Extension

Use after Lesson 4.1

Perform Transformations

TEKS *a.1, a.2; 8.6.B*

GOAL Perform and describe transformations in a coordinate plane.

Key Vocabulary
- **transformation**
- **translation**
- **vertical stretch or shrink**
- **reflection**

For a given set of points, a **transformation** produces an image by applying a rule to the coordinates of the points. Some types of transformations are *translations, vertical stretches, vertical shrinks,* and *reflections.*

A **translation** moves every point in a figure the same distance in the same direction either horizontally, vertically, or both. You can describe translations algebraically.

Horizontal translation: $(x, y) \rightarrow (x + h, y)$ **Vertical translation:** $(x, y) \rightarrow (x, y + k)$

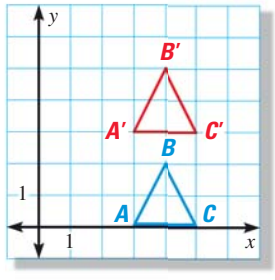
EXAMPLE 1 Perform a translation

READ TRANSFORMATIONS
If a transformation is performed on a point A, the new location of point A is indicated by A' (read "A prime").

The transformation $(x, y) \rightarrow (x, y + 3)$ moves $\triangle ABC$ up 3 units.

Original		Image
$A(3, 0)$	$\rightarrow$	$A'(3, 3)$
$B(4, 2)$	$\rightarrow$	$B'(4, 5)$
$C(5, 0)$	$\rightarrow$	$C'(5, 3)$

The result of the transformation is $\triangle A'B'C'$.



A **vertical stretch or shrink** moves every point in a figure away from the x-axis (a vertical stretch) or toward the x-axis (a vertical shrink), while points on the x-axis remain fixed. A **reflection** flips a figure in a line. You can describe vertical stretches and shrinks with or without reflection in the x-axis algebraically.

Vertical stretch:
$(x, y) \rightarrow (x, ay)$ where $a > 1$

Vertical shrink:
$(x, y) \rightarrow (x, ay)$ where $0 < a < 1$

Vertical stretch with reflection in the x-axis:
$(x, y) \rightarrow (x, ay)$ where $a < -1$

Vertical shrink with reflection in the x-axis:
$(x, y) \rightarrow (x, ay)$ where $-1 < a < 0$

EXAMPLE 2 Perform a vertical stretch with reflection

The transformation $(x, y) \rightarrow (x, -2y)$ vertically stretches $\triangle ABC$ and reflects it in the x-axis.

Original		Image
$A(3, 0)$	$\rightarrow$	$A'(3, 0)$
$B(4, 2)$	$\rightarrow$	$B'(4, -4)$
$C(5, 0)$	$\rightarrow$	$C'(5, 0)$

The result of the transformation is $\triangle A'B'C'$.