

UNIT 5 • TRANSFORMATIONS IN THE COORDINATE PLANE

Lesson 2: Defining and Applying Rotations, Reflections, and Translations

Instruction

Guided Practice 5.2.1

Example 1

How far and in what direction does the point $P(x, y)$ move when translated by the function $T_{24, 10}$?

1. Each point translated by $T_{24, 10}$ will be moved right 24 units, parallel to the x -axis.



2. The point will then be moved up 10 units, parallel to the y -axis.



3. Therefore, $T_{24, 10}(P) = P' = (x + 24, y + 10)$.



Example 2

Using the definitions described earlier, write the translation $T_{5, 3}$ of the rotation R_{180} in terms of a function F on (x, y) .

1. Write the problem symbolically.

$$F = T_{5, 3}(R_{180}(x, y))$$



2. Start from the inside and work outward.

$$R_{180}(x, y) = (-x, -y)$$

$$\text{Therefore, } T_{5, 3}(R_{180}(x, y)) = T_{5, 3}(-x, -y).$$



3. Now translate the point.

$$T_{5, 3}(-x, -y) = (-x + 5, -y + 3)$$



4. Write the result of both translations.

$$F = T_{5, 3}(R_{180}(x, y)) = (-x + 5, -y + 3)$$



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Example 3

Using the definitions described earlier, write the reflection $r_{y=x}$ of the translation $T_{2,3}$ of the reflection $r_{x\text{-axis}}(x, y)$ in terms of a function S on (x, y) .

1. Write the problem symbolically.

$$S = r_{y=x}(T_{2,3}(r_{x\text{-axis}}(x, y)))$$

2. Start from the inside and work outward. First address the reflection through the x -axis. Solve $r_{x\text{-axis}}(x, y)$ for $(x, -y)$.

$$S = r_{y=x}(T_{2,3}(r_{x\text{-axis}}(x, y))) = r_{y=x}(T_{2,3}(x, -y))$$

3. Next, solve for the translation function, $T_{2,3}$, using the input from above, $T_{2,3}(x, -y) = (x + 2, -y + 3)$.

$$S = r_{y=x}(T_{2,3}(x, -y)) = r_{y=x}(x + 2, -y + 3)$$

4. Finally, solve the reflection $r_{y=x}$ using the input from above.

$$S = r_{y=x}(x + 2, -y + 3) = (-y + 3, x + 2)$$

