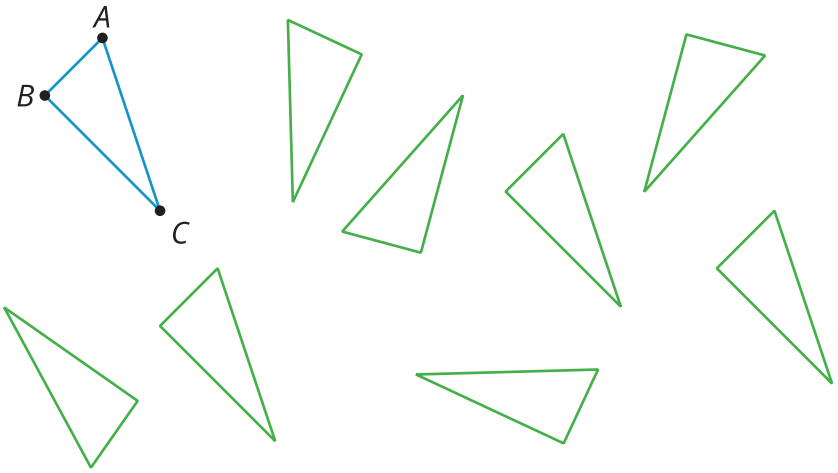
Unit 1, Lesson 12

Congruent Polygons

Let's decide if two figures are congruent.

12.1 Translated Images

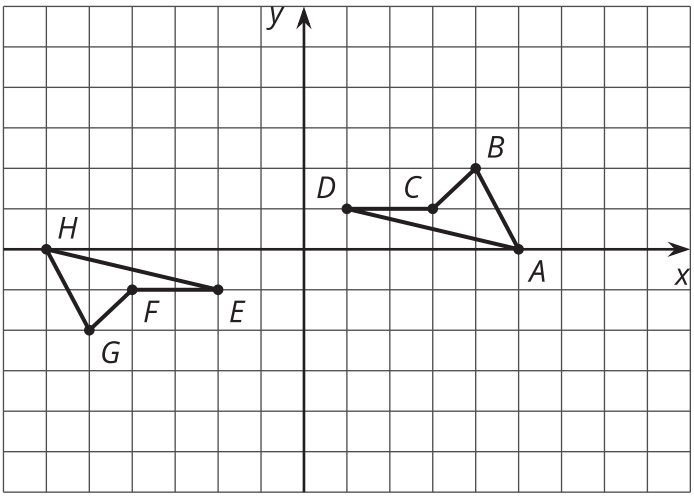
All of these triangles are congruent. Sometimes we can take one figure to another with a translation. Shade the triangles that are images of triangle ABC under a translation.



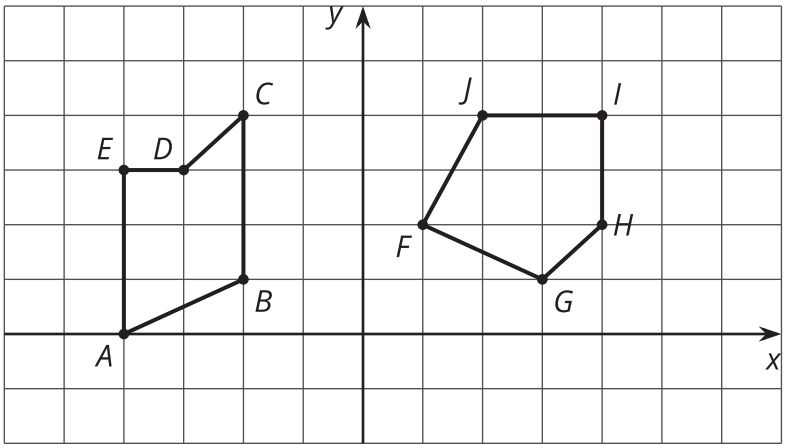
12.2 Congruent Pairs (Part 1)

For each of the following pairs of shapes, decide whether or not they are congruent. Explain your reasoning.

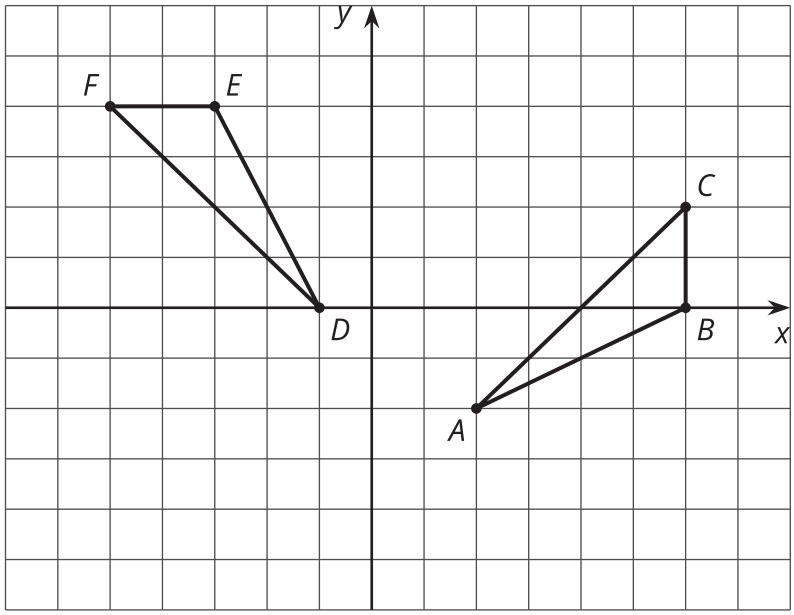
1.



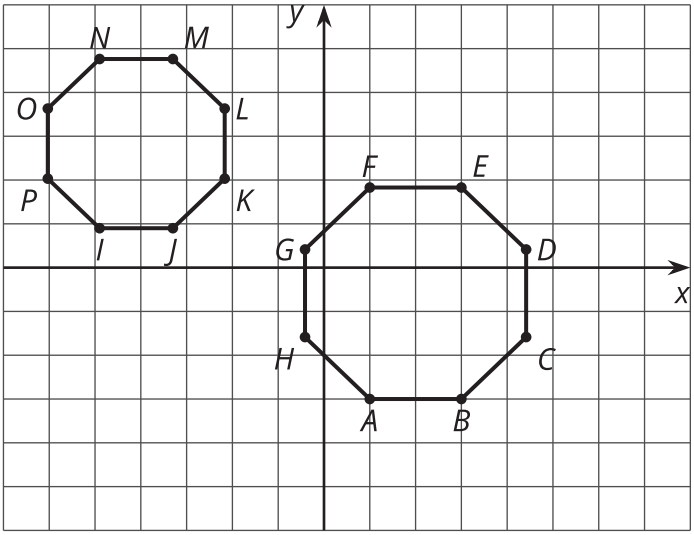
2.



3.



4.

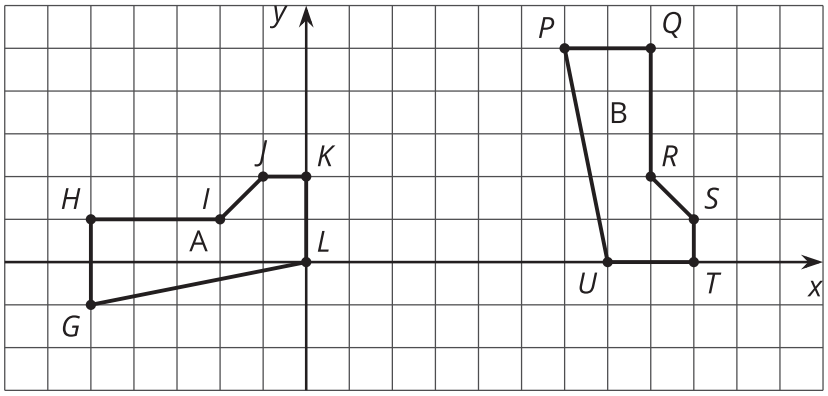


12.3 Congruent Pairs (Part 2)

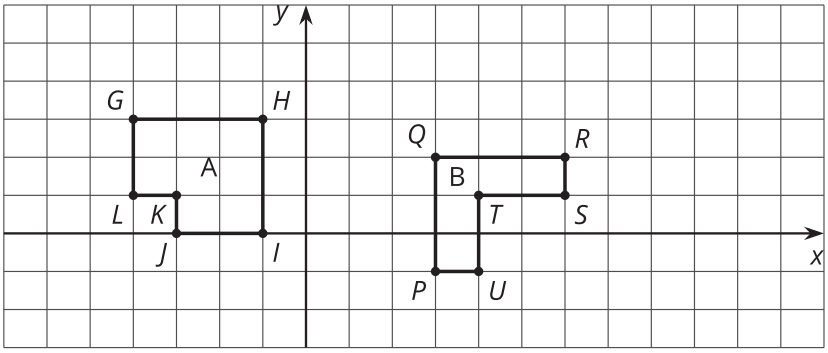
Take turns with your partner to decide whether Shape A is congruent to Shape B.

- For each pair of shapes that you decide is congruent or not congruent, explain to your partner how you know.
- For each pair of shapes that your partner decides is congruent or not congruent, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.

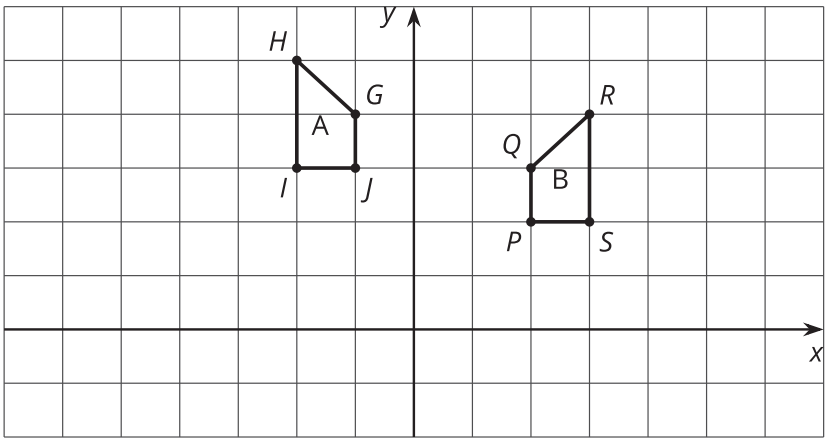
1.



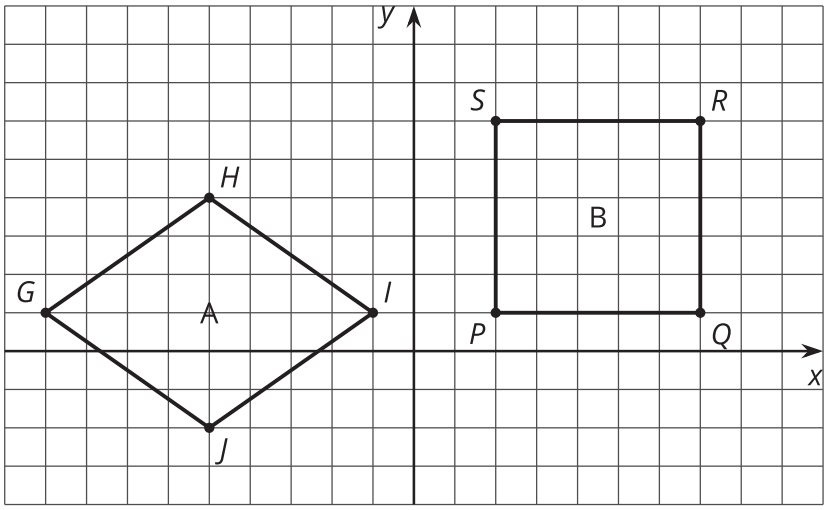
2.



3.



4.



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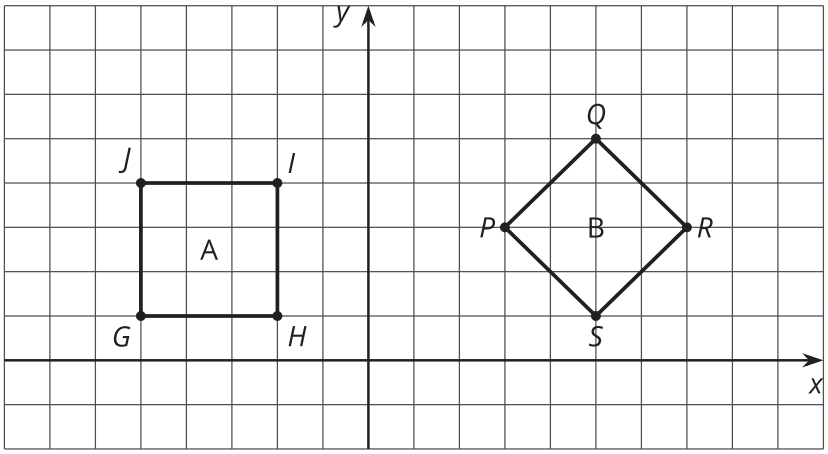


Are you ready for more?

A polygon has 8 sides: five of length 1, two of length 2, and one of length 3. All sides lie on grid lines. (It may be helpful to use graph paper when working on this problem.)

1. Find a polygon with these properties.

2. Is there a second polygon, not congruent to the first, with these properties?

12.4 Building Quadrilaterals

Your teacher will give you a set of four objects.

1. Make a quadrilateral with your four objects and record what you have made.

2. Compare your quadrilateral with your partner's. Are they congruent? Explain how you know.

3. Repeat Steps 1 and 2, forming different quadrilaterals. If your first quadrilaterals were not congruent, can you build a pair that is? If your first quadrilaterals were congruent, can you build a pair that is not? Explain.

Lesson 12 Summary

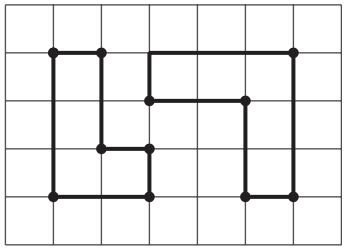
How do we know if two figures are congruent?

- If we copy one figure on tracing paper and move the paper so the copy covers the other figure exactly, then that suggests they are congruent.
- If we can describe a sequence of translations, rotations, and reflections that move one figure onto the other so they match up exactly, they are congruent.

How do we know that two figures are *not* congruent?

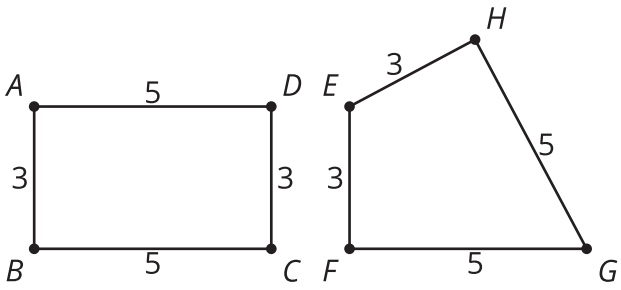
- If there is no correspondence between the figures where the parts have equal measure, that shows that the two figures are *not* congruent.
  - If two polygons have different sets of side lengths, they can't be congruent.

    For example, the figure on the left has side lengths 3, 2, 1, 1, 2, 1. The figure on the right has side lengths 3, 3, 1, 2, 2, 1. There is no way to make a correspondence between them where all corresponding sides have the same length.



  - If two polygons have the same side lengths, but not in the same order, the polygons can't be congruent.

    For example, rectangle $ABCD$ can't be congruent to quadrilateral $EFGH$. Even though they both have two sides of length 3 and two sides of length 5, they don't correspond in the same order.



  - If two polygons have the same side lengths, in the same order, but different corresponding angles, the polygons can't be congruent.

    For example, parallelogram $JKLM$ can't be congruent to rectangle $ABCD$. Even though they have the same side lengths in the same order, the angles are different. All angles in $ABCD$ are right angles. In $JKLM$, angles J and L are less than 90 degrees and angles K and M are more than 90 degrees.