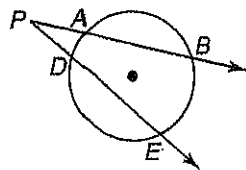


# Study Guide and Intervention (continued)

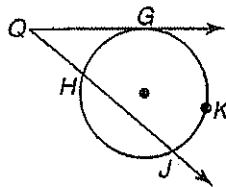
## Secants, Tangents, and Angle Measures

**Intersections Outside a Circle** If secants and tangents intersect outside a circle, they form an angle whose measure is related to the intercepted arcs.

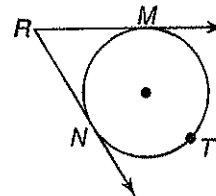
If two secants, a secant and a tangent, or two tangents intersect in the exterior of a circle, then the measure of the angle formed is one-half the positive difference of the measures of the intercepted arcs.



$\overline{PB}$  and  $\overline{PE}$  are secants.  
 $m\angle P = \frac{1}{2}(m\widehat{BE} - m\widehat{AD})$



$\overline{QG}$  is a tangent.  $\overline{QJ}$  is a secant.  
 $m\angle Q = \frac{1}{2}(m\widehat{GKJ} - m\widehat{GH})$



$\overline{RM}$  and  $\overline{RN}$  are tangents.  
 $m\angle R = \frac{1}{2}(m\widehat{MTN} - m\widehat{MN})$

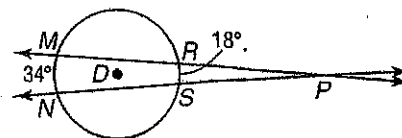
### Example

Find  $m\angle MPN$ .

$\angle MPN$  is formed by two secants that intersect in the exterior of a circle.

$$\begin{aligned} m\angle MPN &= \frac{1}{2}(m\widehat{MN} - m\widehat{RS}) \\ &= \frac{1}{2}(34 - 18) \\ &= \frac{1}{2}(16) \text{ or } 8 \end{aligned}$$

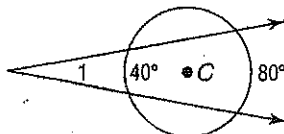
The measure of the angle is 8.



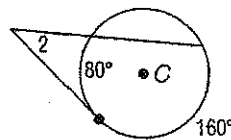
### Exercises

Find each measure.

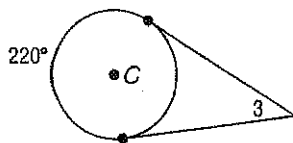
1.  $m\angle 1$



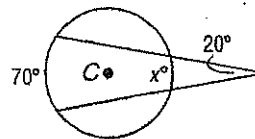
2.  $m\angle 2$



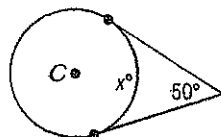
3.  $m\angle 3$



4.  $x$



5.  $x$



6.  $x$

