Translations: Lesson 5 Vectors

Student Activity

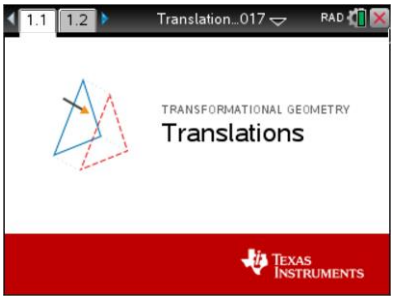
Name _____

Class _____

In this lesson, you will investigate how to translate a triangle using a vector and how this relates to previous work with translations.

Open the document: *Translations.tns.*

It is important that one of the Translations Tours be done before any Translations lessons.



PLAY INVESTIGATE EXPLORE DISCOVER

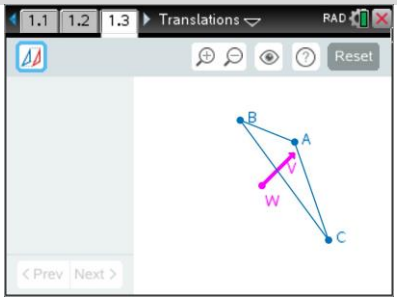
Move to page 1.3. (ctrl ▶ two times)

On the handheld, press ctrl ▶ and ctrl ◀ to navigate through the pages of the lesson.
(On the iPad®, select the page thumbnail in the page sorter panel.)

1. Press menu to open the menu.

   (On the iPad, tap the wrench icon to open the menu.)

   Press 1 (1: Templates), 8 (8: Vector).



2. Translate ΔABC by vector $\overrightarrow{WV}$ by clicking on or pressing T.

   Zoom in (+) or out (−) as needed.

   a. Look at the dashed segments, $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$, and the **vector** $\overrightarrow{WV}$.

      A **vector** is a directed line segment which has both length and direction.

      Discuss in your groups what seems to be true about vector $\overrightarrow{WV}$ and these three dashed segments.

   b. Grab the endpoint of the vector, W, by clicking on it or pressing W and use the directional arrows (▲ ▼ ◀ ▶) on the touchpad to move point W so that it coincides with vertex A.

      What point coincides with V?

      Move point W so that it coincides with vertex B. What point coincides with V?

      Move point W so that it coincides with vertex C. What point coincides with V?

      Discuss in your groups what seems to be true about the dashed segments, $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$, and the vector $\overrightarrow{WV}$. Write your conjecture(s) below.

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c. Click on  or press [T] to undo the translation. Grab and move point W ([W]) and redo the translation by clicking on  or by pressing [T] again. What do you observe?
Grab and move point W ([W]) about the screen. What do you observe?
Does moving point W change the result of the translation?
Discuss in your groups and write a conjecture below.

3. Investigate what happens when point V on the vector is moved.

a. Grab point V by clicking on it or pressing [V] and use the directional arrows (▲ ▼ ◀ ▶) on the touchpad to move V to several places on the screen. Look at the dashed segments $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$, and the vector $\overrightarrow{WV}$. Discuss in your groups what you observe.

b. Grab and move each of the three vertices of ΔABC ([A], [B], [C]) to create different shaped triangles. Discuss in your groups what segment lengths appear to be equal. Write a conjecture about segment lengths.

c. To confirm or disprove your conjecture, open the Options menu (press or ([O]).
Select “AA’ BB’ CC’ WV’ “ by putting a check mark in the box next to it using the space bar key (␣). Press [esc] .
Look at the lengths displayed.

d. Further investigate by grabbing and moving each of the three vertices ([A], [B], [C]) and look at the lengths displayed as you do this. Is your conjecture still true? Discuss with your group.

e. Investigate further by grabbing and moving point V ([V]) about the screen.
Is your conjecture still true? Discuss in your group.

f. Grab and move point W. How does that affect what is displayed? Discuss in your group.
Based on your investigations, what seems to be true about the dashed segments $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$, and the vector $\overrightarrow{WV}$?

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4. Open the Options menu (press or (O)).
   a. Select "Slope AA' BB' CC' WV' " by putting a check mark in the box next to it using the space bar key (␣). Press esc . Click on Next or press) to see the next set of data.
   Look at the slopes displayed. Make a conjecture based upon those values. Discuss with your group.
   b. Investigate further by grabbing and moving each of the three vertices (A, B, C) and look at the slopes displayed. Is your conjecture still true? Discuss in your group.

   c. Investigate further by grabbing and moving point V (V) about the screen.
   Is your conjecture still true? Discuss in your group.

   d. Grab and move point W. How does that affect what is displayed? Discuss in your group.
   Based on your investigations, what seems to be true about the dashed segments $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$, and the vector $\overrightarrow{WV}$?

   e. Grab the endpoint of the vector, W, by clicking on it or pressing W and use the directional arrows (▲ ▼ ◀ ▶) on the touchpad to move point W so that it coincides with vertex A. What point coincides with V?
   Move point W so that it coincides with vertex B. What point coincides with V?
   Move point W so that it coincides with vertex C. What point coincides with V?

   Based on your investigations, what seems to be true about the dashed segments $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$, and the vector $\overrightarrow{WV}$?

5. Many triangles have been translated by a given vector. Answer the following based on this activity.
   a. What is a vector?
   _____

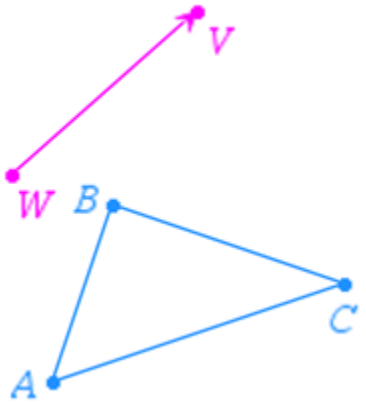
   b. A vector has both _____ and _____.

   c. A translation can also be called a _____.

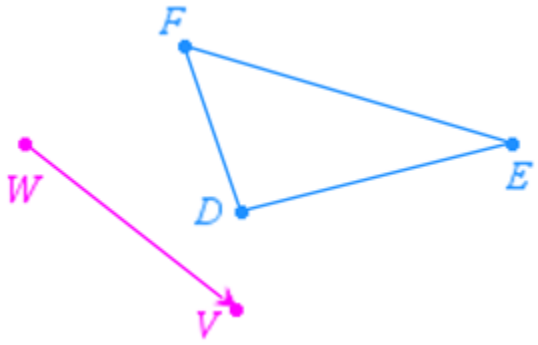
   d. Lines that are parallel have the same _____.

   e. Based on your discoveries, write a definition for translating a triangle about a vector.

6. We have been using technology to translate the triangles. Now do this "by hand" using a straightedge.
Translate ΔABC by vector $\overrightarrow{WV}$. Also, draw the dashed segments, $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$.



7. Translate ΔDEF by vector $\overrightarrow{WV}$. Also, draw the dashed segments, $\overline{DD'}$, $\overline{EE'}$, $\overline{FF'}$.



Using the figure above, answer the following questions.

a. List 3 other segments that are parallel to $\overline{EE'}$:

_____

b. If DD' = 4 cm, then what other segments have a length of 4 cm?

_____