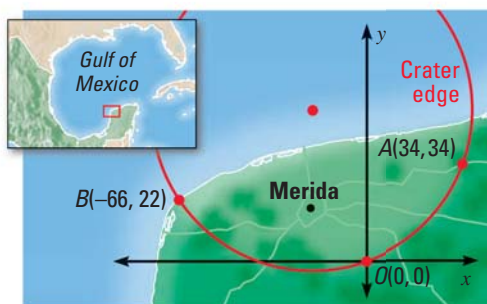**FINDING A CIRCLE'S CENTER** Recall from geometry that the perpendicular bisector of any chord of a circle passes through the circle's center. You can use this theorem to find the center of a circle given three points on the circle.

EXAMPLE 5 **TAKS REASONING: Multi-Step Problem**

ASTEROID CRATER Many scientists believe that an asteroid slammed into Earth about 65 million years ago on what is now Mexico's Yucatan peninsula, creating an enormous crater that is now deeply buried by sediment. Use the labeled points on the outline of the circular crater to estimate its diameter. (Each unit in the coordinate plane represents 1 mile.)

Solution

STEP 1 **Write** equations for the perpendicular bisectors of $\overline{AO}$ and $\overline{OB}$ using the method of Example 4.

$$y = -x + 34 \quad \text{Perpendicular bisector of } \overline{AO}$$

$$y = 3x + 110 \quad \text{Perpendicular bisector of } \overline{OB}$$

REVIEW SYSTEMS

For help with solving systems of equations, see p. 160.

STEP 2 **Find** the coordinates of the center of the circle, where $\overline{AO}$ and $\overline{OB}$ intersect, by solving the system formed by the two equations in Step 1.

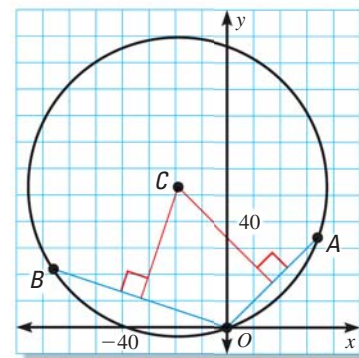|	
$y = -x + 34$	**Write first equation.**
$3x + 110 = -x + 34$	**Substitute for y.**
$4x = -76$	**Simplify.**
$x = -19$	**Solve for x.**
$y = -(-19) + 34$	**Substitute the x-value into the first equation.**
$y = 53$	**Solve for y.**

The center of the circle is $C(-19, 53)$.

STEP 3 **Calculate** the radius of the circle using the distance formula. The radius is the distance between C and any of the three given points.

$$OC = \sqrt{(-19 - 0)^2 + (53 - 0)^2} = \sqrt{3170} \approx 56.3 \qquad \text{Use } (x_1, y_1) = (0, 0) \text{ and } (x_2, y_2) = (-19, 53).$$

▶ The crater has a diameter of about $2(56.3) = 112.6$ miles.

✓ **GUIDED PRACTICE** for Examples 3, 4, and 5

For the line segment joining the two given points, (a) find the midpoint and (b) write an equation for the perpendicular bisector.

3. $(0, 0), (-4, 12)$ **4.** $(-2, 1), (4, -7)$ **5.** $(3, 8), (-5, -10)$

6. The points $(0, 0)$, $(6, -2)$, and $(16, 8)$ lie on a circle. Use the method given in Example 5 to find the diameter of the circle.