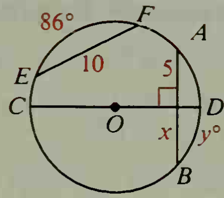
Example 1 Find the values of x and y.



Solution Diameter $\overline{CD}$ bisects chord $\overline{AB}$, so $x = 5$. (Theorem 9-5)

$\overline{AB} \cong \overline{EF}$, so $m\overset{\frown}{AB} = 86$. (Theorem 9-4)

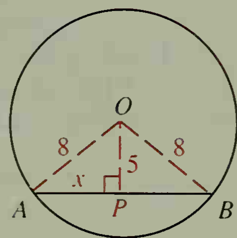
Diameter $\overline{CD}$ bisects $\overset{\frown}{AB}$, so $y = 43$. (Theorem 9-5)

Recall (page 154) that the distance from a point to a line is the length of the perpendicular segment from the point to the line. This definition is used in the following example.

Example 2 Find the length of a chord that is a distance 5 from the center of a circle with radius 8.

Solution Draw the perpendicular segment, $\overline{OP}$, from O to $\overline{AB}$.

$$x^2 + 5^2 = 8^2$$
$$x^2 + 25 = 64$$
$$x^2 = 39$$
$$x = \sqrt{39}$$



By Theorem 9-5, $\overline{OP}$ bisects $\overline{AB}$ so $AB = 2 \cdot AP = 2x = 2\sqrt{39}$.

It should be clear that *all* chords in $\odot O$ above that are a distance 5 from center O will have length $2\sqrt{39}$. Thus, all such chords are congruent, as stated in part (1) of the next theorem. You will prove part (2) of the theorem as Classroom Exercise 6.

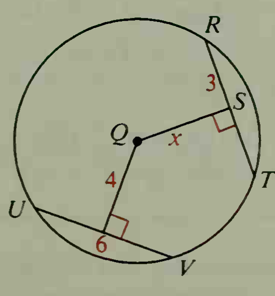
Theorem 9-6

In the same circle or in congruent circles:

(1) Chords equally distant from the center (or centers) are congruent.

(2) Congruent chords are equally distant from the center (or centers).

Example 3 Find the value of x.



Solution S is the midpoint of $\overline{RT}$, so $RT = 6$. (Theorem 9-5)

$\overline{RT} \cong \overline{UV}$, so $x = 4$. (Theorem 9-6)