

Launch:

Vocabulary:

translation - a transformation that slides a graph or figure horizontally, vertically, or both without changing the size or shape of the graph

composition - a transformation that is equivalent to performing the first transformation and then performing the second transformation on the image of the first.

7.3 Translations

Objective:

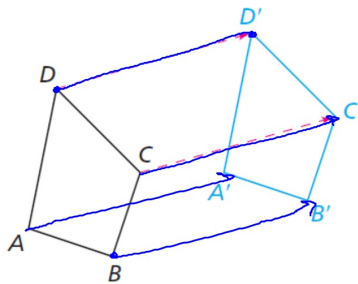
To model the composition of reflections over parallel lines and classify the resulting transformation as a translation.

To model translations in the plane, with and without coordinates.

To understand properties of reflection and translation in the plane.

For Discussion

- 1. How can you describe the transformation that maps $ABCD$ onto $A'B'C'D'$?

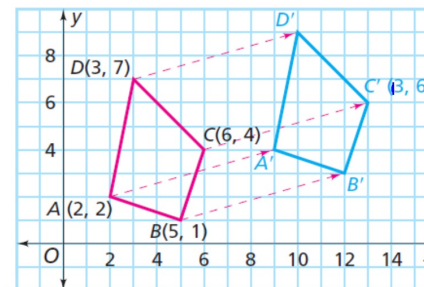


How are the arrows related? Explain.

parallel & congruent

Developing Habits of Mind

Write a description. The coordinate plane gives you an algebraic way to describe a translation. The diagram shows a translation of a quadrilateral.



$$(x, y) \mapsto (x + 7, y + 2)$$

Here, you "add" (7, 2) to each point of the preimage to get the image.

In general, a translation on the coordinate plane is a transformation that adds one value to every x -coordinate of the preimage and another (possibly the same) value to every y -coordinate of the preimage. In symbols,

notation for transformations
 $(x, y) \mapsto (x + a, y + b)$

where a and b are any real numbers. This notation describes a mapping. You say, "The translation (a, b) maps (x, y) to $(x + a, y + b)$."

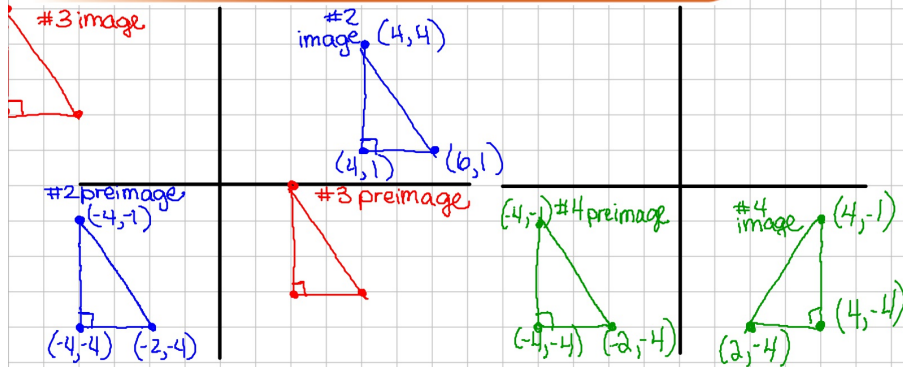
For You to Do

p. 548

Graph a scalene right triangle. Find its image after applying each rule.

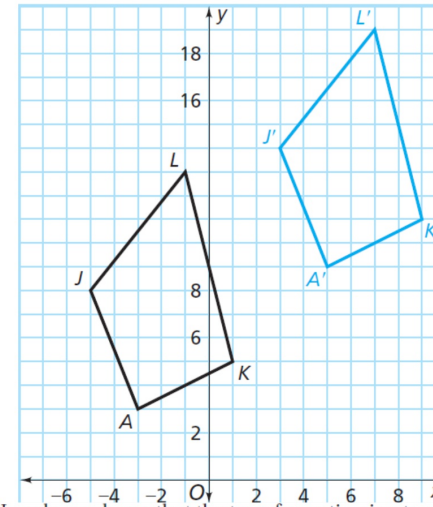
- $(x, y) \mapsto (x + 8, y + 5)$ Translation: 8 units right, 5 units up
- $(a, b) \mapsto (a - 8, b + 5)$ Translation: 8 units left, 5 units up
- $(a, b) \mapsto (-a, b)$ Reflection over y-axis
- $(x, y) \mapsto (x + 1, y + 2)$
- $(x, y) \mapsto (x, -y)$

Which rules are translations? What are the other rules?



1. The diagram shows the transformation $AKLJ \rightarrow A'K'L'J'$.

Check Your Understanding



- How do you know that the transformation is a translation?
- Describe the translation.
- Describe what you have to do to the coordinates of the vertices of $AKLJ$ to get the coordinates of the vertices of $A'K'L'J'$.

2. Apply the rule $(x, y) \mapsto (x + 10, y + 6)$ to the vertices of a triangle. Then connect the three image points. What figure do you get? How is it related to your original triangle?

On Your Own

Page 552: 4, 5

4. Graph \overline{AB} with endpoints $A(1, 2)$ and $B(2, 5)$.
 - a. Reflect \overline{AB} over the line $x = 3$. Call its image $\overline{A'B'}$.
 - b. Reflect $\overline{A'B'}$ over the line $x = 6$. Call its image $\overline{A''B''}$.
 - c. Find the coordinates of A' , B' , A'' , and B'' .
 - d. Is there a single mapping that sends \overline{AB} onto $\overline{A''B''}$? If so, describe it. If not, explain why not.
5. Use coordinate methods to show that quadrilateral $AA''B''B$ in Exercise 4 is a parallelogram.