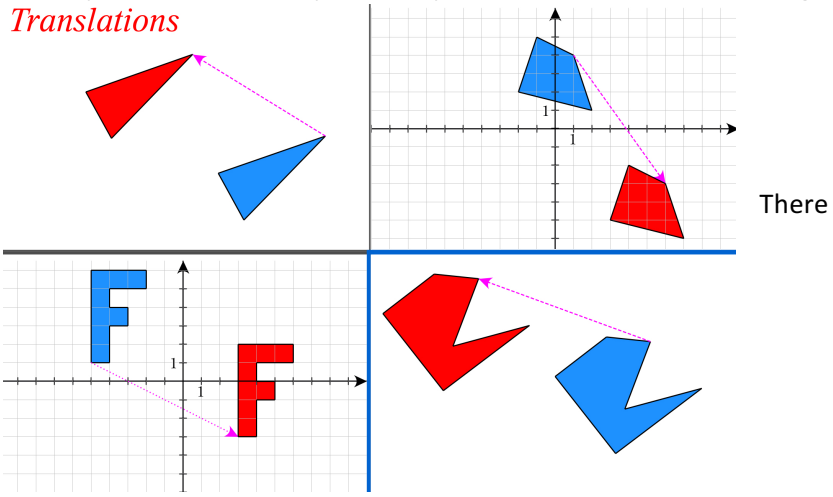
Exploring Translations with TI-Nspire

In this activity, we will use explore Geometric Translations on a plane using the TI-Nspire software. We will begin by looking at a general translation in a plane, and by the end you should be ready to draw your own transformations using grid paper.

Quick Background Info.

A ***Geometric Transformation*** changes a polygon's size or position on a plane. There are four types of transformations:

1. Translation
2. Reflection
3. Rotation
4. Dilation



Translation Lab

Open the Translations tool in TI-Nspire and go to the tool on the 3rd slide.

1. Click on the top-left button to show the translation. 
   Now click on the arrows to create a translation.
   a. What are the names of the three new points?

      *The original points and triangle are called the **Pre-Image.***
      *The new points and triangle are called the **Image.***

   b. As you click the arrows, how is the shape of the new triangle changing?

2. Now click on the tool "wrench" button  . Choose "Templates", and choose the first option **"Angles and Sides".**
   a. Begin by looking at the "Angle Measures". As you Translate the triangle, what do you notice about the angles of the two triangles?

   b. Click "Next" and observes the "Side Lengths". As you Translate the triangle, what do you notice about the side lengths of the two triangles?

3. Now click on the tool "wrench" button  , and choose the option **"Perimeter and Area".** Translate the triangle with the arrows and show the translation.
   a. Observe the Perimeter and areas (click next for areas). As you Translate the triangle, what do you notice about the *perimeters* of the two triangles?

b. As you Translate the triangle, what do you notice about the *areas* of the two triangles?

4. Now click on the tool "wrench" button, and choose the option **"$AA'BB'CC'W\ V$".** Translate the triangle with the arrows and show the translation.
   a. What new lines are drawn in this template?

      These lines are called the translation vectors.
   b. What do you notice about all of these lines that connect the corresponding points?

5. Now click on the tool "wrench" button, and choose the option **"Grid and Coordinates".** Translate the triangle with the arrows and show the translation. Move the triangle until it is **Up 3, Left 5**. Now compare the coordinates of the Pre-Image and the Image. (e.g. Compare the coordinates of A and A'
   a. How are the x-coordinates different?

   b. How are the y-coordinates different?

   c. We will also use a "**Coordinate Rule**" to name these and we will say this transformation is $(x, y) \rightarrow (x - 5, y + 3)$ for going left 5 and up 3.
      Can you make a translation that follows the rule $(x, y) \rightarrow (x + 2, y - 4)$? How is this moved?

6. Now click on the tool "wrench" button, and choose the option **"All Options on".** Click the Next button to get the **Coordinates.** Translate the triangle with the arrows and show the translation. Move the triangle until it is **Up 3, Left 5**. (Don't move point W).
   a. The arrow labeled v is called the translation vector. What are the coordinates of "v"?

   b. How do the lines $\overline{AA'}$, $\overline{BB'}$, and $\overline{CC'}$ compare to the vector shown by $\overrightarrow{WV}$?

      These coordinates of V name the **vector** "v" and we will write this as $\langle -5,3 \rangle$.

Conclusion: We have now seen that translating a polygon preserves is shape and size. We can describe the translation in words "Up 3, Left 5", or a coordinate rule $(x, y) \rightarrow (x - 5, y + 3)$, or a vector $\langle -5,3 \rangle$.