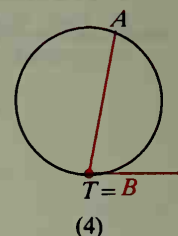
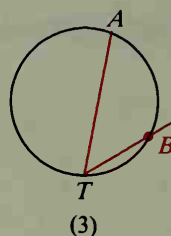
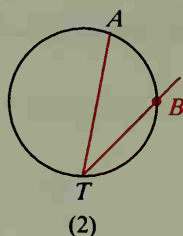
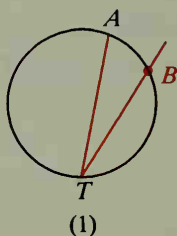


Study the diagrams below from left to right. Point  $B$  moves along the circle closer and closer to point  $T$ . Finally, in diagram (4), point  $B$  has merged with  $T$ , and one side of  $\angle T$  has become a tangent.

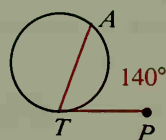


Apply Theorem 9-7 to diagrams (1), (2), and (3) and you have  $m\angle T = \frac{1}{2}m\widehat{AB}$ . As you might expect, this equation applies to diagram (4), too, since we say that  $\angle T$  intercepts  $\widehat{AB}$  in this case as well. Diagram (4) suggests Theorem 9-8. In Exercises 13–15 you will prove the three cases of the theorem.

### Theorem 9-8

**The measure of an angle formed by a chord and a tangent is equal to half the measure of the intercepted arc.**

For example, if  $\overline{PT}$  is tangent to the circle and  $\overline{AT}$  is a chord, then  $\angle ATP$  intercepts  $\widehat{AT}$  and  $m\angle ATP = \frac{1}{2}m\widehat{AT} = \frac{1}{2} \cdot 140 = 70$ .



### Classroom Exercises

1. Explain why Corollary 1 of Theorem 9-7 is true. That is, explain why  $\angle 1 \cong \angle 2$ .
2. Explain why Corollary 2 is true. That is, explain how the fact that  $\widehat{MXN}$  is a semicircle leads to a conclusion that  $\angle X$  is a right angle.

