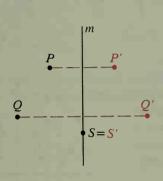
14-2 Reflections

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 O 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 $R_m: P \to P'$ 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.

