Defining Translations

Illustrative Mathematics®

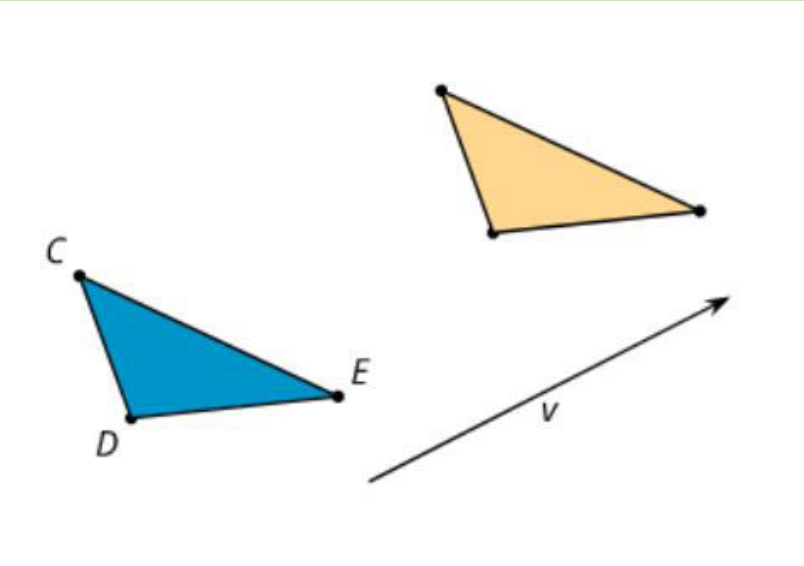
Learning Goal

- I can describe a translation by stating the directed line segment.
- I can draw translations.

12.1 Two Triangles and an Arrow

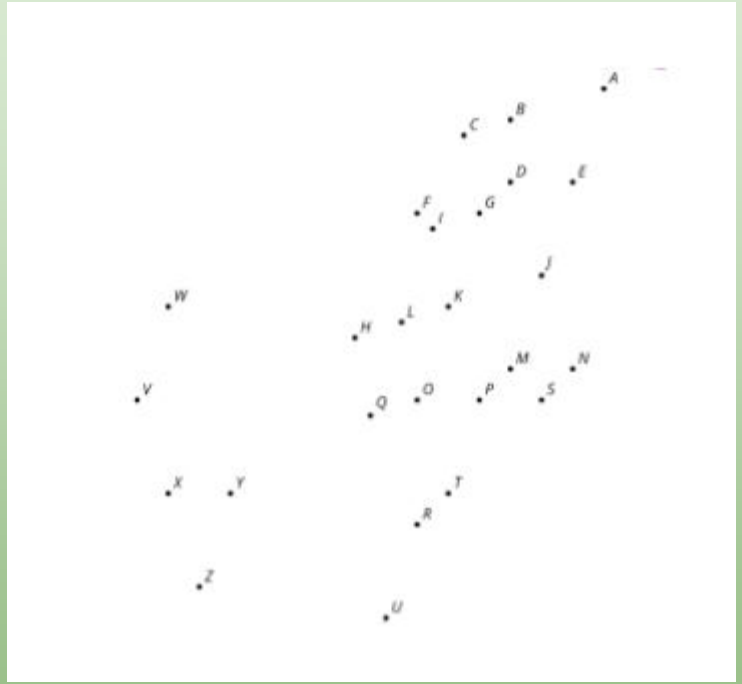
what do you notice?

what do you wonder?



12.2 What's the Point: Translations

1. After a translation, the image of *V* is *W*. Find at least 3 other points that are taken to a labeled point by that translation.
2. Write at least 1 conjecture about translations.
3. In a new translation, the image of *V* is *Z*. Find at least 3 other points that are taken to a labeled point by the new translation.
4. Are your conjectures still true for the new translation?

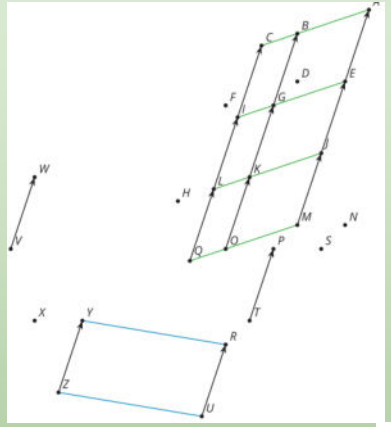


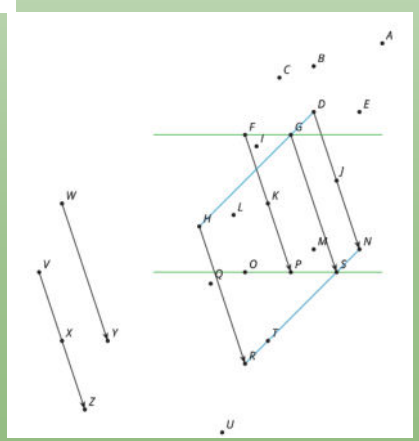
Helpful tools:

- Tracing paper
- Two different colors to see transformations

Activity Synthesis

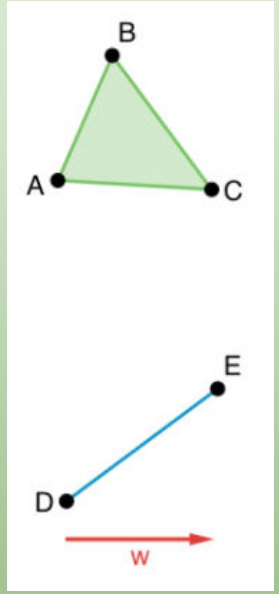
- What conjectures can you make about translations?
- connecting each original point to each image results in arrows that are all the same length and going in the same direction.
    - These are called **Directed Line Segments**
- Conjecture: Translations take lines to parallel lines





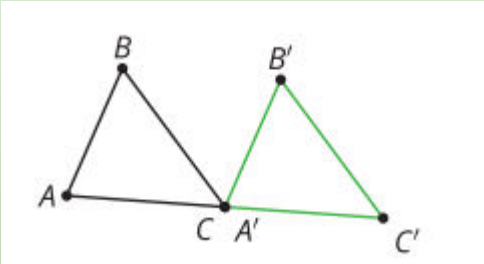
12.3 Translating Triangles

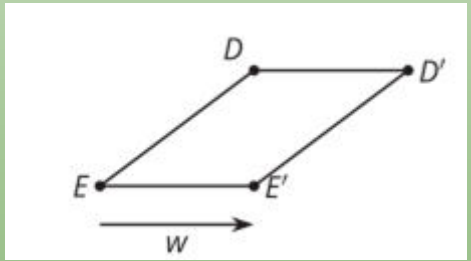
1. Translate triangle *ABC* by the **directed line segment** from *A* to *C*.
   a. What is the relationship between line *BC* and line *B'C'*? Explain your reasoning.
   b. How does the length of segment *BC* compare to the length of segment *BC*? Explain your reasoning.
2. Translate segment *DE* by directed line segment *w*. Label the new endpoints *D'* and *E'*.
   a. Connect *D* to *D'* and *E* to *E'*.
   b. What kind of shape did you draw? What properties does it have? Explain your reasoning.



Work quietly, then compare with your partner.

Activity Synthesis





- How do you know lines BC and B′C′ are parallel?
- How do you know segments BC and B′C′ are the same length?

Lesson Synthesis

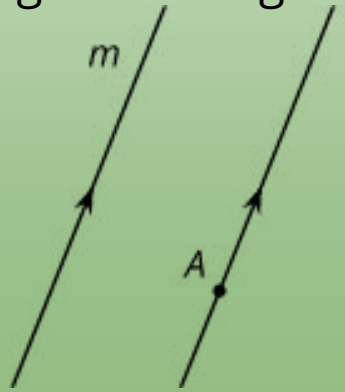
There are two facts related to translation and parallel lines that will come up repeatedly:

1. Given a line and a point off the line, there is a unique parallel line that goes through the point.
2. Translations take lines to parallel lines or to themselves

Defining Translations

- Given a line and a point off the line, there is a unique parallel line that goes through the point.
- Translations take lines to parallel lines or to themselves.

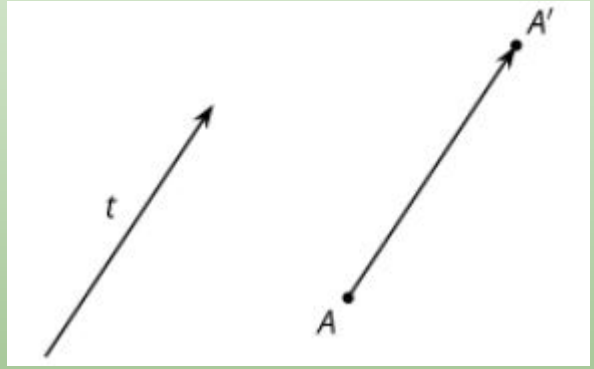
Parallel Postulate: Given a line (*m*) and a point (*A*) that is not on *m*, there is exactly one line that goes through *A* that is parallel to *m*.



translation

A translation is defined using a directed line segment. It takes a point to another point so that the directed line segment from the original point to the image is parallel to the given line segment and has the same length and direction.

In the figure, *A'* is the image of *A* under the translation given by the directed line segment *t*.



Parallel Postulate

Given a line (*m*) and a point (*A*) that is not on *m*, there is exactly one line that goes through *A* that is parallel to *m* .

(Assertion)