Name: ___________________________

Date: ___________________________

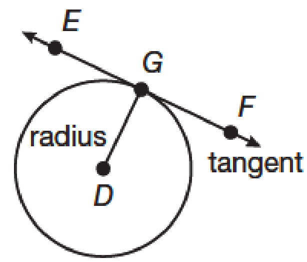
Period: _________________________

Geometry Lesson 58

Objective: TSW use tangents and circles (Part 1).

A tangent line lies in the same plane as a circle and intersects the circle at exactly one point. A radius of a circle drawn to a point of tangency meets the tangent line at a fixed angle.

Theorem 58-1 - If a line is tangent to a circle, then the line is perpendicular to a radius drawn to the point of tangency.



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Example 1 Tangent Lines and Angle Measures

Line *n* is tangent to ⊙C at point *P*, and line *m* passes through *C*.

Lines *n* and *m* intersect at point *Q*.

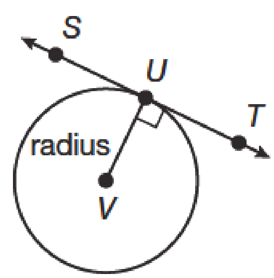
a. Sketch ⊙C and lines *n* and *m*. Mark *C*, *P*, and *Q* on your sketch.

SOLUTION

b. If m∠*CQP* = 36°, determine m∠*PCQ*.

SOLUTION

Theorem 58-2 - If a line in the plane of a circle is perpendicular to a radius at its endpoint on the circle, then the line is tangent to the circle.



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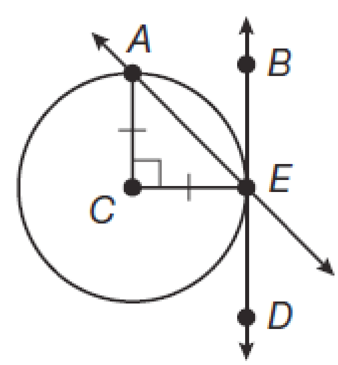
Theorem 58-2 is the converse of Theorem 58-1. Together, they can be used to show that this biconditional statement is true:

A line in the plane of a circle is tangent to the circle if and only if it is perpendicular to a radius drawn to the point of tangency.

Example 2 Identifying Tangent Lines

If m∠*BEA* = 45°, show that $\overleftrightarrow{BD}$ is tangent to ⊙C.

SOLUTION



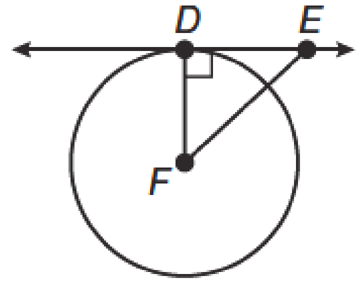
Example 3 Proving Theorem 58-2

Prove Theorem 58-2.

Given: $\overleftrightarrow{DE} \perp \overline{FD}$ and D is on $\odot$.

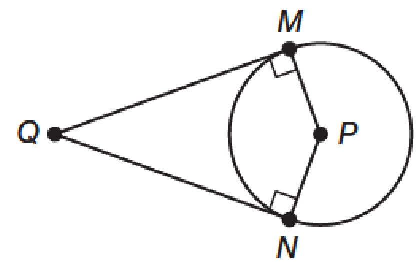
Prove: $\overleftrightarrow{DE}$ is tangent to $\odot$.

SOLUTION



If two tangents to the same circle intersect, the tangent segments exhibit a special property, stated in Theorem 58-3.

Theorem 58-3 - If two tangent segments are drawn to a circle from the same exterior point, then they are congruent.

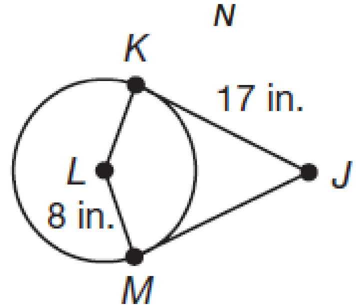


Example 4 Applying Relationships of Tangents from an Exterior Point

In this figure, $\overline{JK}$ and $\overline{JM}$ are tangent to $\odot$L.

Determine the perimeter of quadrilateral *JKLM*. What type of quadrilateral is *JKLM* ?

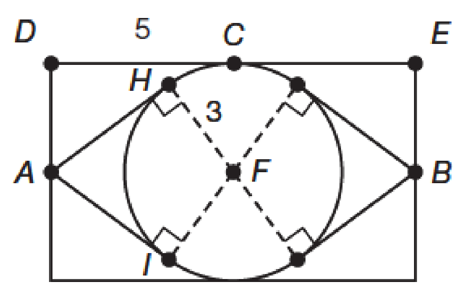
SOLUTION



Example 5 Application: Glass Cutting

An ornamental window has several glass panes oriented to look like an eye. The radius of the eye's iris is 3 feet, and *DC* is 5 feet. What are *AI* and *AH* ?

SOLUTION

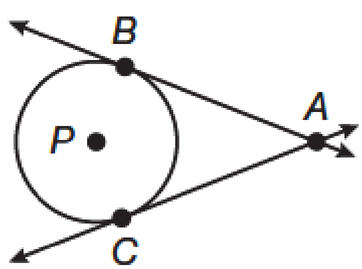


You Try!!!!!

a.Line *a* is tangent to $\odot$R at *D*, and line *b* passes through *R*. Lines *a* and *b* intersect at *E*. If m∠*RED* = 42°, determine m∠*DRE*.

b. Let $\overline{CA}$ be a radius of $\odot$C. Let line *m* be tangent to $\odot$C at *A*. Let *B* be an exterior point of $\odot$C, with m∠*BAC* < 90°. Is $\overleftrightarrow{AB}$ a tangent to $\odot$C? Why or why not?

c. Give a paragraph proof of Theorem 58-3.
Hint: Draw $\overline{PA}$, $\overline{PB}$, *and* $\overline{PC}$.
Given: $\overline{AB}$ and $\overline{AC}$ are tangent to $\odot$P
Prove: $\overline{AB} \cong \overline{AC}$



d. Circle *C* has a 5-inch radius. $\overline{XZ}$ and $\overline{YZ}$ are tangents to $\odot$C and *Z* is exterior to $\odot$C. If ∠*XCY* is a right angle, what is the area of quadrilateral *CXZY* ?

e. A decorative window is shaped like a triangle with an inscribed circle. If the triangle is an equilateral triangle, the circle has a radius of 3 feet, and *CQ* is 6 feet, what is the perimeter of the triangle in simplified radical form?