



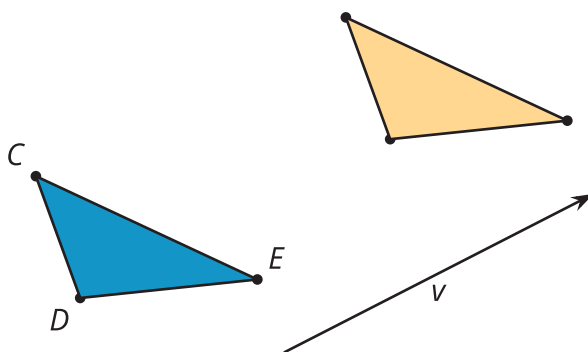
# Defining Translations

Let's translate some figures.

## 12.1

## Notice and Wonder: Two Triangles and an Arrow

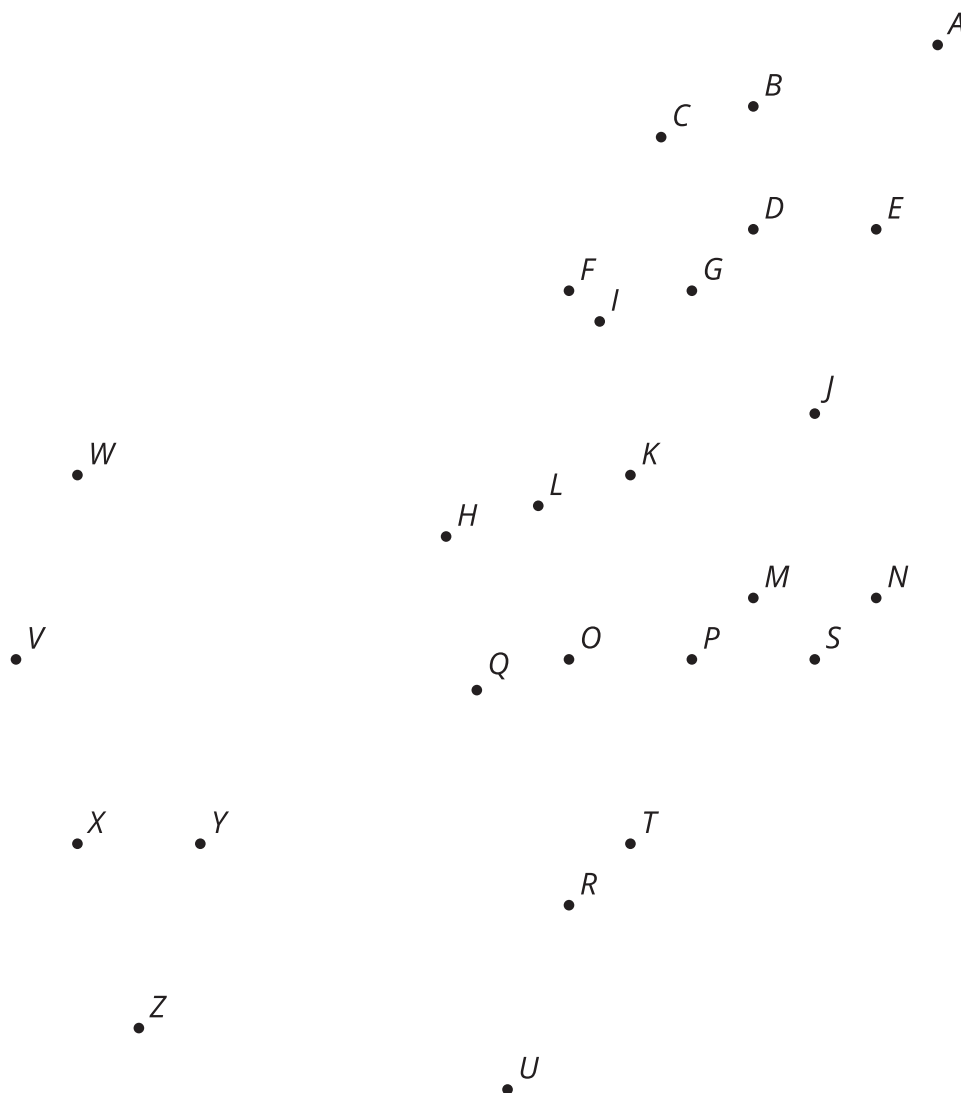
What do you notice? What do you wonder?



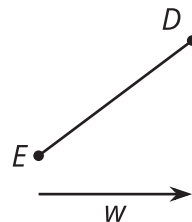
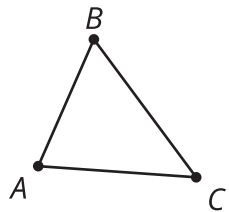
## 12.2

## 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 this same 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?



## 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  $B'C'$ ? 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.

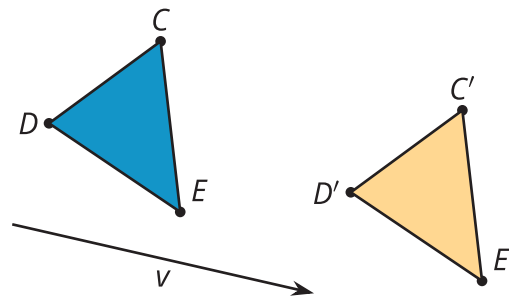
## Are you ready for more?

1. On triangle  $ABC$  in the task, use a straightedge and compass to construct the line which passes through  $A$  and is perpendicular to  $AC$ . Label it  $\ell$ . Then construct the perpendicular bisector of  $AC$  and label it  $m$ . Draw the reflection of  $ABC$  across the line  $\ell$ . Since the label  $A'B'C'$  is used already, label it  $DEF$  instead.
2. What is the reflection of  $DEF$  across the line  $m$ ?
3. Explain why this is cool. What does it tell you about translations?

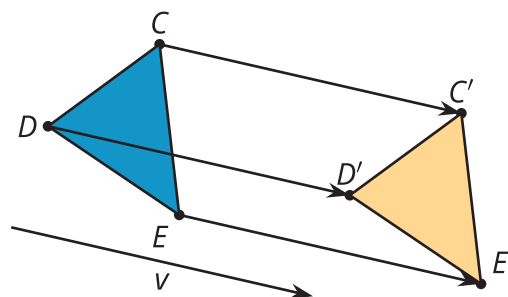
## Lesson 12 Summary

A translation slides a figure a given distance in a given direction with no rotation. The distance and direction are given by a **directed line segment**. The arrow of the directed line segment specifies the direction of the translation, and the length of the directed line segment specifies how far the figure gets translated.

More precisely, a **translation** of a point  $A$  by a directed line segment  $t$  is a transformation that takes  $A$  to  $A'$  so that the directed line segment  $AA'$  is parallel to  $t$ , goes in the same direction as  $t$ , and is the same length as  $t$ .



Here is a translation of 3 points. Notice that the directed line segments  $CC'$ ,  $DD'$ , and  $EE'$  are each parallel to  $v$ , go in the same direction as  $v$ , and are the same length as  $v$ .



Also notice that segment  $CD$  is parallel to segment  $C'D'$ . We proved that this would always be true, so we can write a theorem that says translations take lines to parallel lines or to themselves. A **theorem** is a statement that has been proved mathematically.