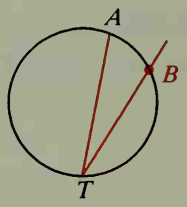
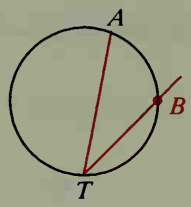
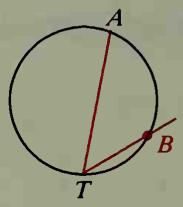
Study the diagrams below from left to right. Point B moves along the circle closer and closer to point T. Finally, in diagram (4), point B has merged with T, and one side of $\angle T$ has become a tangent.



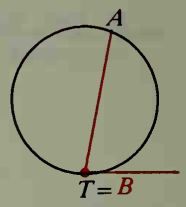
(1)



(2)



(3)



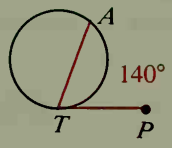
(4)

Apply Theorem 9-7 to diagrams (1), (2), and (3) and you have $m\angle T = \frac{1}{2}m\overset{\frown}{AB}$. As you might expect, this equation applies to diagram (4), too, since we say that $\angle T$ intercepts $\overset{\frown}{AB}$ 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

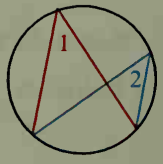
The measure of an angle formed by a chord and a tangent is equal to half the measure of the intercepted arc.

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



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 $\overset{\frown}{MXN}$ is a semicircle leads to a conclusion that $\angle X$ is a right angle.