

Geometry 10.5

Use properties of tangents

Solve problems involving circumscribed polygons

~~Soh Cah Toa~~

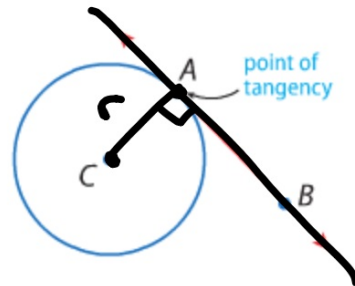
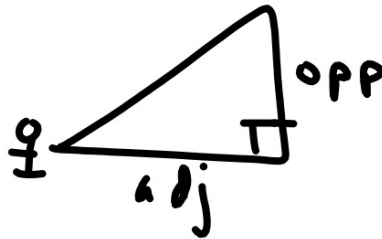
tangent

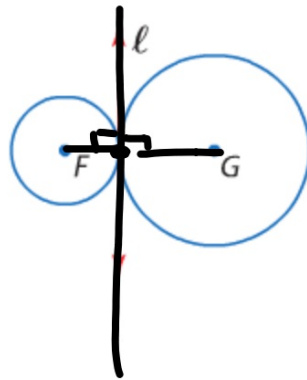
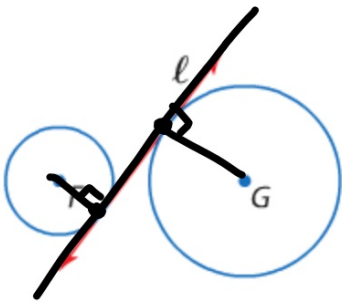
point of tangency

common tangent

pythagorean theorem

hula hoops & meter sticks





Common tangent

- Tangent to same line
 - Does not have to be the same point for both circles.
-

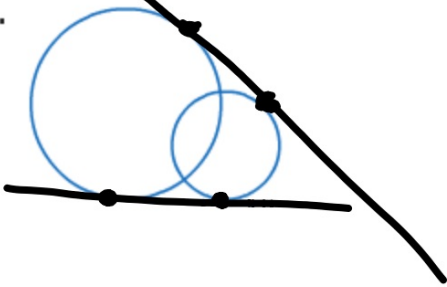
Look outside AND between the circles.



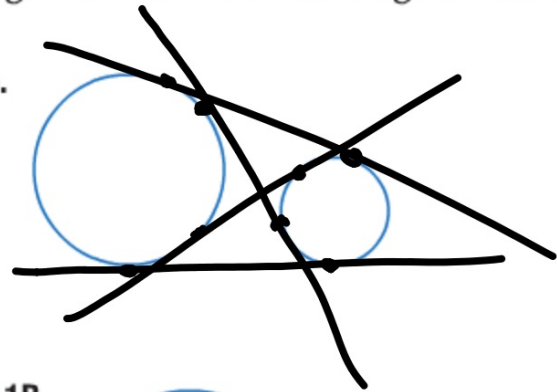
Example 1 Identify Common Tangents

Copy each figure and draw the common tangents. If no common tangent exists, state *no common tangent*.

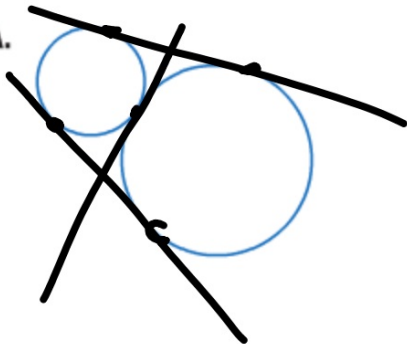
a.



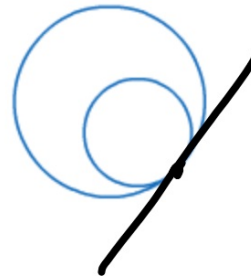
b.



1A.



1B.

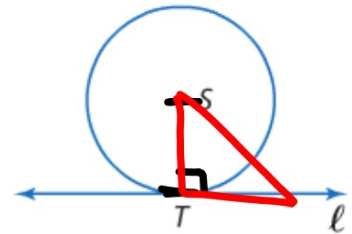


if
f

Theorem 10.10

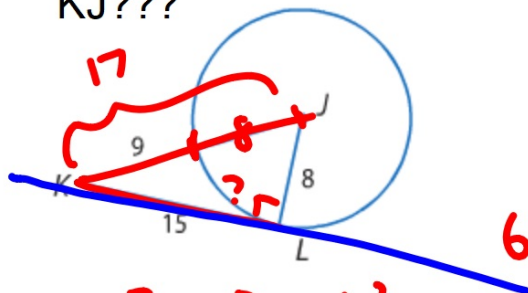
Words In a plane, a line is tangent to a circle if and only if it is perpendicular to a radius drawn to the point of tangency.

Example Line ℓ is tangent to $\odot S$ if and only if $\ell \perp \overline{ST}$.



Shortest distance is perpendicular. Why?

KJ???



$$15^2 + 8^2 = h^2$$

$$289 =$$

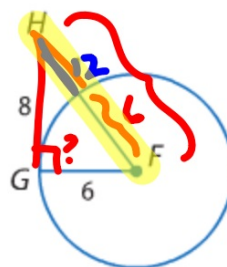
Is KL tangent to the circle?
(can't just go by eyeball...)

$$h = 17 \text{ yes}$$

$$8^2 + 6^2 = 18^2$$

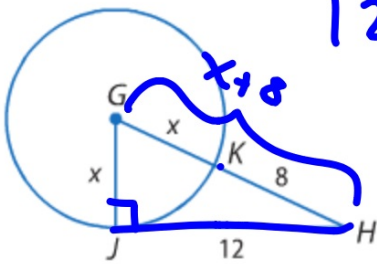
$$64 + 36 = 324$$

no



Is HG tangent to the circle?

\overline{JH} is tangent to $\odot G$ at J . Find the value of x .



$$12^2 + x^2 = (x + 8)^2$$

$$144 + \cancel{x^2} = \cancel{x^2} + 16x + 64$$

~~-64~~ ~~-x^2~~ ~~-64~~

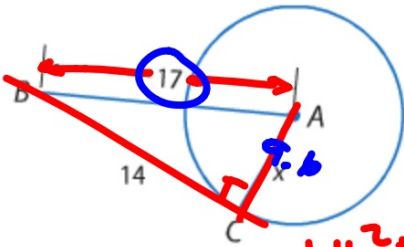
$$x = 5 \quad \frac{80}{16} = \frac{16x}{16}$$

Guided Practice

OK to go by eyeball...

Find the value of x . Assume that segments that appear to be tangent are tangent.

3A.



$$14^2 + x^2 = 17^2$$

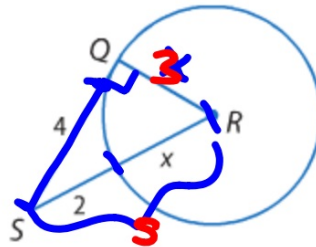
$$196 + x^2 = 289$$

Better: BC perp to AC, etc.

$$x^2 = 93$$

$$x = 9.6$$

3B.



$$x = 3$$

$$4^2 + x^2 = (x + 3)^2$$

$$16 + x^2 = x^2 + 4x + 9$$

$$-x^2 \quad -x^2$$

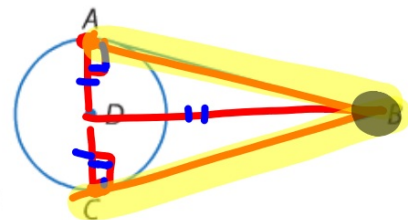
$$\begin{array}{r} 16 \\ -9 \\ \hline 7 = 4x + 9 \\ -9 \\ \hline 12 = 4x \end{array}$$

More than one line can be tangent to the same circle.

Theorem 10.11

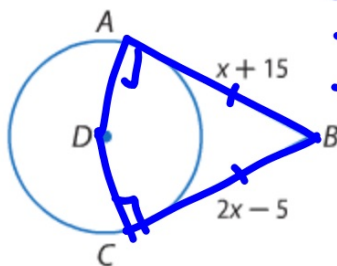
Words If two segments from the same exterior point are tangent to a circle, then they are congruent.

Example If \overline{AB} and \overline{CB} are tangent to $\odot D$, then $\overline{AB} \cong \overline{CB}$.



Example 4 Use Congruent Tangents to Find Measures

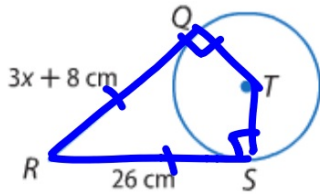
ALGEBRA \overline{AB} and \overline{CB} are tangent to $\odot D$.
Find the value of x .



$$\begin{aligned} 2x - 5 &= x + 15 \\ -x \quad -5 & \quad -x + 5 \\ \hline x &= 20 \end{aligned}$$

ALGEBRA Find the value of x . **Assume** that segments that appear to be tangent are tangent.

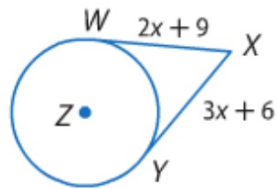
4A.



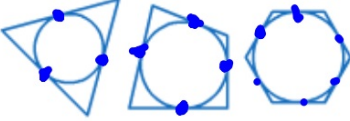
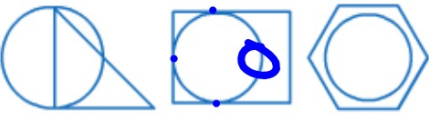
$$\begin{aligned} 3x + 8 &= 26 \\ 3x &= 18 \\ x &= 6 \end{aligned}$$

Better: Q is a point of tangency, S is a point of tangency, etc.

4B.

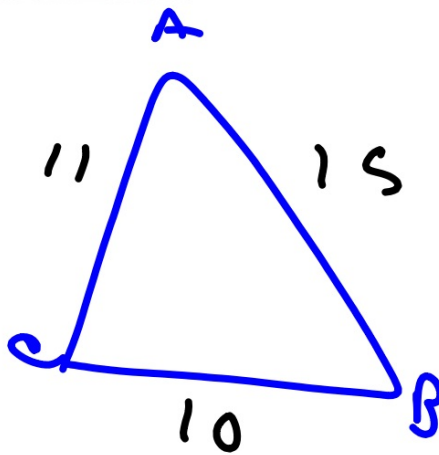
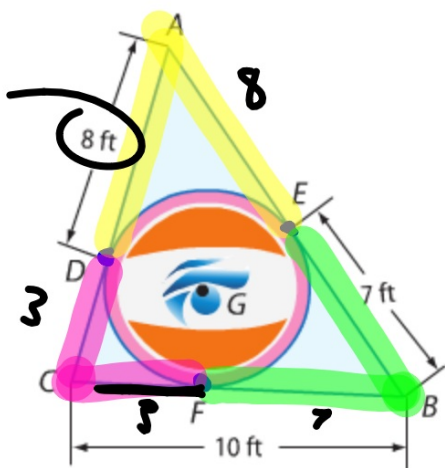


2 Circumscribed Polygons A polygon is circumscribed about a circle if every side of the polygon is tangent to the circle.

Circumscribed Polygons	Polygons Not Circumscribed
	

Real-World Example 5 Find Measures in Circumscribed

GRAPHIC DESIGN A graphic designer is giving directions to create a larger version of the triangular logo shown. If $\triangle ABC$ is circumscribed about $\odot G$, find the perimeter of $\triangle ABC$.

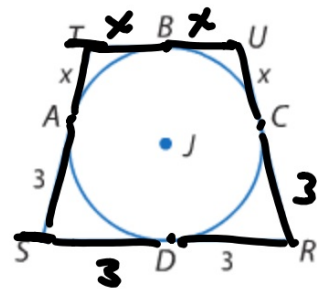


36 ft

Hint:
Vertex is
equidistant
from
points of
tangency

► **Guided Practice**

5. Quadrilateral $RSTU$ is circumscribed about $\odot J$.
 If the perimeter is 18 units, find x .



$$TS + TU + UR + RS = 18$$

$$x + 3 + 2x + x + 3 + 6 = 18$$

$$4x + 12 = 18$$

$$\begin{array}{r} 4x + 12 = 18 \\ -12 \quad -12 \\ \hline 4x = 6 \end{array}$$

$$x = 1.5$$

10.5 p. 736
9-270 44-52 aq