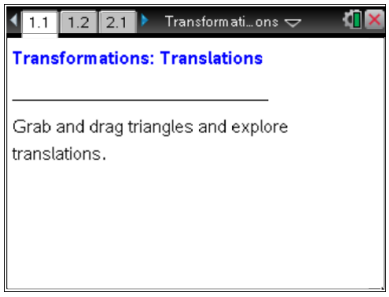
Transformations: Translations

Student Activity

Name _____

Class _____

Open the TI-Nspire document *Transformations_Translations*.



When an object is shifted left, right, up, or down, we call the transformation a *translation.* In this lesson you will visualize what a triangle will look like when it is translated horizontally or vertically. Then, you will identify the properties of the object that are preserved in a translation and determine the coordinates of a triangle that is translated in the coordinate plane.

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1. a. Grab and drag the open circle to translate the triangle left seven units and down two units.
   b. Complete the table below for the pre-image $\triangle ABC$ and the translated image $\triangle A'B'C'$.

	$\triangle ABC$	$\triangle A'B'C'$
Side length	AB =	$A'B'$ =
Angle measure	$m\angle A$ =	$m\angle A'$
Side length	AC =	$A'C'$ =
Area		
Perimeter		

2. Two figures are **congruent** if they have the same size and same shape. Is $\triangle ABC$ congruent to $\triangle A'B'C'$? Explain your reasoning.

3. Change the pre-image of the triangle by dragging one of its vertices and observe the changes in the translated image. Are the pre-image and image of the triangle congruent? Explain your reasoning.

4. An isometry is a transformation that produces an image that is congruent to the pre-image. Is transformation of an object using translation an isometry? Explain your reasoning.

5. If the clockwise order of the vertices of the image and the pre-image is the same, the figures are said to have the same orientation.
   a. Do $\triangle ABC$ and $\triangle A'B'C'$ have the same orientation? Why or why not?

   b. Does your answer to 5a depend on the location of the pre-image triangle?

c. Does your answer to 5a depend on the direction or amount of translation?

6. Consider the properties of side length, angle measure, perimeter, area, and orientation. Which of these properties are preserved in a translation? Which are not preserved in a translation?

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7. a. If △*ABC* has vertices *A*(–3, 2), *B*(5, 4), and *C*(–1, 6), predict the coordinates of the vertices of △*A′B′C′* for each of the translations in the table below.

Translation	Coordinates of *A′*	Coordinates of *B′*	Coordinates of *C′*
△*ABC* is translated left 4 units			
△*ABC* is translated up 2 units			
△*ABC* is translated right 2 units and down 7 units			

b. Grab and drag the open circle at *C* and perform each of the translations in question 7a. Verify or revise your predictions.

8. The coordinates of a point *P* are (*x*, *y*).

a. What are the coordinates of the new point, *P′*, when *P* is translated 3 units to the right?
P(*x*, *y*) → *P′*(_____, _____)

b. What are the coordinates of the new point, *P*', when *P* is translated 5 units to the left?
P(*x*, *y*) → *P′*(_____, _____)

c. What are the coordinates of the new point, *P*', when *P* is translated up 5 units?
P(*x*, *y*) → *P′*(_____, _____)

d. What are the coordinates of the new point, *P*', when *P* is translated down 7 units?
P(*x*, *y*) → *P′*(_____, _____)

9. Generalize your findings. If the coordinates of a point P are (x, y):

   a. What are the coordinates of the new point, P', when P is translated h units to the right and v units up?

      $P(x, y) \rightarrow P'($ _____, _____ $)$

   b. What are the coordinates of the new point, P', when P is translated h units to the left and v units up?

      $P(x, y) \rightarrow P'($ _____, _____ $)$

   c. What are the coordinates of the new point, P', when P is translated h units to the right and v units down?

      $P(x, y) \rightarrow P'($ _____, _____ $)$

   d. What are the coordinates of the new point, P', when P is translated h units to the left and v units down?

      $P(x, y) \rightarrow P'($ _____, _____ $)$