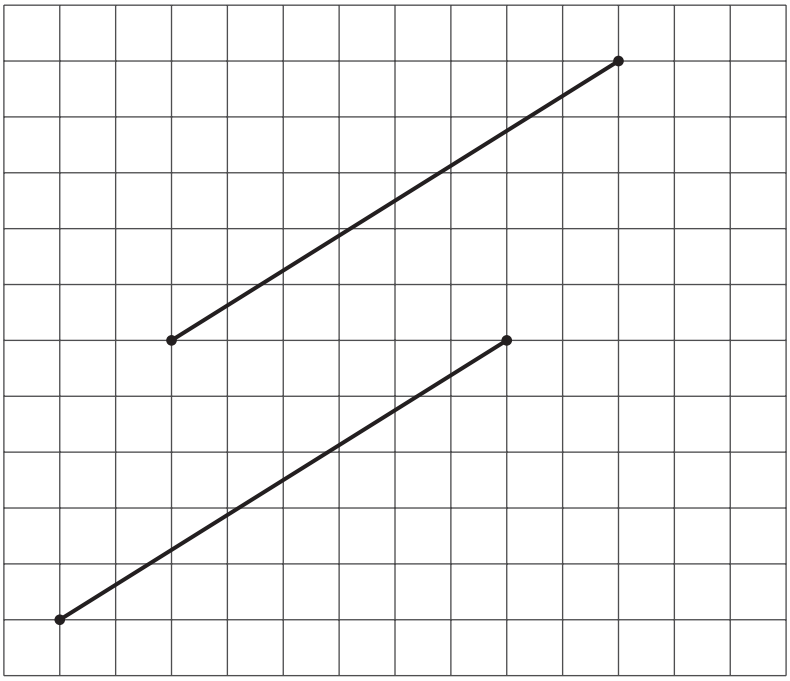
# 7.2 Rotating a Segment




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

4. What happens when you rotate a segment $180^\circ$ 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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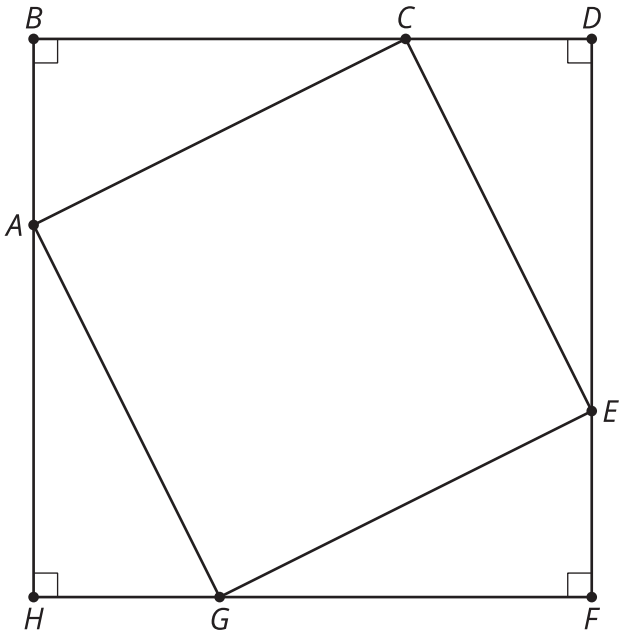
# 7.3 A Pattern of Four Triangles

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.