Investigating Points Equidistant from a Point and a Line

Point *P* and line *k* lie in a plane. Which points in the plane are equidistant from *P* and *k*? You can use geometry software to find out.

▶ **CONSTRUCT** Follow the steps to construct a line *k*, a point *P* not on *k*, and two points that are equidistant from *P* and *k*.

1 Draw a line *k* and a point *P* not on *k*. Near the corner of the screen, draw a segment and label it $\overline{AB}$.

2 Construct a line perpendicular to *k*. Label the intersection *C*. Construct a circle with center *C* and radius *AB*. The circle intersects the line perpendicular to *k* in two points. Choose the point that is on the same side of *k* as *P* and label it *D*. Construct a line through *D* parallel to *k*. Label this line *m*. Hide $\overleftrightarrow{CD}$, $\odot C$, *C*, and *D*.

3 Construct a circle with center *P* and radius *AB*.

4 Draw the intersection points of circle *P* and line *m*. Label the points *Y* and *Z*.
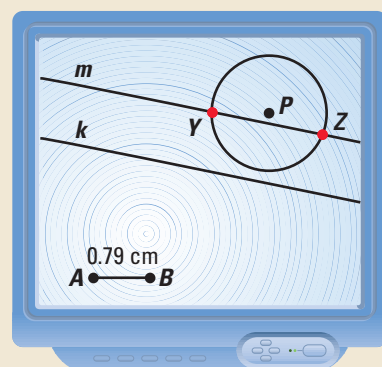
▶ **INVESTIGATE**

1. Is *Y* equidistant from *P* and *k*? How do you know? Is *Z* equidistant from *P* and *k*? How do you know?

2. Drag point *B*. What happens to *m*? What happens to circle *P*? Do *Y* and *Z* remain equidistant from *P* and *k*?

3. Use the *Trace* feature to trace *Y* and *Z* as you slowly drag *B*. What shape is formed? You should recognize it from your algebra class.
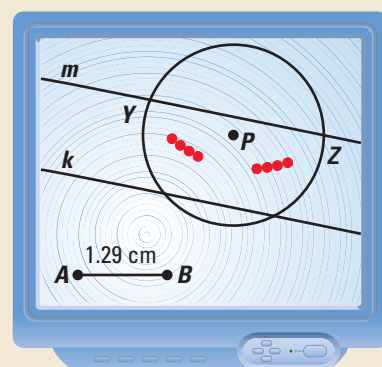
▶ **CONJECTURE**

4. Make a conjecture about the points in a plane that are equidistant from a line and a point in the plane.

EXTENSION

CRITICAL THINKING Use the *Coordinate* feature of the geometry software to find the coordinates of some points that are equidistant from the line $y = -\frac{1}{4}$ and the point $\left(0, \frac{1}{4}\right)$. Make and test a conjecture.