

9.1 Translate Figures

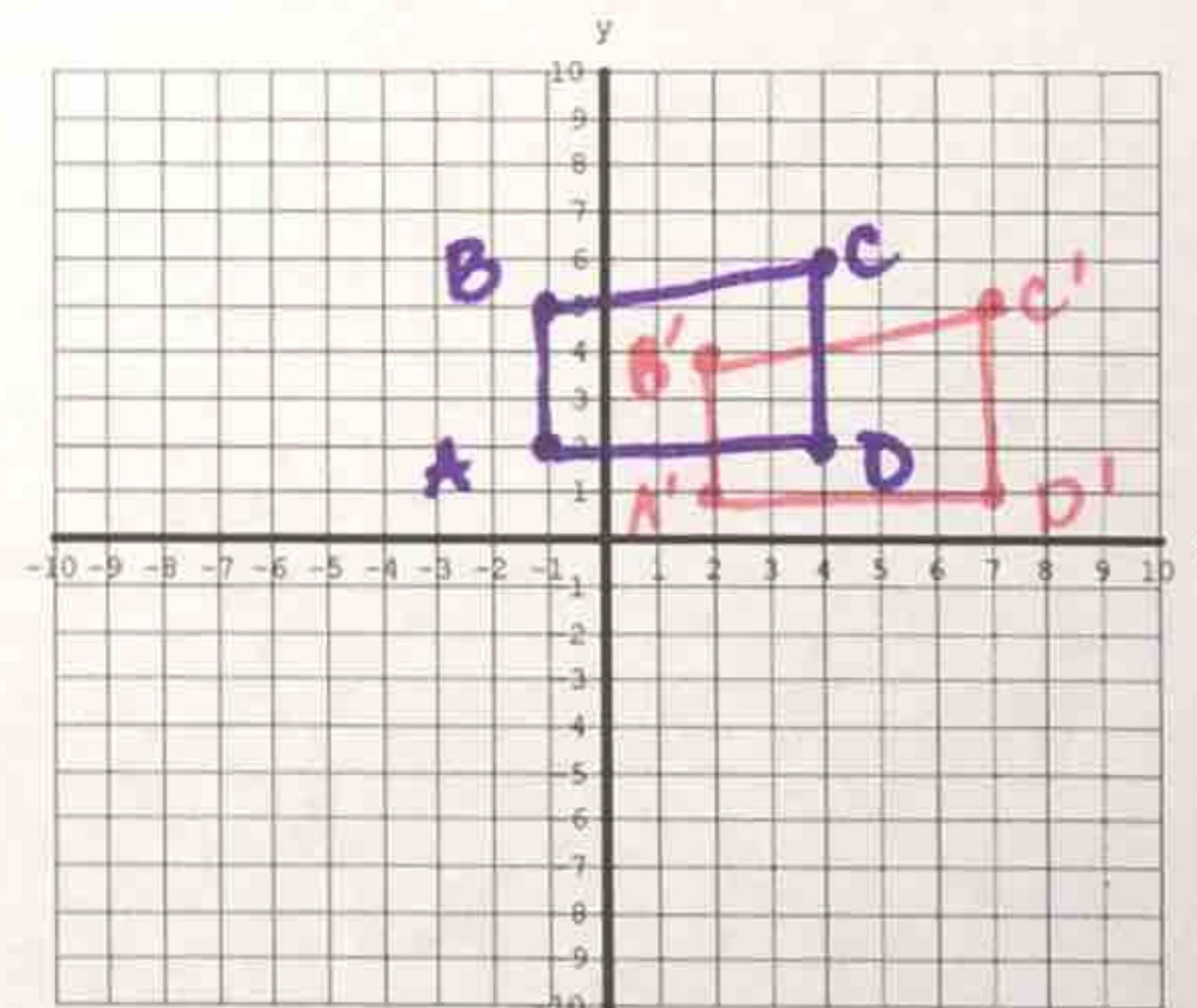
transformation - moves or changes a figure (preimage) in some way to produce a new figure (image), moves every point the same distance in the same direction

translation - maps, or moves, the points P and Q of a plane figure to the points P' (P prime) and Q' (Q prime), so that one of the following statements is true:

- * $PP' = QQ'$ and $\overline{PP'} \parallel \overline{QQ'}$, or
- * $PP' = QQ'$ and $\overline{PP'}$ and $\overline{QQ'}$ are collinear

Ex 1: Graph quadrilateral ABCD with vertices A(-1, 2), B(-1, 5), C(4, 6), and D(4, 2). Find the image of each vertex after the translation $(x, y) \rightarrow (x + 3, y - 1)$. Then graph the image use prime notation.

$$\begin{aligned}A & (-1, 2) \rightarrow A' (2, 1) \\B & (-1, 5) \rightarrow B' (2, 4) \\C & (4, 6) \rightarrow C' (7, 5) \\D & (4, 2) \rightarrow D' (7, 1)\end{aligned}$$

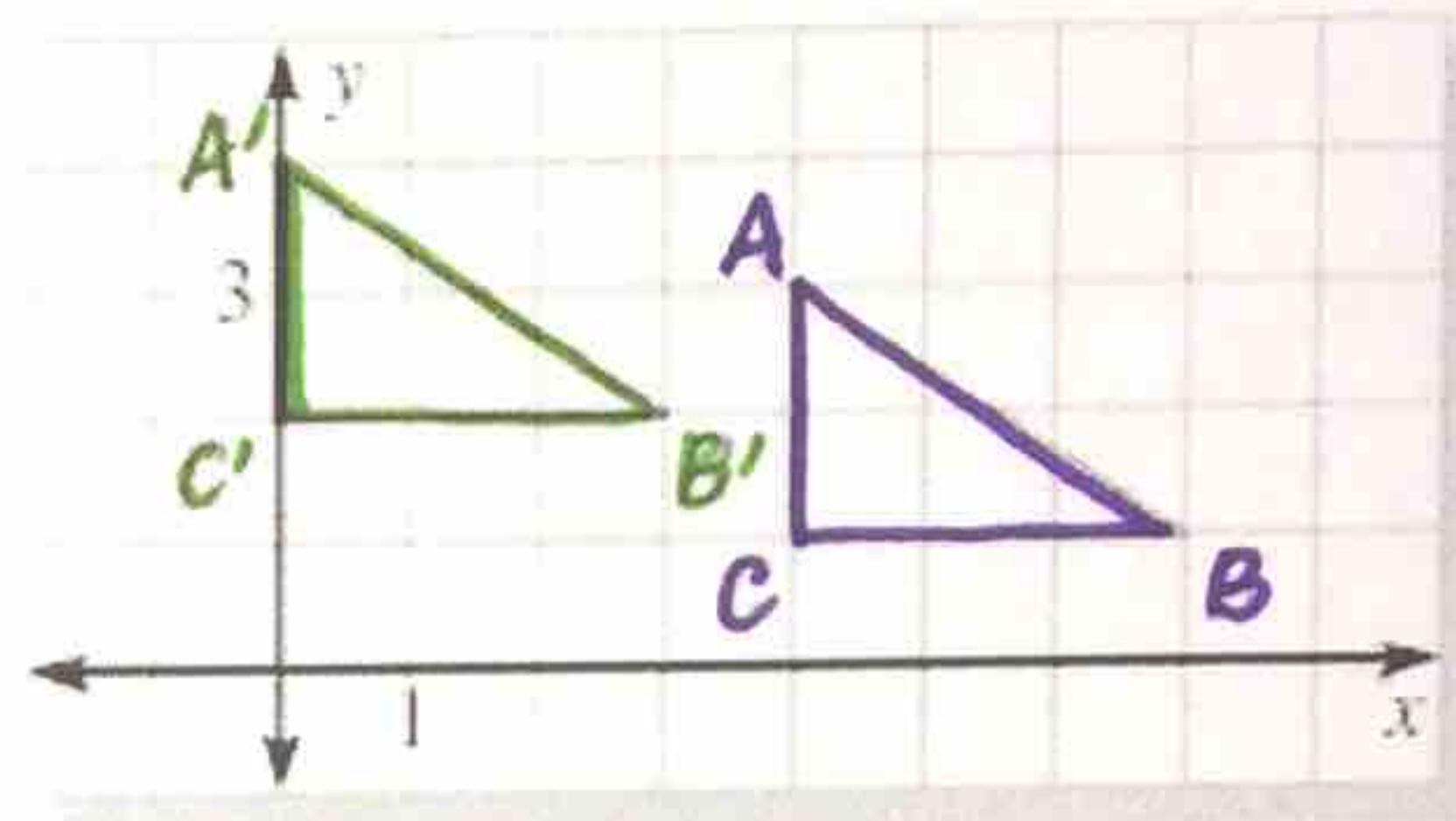


isometry - a transformation that preserves length and angle measure

Ex 2: Write a rule for the translation of $\triangle ABC$ and $\triangle A'B'C'$. Then verify that the transformation is an isometry.

4 units left, 1 unit up

$$(x, y) \rightarrow (x - 4, y + 1)$$



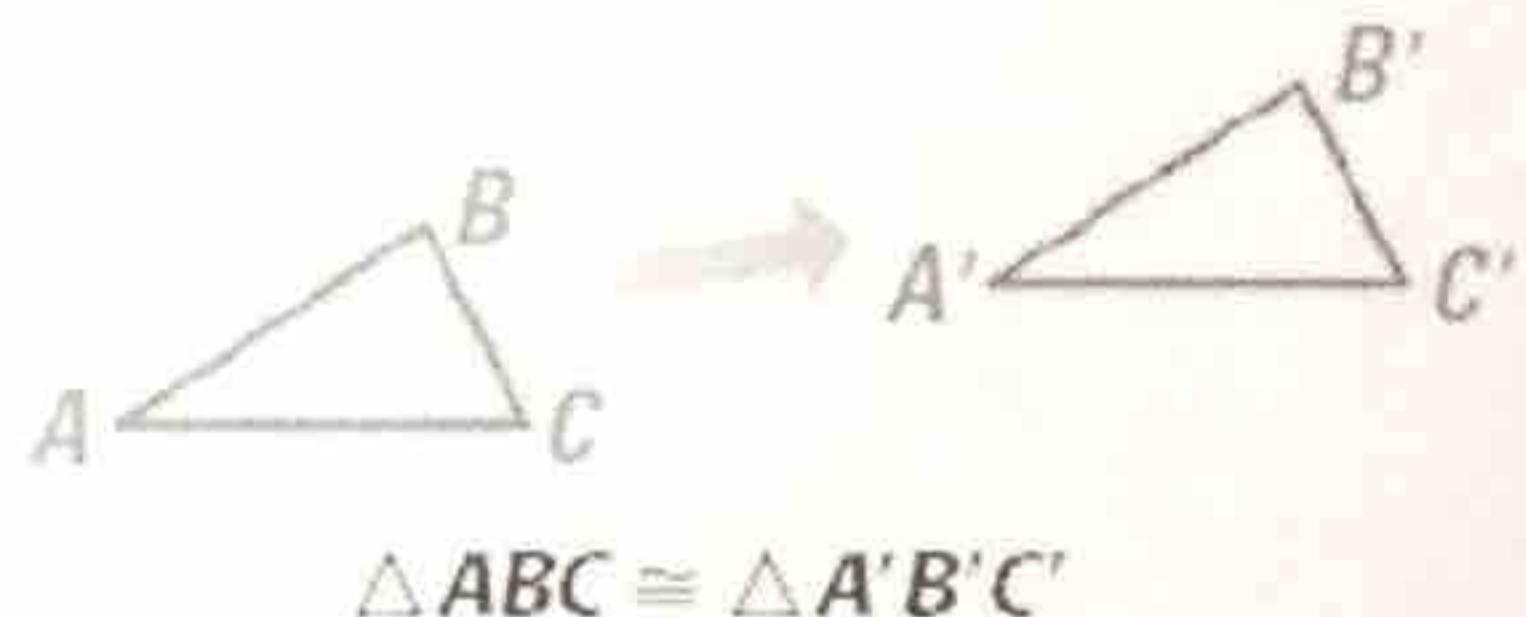
THEOREM

For Your Notebook

THEOREM 9.1 Translation Theorem

A translation is an isometry.

Proof: below; Ex. 46, p. 579



Prove the Translation Theorem.

GIVEN ▶ $P(a, b)$ and $Q(c, d)$ are two points on a figure translated by $(x, y) \rightarrow (x + s, y + t)$.

PROVE ▶ $PQ = P'Q'$

$$d_{PQ} = \sqrt{(c-a)^2 + (d-b)^2}$$

$$d_{P'Q'} = \sqrt{[(c+s)-(a+s)]^2 + [(d+t)-(b+t)]^2}$$

$$d_{P'Q'} = \sqrt{(c+s-a-s)^2 + (d+t-b-t)^2}$$

$$d_{P'Q'} = \sqrt{(c-a)^2 + (d-b)^2}$$

So $PQ = P'Q'$ by the Transitive Property of Equality.

