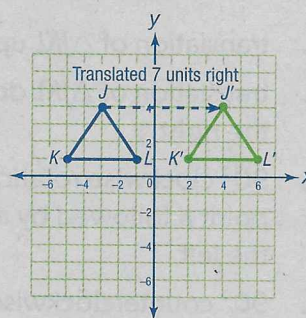LESSON

2 Translations

UNDERSTAND A **translation** is an operation that slides a geometric figure in the plane. You can think of a translation of a geometric figure as a function in which the input is not a single value, *x*, but rather a point on the coordinate plane, (*x*, *y*). When you apply the function to a point, the output will be the coordinates of the translated image of that point.

You can translate not only individual points but also entire graphs and figures. When you apply a translation function to every point on a figure, the resulting points will form the translated figure. For each **line segment** on the original figure, the translated image will contain either a corresponding **parallel line segment** or a **collinear line segment** of equal length.
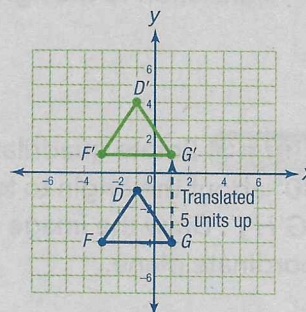
In a **horizontal translation,** the *x*-coordinate changes, but the *y*-coordinate stays the same. A horizontal translation of *a* units can be represented by the function $T(x, y) = (x + a, y)$. If $a > 0$, the figure slides to the right. If $a < 0$, the figure slides to the left.

The transformation shown on the right is the result of applying the function $T(x, y) = (x + 7, y)$ to $\triangle JKL$. In this example, *a* is a positive number, 7, so the figure slides to the right.

In a **vertical translation**, the *y*-coordinate changes, but the *x*-coordinate stays the same. A vertical translation of *b* units can be represented by the function $T(x, y) = (x, y + b)$. If $b > 0$, the figure slides up. If $b < 0$, the figure slides down.

The transformation shown on the right is the result of applying the function $T(x, y) = (x, y + 5)$ to $\triangle DFG$. In this example, *b* is a positive number, 5, so the figure slides up.

In a slant translation, both the *x*- and *y*-coordinates change. Slant translations can be described by the function $T(x, y) = (x + a, y + b)$.

The transformation shown on the right is the result of applying the function $T(x, y) = (x - 8, y - 6)$ to $\triangle ABC$. In this example, *a* and *b* are both negative, so the figure slides to the left and down.