Guided Practice 5.1.2

Example 1

Given the point P (5, 3) and $T(x, y) = (x + 2, y + 2)$, what are the coordinates of $T(P)$?

1. Identify the point given.

   We are given P (5, 3).

2. Identify the transformation.

   We are given $T(P) = (x + 2, y + 2)$.

3. Calculate the new coordinate.

   $T(P) = (x + 2, y + 2)$

   $(5 + 2, 3 + 2)$

   $(7, 5)$

   $T(P) = (7, 5)$ ✓

Example 2

Given $\triangle ABC: A(5,2), B(3,5)$, and $C(2,2)$, and the transformation $T(x, y) = (x, -y)$, what are the coordinates of the vertices of $T(\triangle ABC)$? What kind of transformation is T?

1. Identify the vertices of the triangle.

   We are given the coordinates of the vertices A (5, 2), B (3, 5), and C (2, 2).

2. Identify the transformation.

   We are given $T(x, y) = (x, -y)$.

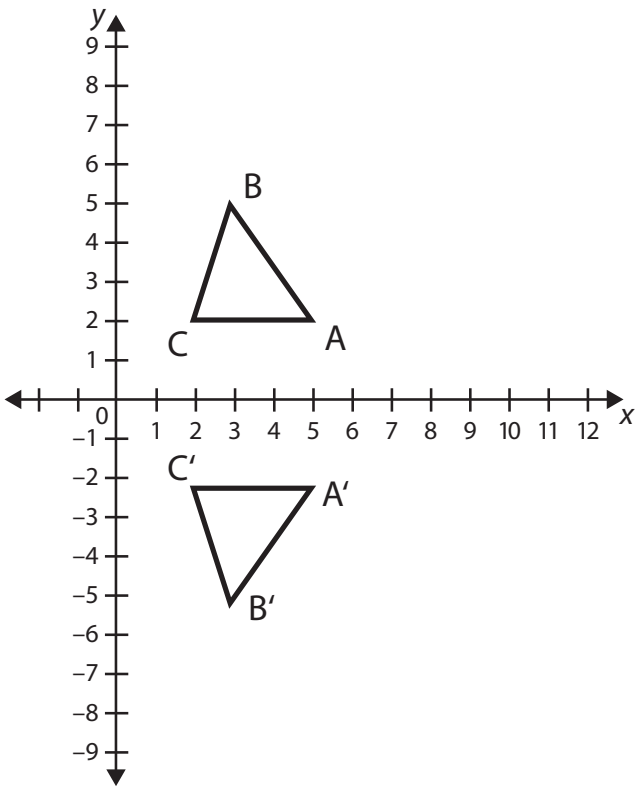
3. Calculate the new coordinates of the triangle.

$T(A)=T(5,2)=(5,-2)=A'$

$T(B)=T(3,5)=(3,-5)=B'$

$T(C)=T(2,2)=(2,-2)=C'$

When $\triangle ABC$ and $\triangle A'B'C'$ are drawn, we can see that the transformation is a reflection transformation through the x-axis.

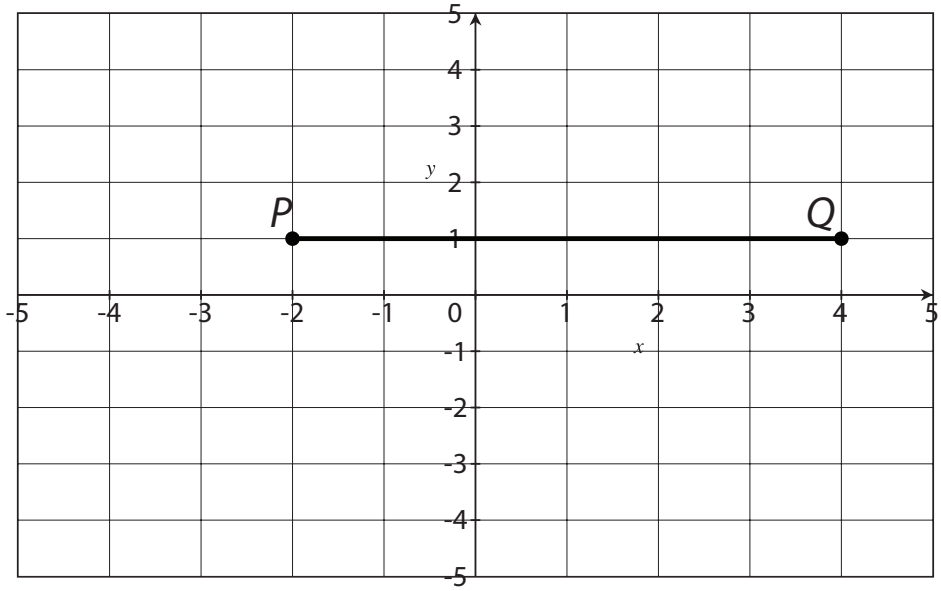


Instruction

Example 3

Given the transformation of a translation $T_{5,-3}$, and the points P (–2, 1) and Q (4, 1), show that the transformation of a translation is isometric by calculating the distances, or lengths, of $\overline{PQ}$ and $\overline{P'Q'}$.

1. Plot the points of the preimage.



2. Transform the points.

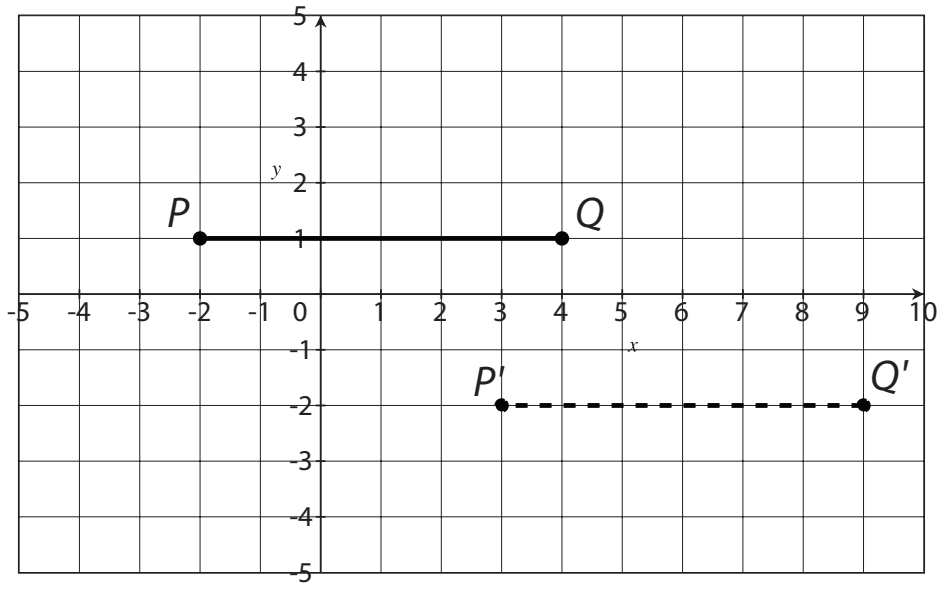
$T_{5,-3}(x, y) = (x + 5, y - 3)$

$T_{5,-3}(P) = (-2+5, 1-3) \Rightarrow P'(3, -2)$

$T_{5,-3}(Q) = (4+5, 1-3) \Rightarrow P'(9, -2)$

Instruction

3. Plot the image points.



4. Calculate the distance, d, of each segment from the preimage and the image and compare them.

   Since the line segments are horizontal, count the number of units the segment spans to determine the distance.

   $d(PQ) = 5$

   $d(P'Q') = 5$

   The distances of the segments are the same. The translation of the segment is isometric. ✓

Instruction

Example 4

Given $T_{-6,2}(x, y) = (x - 6, y + 2)$, state the translation that would yield the identity transformation, $I = T_{h,k}(T_{-6,2}(x, y))$.

1. Recall that the identity function brings a preimage back onto itself. Note what changes are made to the coordinates.

   The x-coordinate is being translated 6 units to the left.

   The y-coordinate is being translated 2 units up.

2. Determine what transformation needs to happen to bring the point (x, y) back to its original position.

   The x-coordinate needs to be brought back to the right 6 units.

   The y-coordinate needs to be brought back down 2 units.

3. Write symbolically the translation that will bring the point back to its original position.

   $T_{6,-2}$

4. Put all the pieces together to write the identity transformation.

   $T_{6,-2}(T_{-6,2}(x, y) = I$