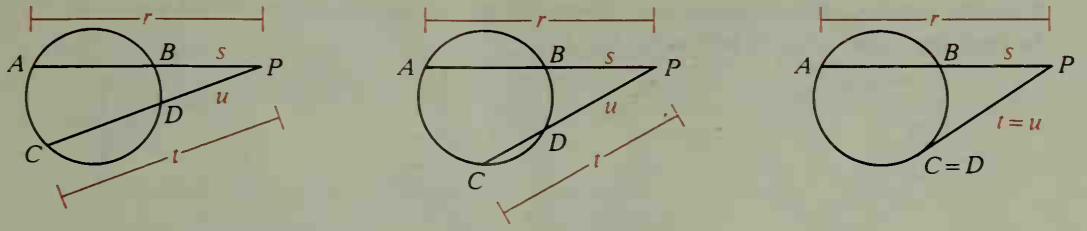
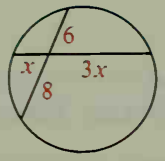


In the first two diagrams we know that $r \cdot s = t \cdot u$. In the third diagram, u and t both become equal to the length of the tangent segment, and the equation becomes $r \cdot s = t^2$. This result, stated below, will be proved more formally in Exercise 10. As with earlier terms, the term "tangent segment" can refer to the length of a segment as well as to the segment itself.

Theorem 9-13

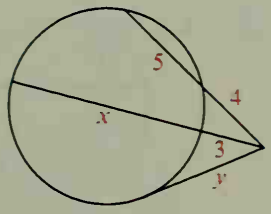
When a secant segment and a tangent segment are drawn to a circle from an external point, the product of the secant segment and its external segment is equal to the square of the tangent segment.

Example 1 Find the value of x.



Solution $3x \cdot x = 6 \cdot 8$ (Theorem 9-11)
$3x^2 = 48$, $x^2 = 16$, and $x = 4$

Example 2 Find the values of x and y.

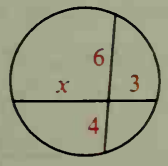


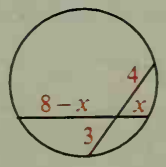
Solution $4(4 + 5) = 3(3 + x)$ (Theorem 9-12)
$36 = 3(3 + x)$, $12 = 3 + x$, and $x = 9$

$4(4 + 5) = y^2$ (Theorem 9-13)
$36 = y^2$, so $y = 6$

Classroom Exercises

Chords, secants, and tangents are shown. State the equation you would use to find the value of x. Then solve for x.

1. 

2. 

3.