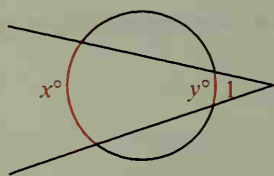One case of the next theorem will be proved in Classroom Exercise 10, the other two cases in Exercises 25 and 26. Notice that angles formed by two secants, two tangents, or a secant and a tangent intercept two arcs.
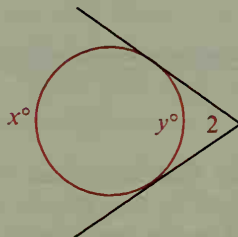
## Theorem 9-10

The measure of an angle formed by two secants, two tangents, or a secant and a tangent drawn from a point outside a circle is equal to half the difference of the measures of the intercepted arcs.
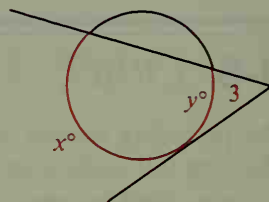
Case I: Two secants      Case II: Two tangents      Case III: A secant and a tangent



$$m \angle 1 = \tfrac{1}{2}(x - y) \qquad m \angle 2 = \tfrac{1}{2}(x - y) \qquad m \angle 3 = \tfrac{1}{2}(x - y)$$
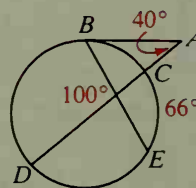
**Example 1**   Find the measures of $\angle 1$ and $\angle 2$.

**Solution**      $m \angle 1 = \tfrac{1}{2}(m\widehat{CE} + m\widehat{FD})$   (Theorem 9-9)
$m \angle 1 = \tfrac{1}{2}(70 + 50) = 60$

$m \angle 2 = \tfrac{1}{2}(m\widehat{CE} - m\widehat{BD})$   (Theorem 9-10)
$m \angle 2 = \tfrac{1}{2}(70 - 26) = 22$
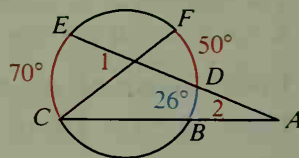


**Example 2**   $\overline{BA}$ is a tangent. Find $m\widehat{BD}$ and $m\widehat{BC}$.

**Solution**      $100 = \tfrac{1}{2}(m\widehat{BD} + 66)$   (Theorem 9-9)
$200 = m\widehat{BD} + 66$, so $m\widehat{BD} = 134$

$40 = \tfrac{1}{2}(m\widehat{BD} - m\widehat{BC})$   (Theorem 9-10)
$80 = 134 - m\widehat{BC}$, so $m\widehat{BC} = 54$



## Classroom Exercises

Find the measure of each numbered angle.

1. 

2. 

3. 