8.2.7 and 8 Lesson Date: _____

Sequencing Translations and Reflections

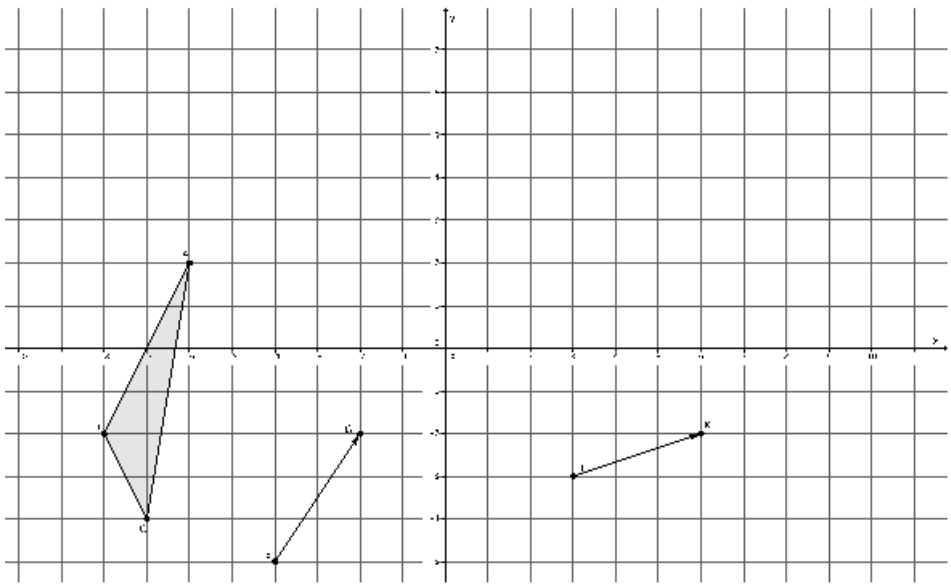
Student Objectives

- I know that a sequence of transformations (one move on the plane followed by another) enjoys the same properties as a single translation with respect to lengths of segments and degrees of angles.
- I know that a translation along a vector followed by another translation along the same vector in the opposite direction can move all points of a plane back to its original position.
- I know that the reflection is its own inverse transformation.
- I understand that a sequence of a reflection followed by a translation is not equal to a translation followed by a reflection.

Classwork

Exploratory Challenge

1. Translate ΔABC along vector $\overrightarrow{FG}$ and then translate its image along vector $\overrightarrow{JK}$. Be sure to label the images appropriately.



a. How does the size of $\angle ABC$ compare to the size of $\angle A''B''C''$?

b. How does the length of $\overline{AB}$ compare to the length of $\overline{A''B''}$?

c. Why do you think what you observed in parts (a) and (b) were true?

d. Where is the image of triangle ABC if you first translate along vector $\overrightarrow{JK}$ and then along vector $\overrightarrow{FG}$? This shows that sequences of translations are _____.

Let the black figure below be figure S.

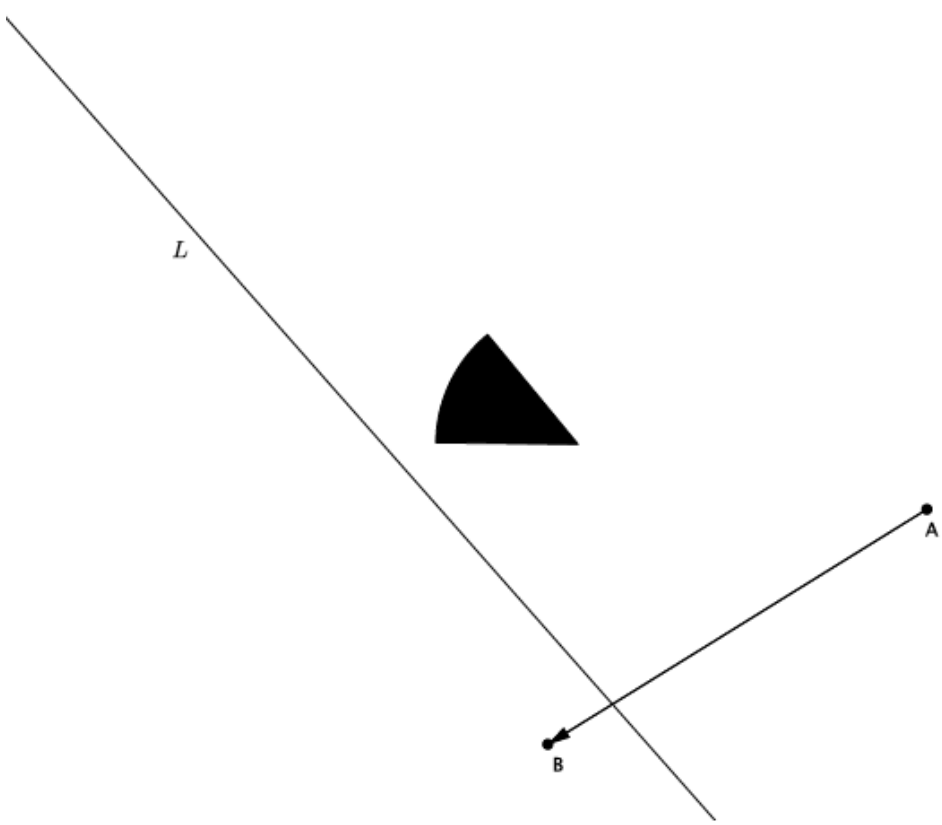
2. If *figure* S was translated along vector $\overrightarrow{AB}$ resulting in $Translation(Figure\ S)$, what transformation would map $Translation(Figure\ S)$ back onto its original position?

3. If *figure* S was reflected across line L resulting in $Reflection(Figure$ S), what transformation would map $Reflection(Figure\ S)$ back onto its original position?

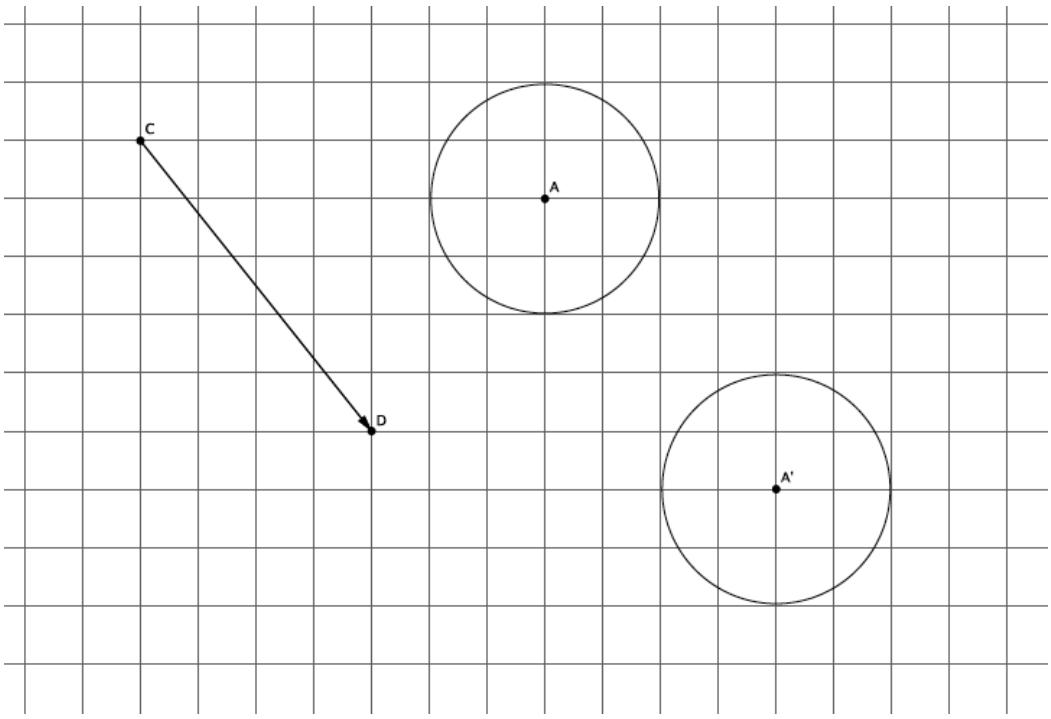
4. Use a transparency to perform the following sequence: Translate figure S along vector $\overrightarrow{AB}$, then reflect figure S across line L. Label the image S'.

5. Use a transparency to perform the following sequence: Reflect figure S across line L, then translate figure S along vector $\overrightarrow{AB}$. Label the image S''.

6. Are figures S and S' in the same location? This shows that sequences of translations and reflections are _____.



7. The picture below shows the translation of Circle A along vector $\overrightarrow{CD}$. Name the vector that will map the image of Circle A back onto itself. Translation along vector _____ is the inverse transformation of a translation along vector $\overrightarrow{CD}$.



Lesson Summary

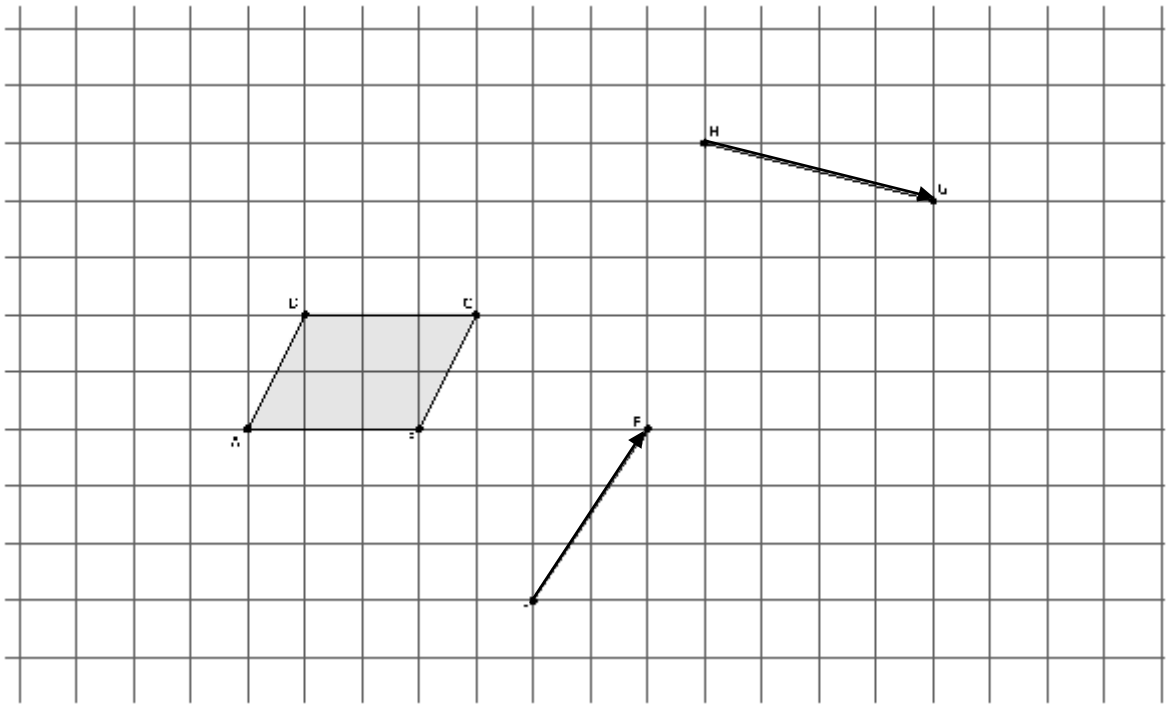
- Translating a figure along one vector then translating its image along another vector is an example of a sequence of transformations.
- A sequence of translations enjoys the same properties as a single translation. Specifically, the figures' lengths and degrees of angles are preserved.
- If a figure undergoes two transformations, F and G, and is in the same place it was originally, then the figure has been mapped onto itself.
- A reflection across a line followed by a reflection across the same line places all figures in the plane back onto their original position.
- A reflection followed by a translation does not place a figure in the same location in the plane as a translation followed by a reflection. The order in which we perform a sequence of rigid motions matters.

Advanced Math 7 Period _____ Name: _____

8.2.7 Homework Set Date: _____

Homework Homework Homework Homework Homework

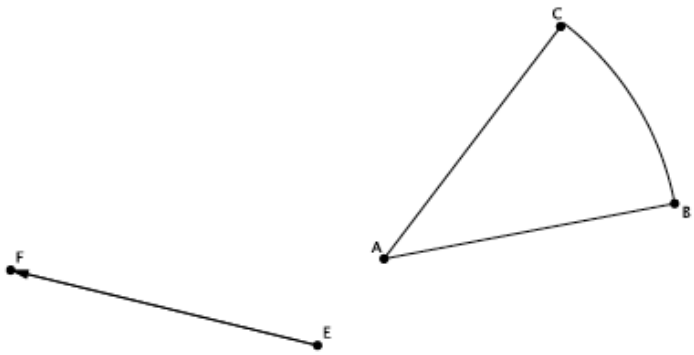
1. Perform the following sequence translations on Parallelogram $ABCD$ (a quadrilateral in which both pairs of opposite sides are parallel) a translation along vector $\overrightarrow{HG}$ and then a translation along vector $\overrightarrow{EF}$. Label the translated images.



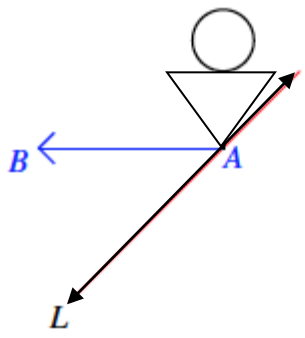
2. What do you know about $\overline{AD}$ and $\overline{BC}$ compared with $\overline{A'D'}$ and $\overline{B'C'}$? Explain.

3. Are $\overline{A'B'}$ and $\overline{A''B''}$ equal in length? How do you know?

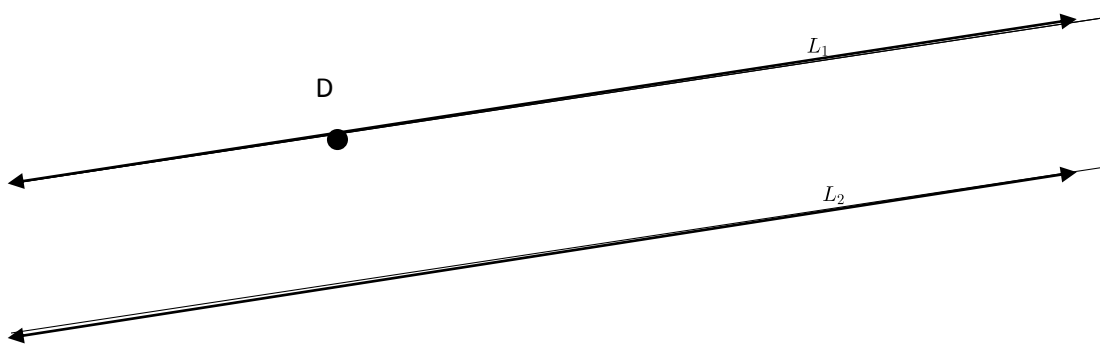
4. Translate the curved shape ABC along the given vector. Label the image.
5. What vector would map the shape $A'B'C'$ back onto shape ABC?



6. Let there be a reflection across line L and let there be a translation along vector $\overrightarrow{AB}$ as shown. If S denotes the figure below (circle and triangle), compare the translation of S followed by the reflection of S with the reflection of S followed by the translation of S.



7. Let L_1 and L_2 be parallel lines and let $Reflection_1$ and $Reflection_2$ be the reflections across L_1 and L_2, respectively (in that order). Show that a $Reflection_2$ followed by $Reflection_1$ is not equal to a $Reflection_1$ followed by $Reflection_2$. (Hint: Take a point on L_1 and see what each of the sequences does to it.)



8. Name another transformation(s) that gives you the same image of point D as the sequence of transformations of $Reflection_1$ and $Reflection_2$.