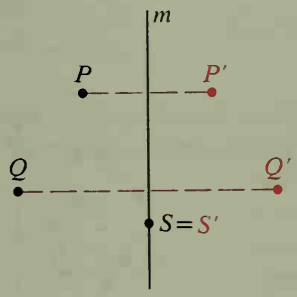
14-2 *Reflections*

When you stand before a mirror, your image appears to be as far behind the mirror as you are in front of it. The diagram shows a transformation in which a line acts like a mirror. Points P and Q are reflected in line m to their images P' and Q'. This transformation is called a *reflection*. Line m is called the *line of reflection* or the mirror line.



A **reflection** in line m maps every point P to a point P' such that:

(1) If P is not on the line m, then m is the perpendicular bisector of $\overline{PP'}$.
(2) If P is on line m, then $P' = P$.

To abbreviate *reflection in line m*, we write R_m. To abbreviate the statement *R_m maps P to P'*, we write $R_m: P \rightarrow P'$ or $R_m(P) = P'$. This may also be read as *P is reflected in line m to P'*.

Theorem 14-2

A reflection in a line is an isometry.

To prove Theorem 14-2 by using coordinates, we assign coordinates in the plane so that the line of reflection becomes the y-axis. Then in coordinate terms the reflection is $R:(x_1, y_1) \rightarrow (-x_1, y_1)$. In Exercise 23 on page 576 the distance formula was used to prove that $PQ = P'Q'$. Although the diagram shows P and Q on the same side of the y-axis, you should realize that the coordinates x_1, y_1, x_2, and y_2 can be positive, negative, or zero, thereby covering all cases.