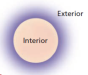
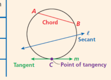
Lesson 30-1: Lines That Intersect Circles

Recall that a circle is the set of all points in a plane that are equidistant from a given point, called the center of the circle. A circle with center *C* is called circle *C*, or ⊙*C*.

The **interior of a circle** is the set of all points inside the circle. The **exterior of a circle** is the set of all points outside the circle.

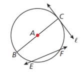


Lines and Segments That Intersect Circles

TERM	DIAGRAM
A **chord** is a segment whose endpoints lie on a circle.	
A **secant** is a line that intersects a circle at two points.	
A **tangent** is a line in the same plane as a circle that intersects it at exactly one point.	
The point where the tangent and a circle intersect is called the **point of tangency**.	

[Ex.1] Identifying Lines and Segments That Intersect Circles

Identify each line or segment that intersects ⊙A.



chords:

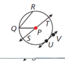
tangent:

radii:

secant:

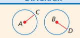
diameter:

YOUR TURN **1.** Identify each line or segment that intersects ⊙*P*.



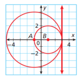
Remember that the terms *radius* and *diameter* may refer to line segments, or to the lengths of segments.

Pairs of Circles

TERM	DIAGRAM
Two circles are **congruent circles** if and only if they have congruent radii.	 $\odot A \cong \odot B$ if $\overline{AC} \cong \overline{BD}$. $\overline{AC} \cong \overline{BD}$ if $\odot A \cong \odot B$.
Concentric circles are coplanar circles with the same center.	
Two coplanar circles that intersect at exactly one point are called **tangent circles**.	 Internally tangent circles; Externally tangent circles

[Ex.2] Identifying Tangents of Circles

Find the length of each radius. Identify the point of tangency and write the equation of the tangent line at this point.



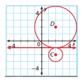
radius of ⊙*A*:

radius of ⊙*B*:

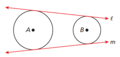
point of tangency:

equation of tangent line:

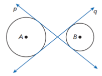
YOUR TURN **2.** Find the length of each radius. Identify the point of tangency and write the equation of the tangent line at this point.



A **common tangent** is a line that is tangent to two circles.

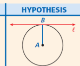
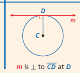


Lines ℓ and *m* are common external tangents to ⊙*A* and ⊙*B*.



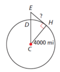
Lines *p* and *q* are common internal tangents to ⊙*A* and ⊙*B*.

Theorems

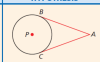
THEOREM		HYPOTHESIS	CONCLUSION
12-1-1	If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency. (line tangent to ⊙ → line ⊥ to radius)	 ℓ is tangent to ⊙*A*	$\ell \perp \overline{AB}$
12-1-2	If a line is perpendicular to a radius of a circle at a point on the circle, then the line is tangent to the circle. (line ⊥ to radius → line tangent to ⊙)	 *m* is ⊥ to $\overline{CD}$ at *D*	*m* is tangent to ⊙*C*.

[Ex.3] *Problem Solving Application*

The summit of Mount Everest is approximately 29,000 ft above sea level. What is the distance from the summit to the horizon to the nearest mile?

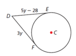


Theorem 12-1-3

THEOREM	HYPOTHESIS	CONCLUSION
If two segments are tangent to a circle from the same external point, then the segments are congruent. (2 segs. tangent to ⊙ from same ext. pt. → segs. ≅)	 $\overline{AB}$ and $\overline{AC}$ are tangent to ⊙*P*.	$\overline{AB} \cong \overline{AC}$

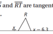
[Ex.4] Using Properties of Tangents

$\overline{DE}$ and $\overline{DF}$ are tangent to ⊙*C*. Find *DF*.



YOUR TURN $\overline{RS}$ and $\overline{RT}$ are tangent to ⊙*Q*. Find *RS*.

4a.



4b.