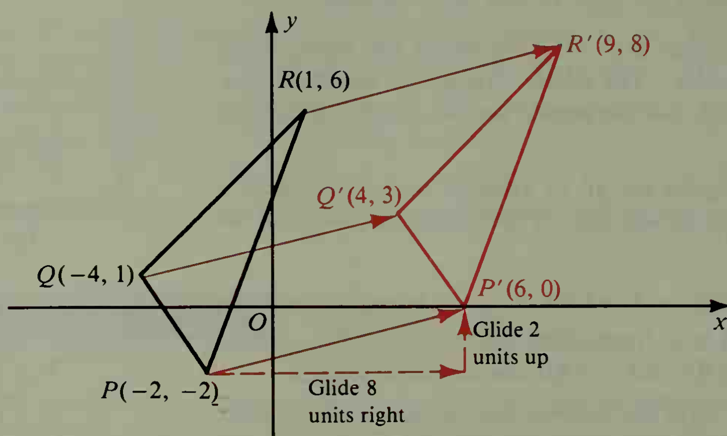
Consider a translation in which every point glides 8 units right and 2 units up. We could use the vector (8, 2) to indicate such a translation, or we could use the coordinate expression $T:(x, y) \rightarrow (x + 8, y + 2)$. The following diagram shows how $\triangle PQR$ is mapped by T to $\triangle P'Q'R'$. You can use the distance formula to check that each segment is mapped to a congruent segment so that T is an isometry.



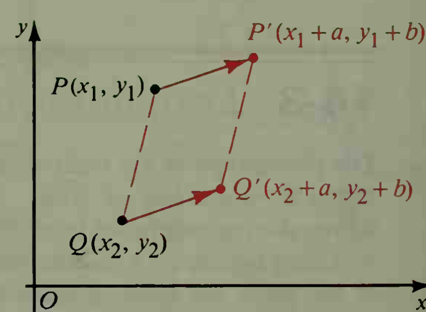
The illustration just presented should help you to understand why we use the following definition of a translation when working in the coordinate plane. A **translation,** or glide, in a plane is a transformation T which maps any point (x, y) to the point $(x + a, y + b)$ where a and b are constants. This definition makes it possible to give a simple proof of the following theorem.

Theorem 14-3

A translation is an isometry.

Plan for Proof: Label two points P and Q and their images P' and Q' as shown in the diagram. To show that T is an isometry, we need to show that $PQ = P'Q'$. Use the distance formula to show that:

$$PQ = P'Q' = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



Of course, since a translation is an isometry, we know by the corollaries of Theorem 14-1, page 573, that a translation preserves angle measure and area.

A glide and a reflection can be carried out one after the other to produce a transformation known as a *glide reflection*. A **glide reflection** is a transformation in which every point P is mapped to a point P'' by these steps:

1. A glide maps P to P'.
2. A reflection in a line parallel to the glide line maps P' to P''.