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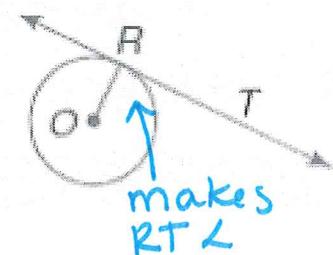
10-5 and 10-6 Notes Tangents and Secants

~A line, line segment, or ray that intersects a circle in exactly one point is the **tangent line**.

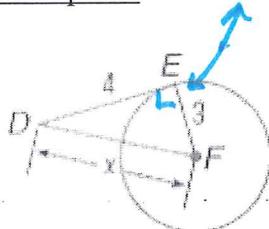
~The point that the line, line segment, or ray intersects with the circle is called the **point of tangency**.

If a line is tangent to a circle, then it is perpendicular to the radius drawn to the point of tangency.

Example: If \overline{RT} is a tangent, $\overline{OR} \perp \overline{RT}$.



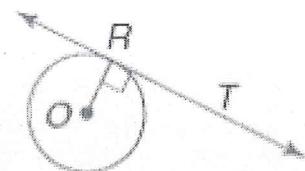
Example 1: \overline{ED} is tangent to Circle F at point E. Find x .



$$\begin{aligned} 4^2 + 3^2 &= x^2 \\ 25 &= x^2 \\ 5 &= x \end{aligned}$$

If a line is perpendicular to a radius of a circle at its endpoint on the circle, then the line is tangent to the circle.

Example: If $\overline{OR} \perp \overline{RT}$, \overline{RT} is a tangent.



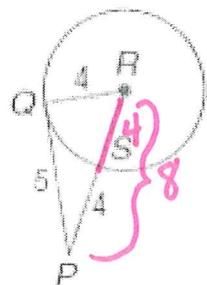
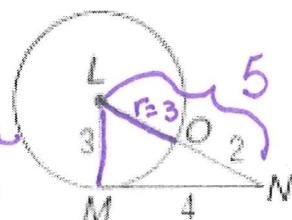
Example 2:

a) Determine whether \overline{MN} is tangent to Circle L.

Justify your reasoning.

$$\begin{aligned} 3^2 + 4^2 &= ? = 5^2 \\ 25 &= 25 \end{aligned}$$

$\angle M$ is a right \angle
by the converse
of the Pythagorean
theorem. $\therefore \overline{MN}$
is tangent to
Circle L.



b) Determine whether \overline{PQ} is tangent to Circle R. Justify your reasoning.

Check,
 $4^2 + 5^2 \stackrel{?}{=} 8^2$
 $41 \neq 64$

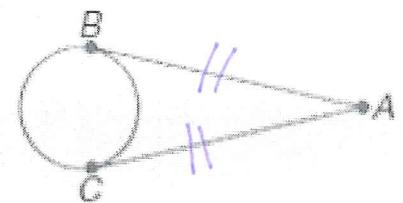
$\angle Q$ is NOT a Right \angle
because it does not work
for the converse of the pyth.
theorem. $\therefore \overline{PQ}$ is NOT Tangent
to Circle R.

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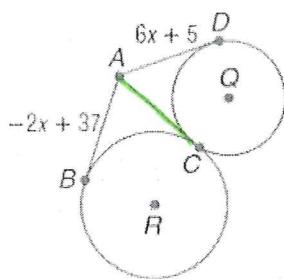
Congruent Tangents

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

Example: $\overline{AB} \cong \overline{AC}$



Example 3: Find AC . Assume that segments that appear tangent to circles are tangent.



$$\begin{aligned}\overline{AC} &\cong \overline{AD} \\ \overline{AC} &\cong \overline{AB} \\ \therefore \overline{AD} &\cong \overline{AB} \quad \text{by transitive}\end{aligned}$$

$$\begin{aligned}AD &= AB \\ 6x + 5 &= -2x + 37 \\ 8x + 5 &= 37 \\ 8x &= 32 \\ x &= 4\end{aligned}$$

$$\begin{aligned}AC &= AD \\ AC &= 6(4) + 5 \\ AC &= 29\end{aligned}$$

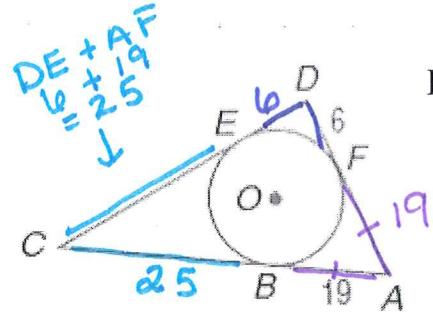
Circumscribed Polygons

~Polygons can also be *circumscribed* about a circle, or the circle is *inscribed* in the polygon.

~The vertices of the polygon DO NOT lie on the circle, but every side of the polygon is TANGENT to the circle.

Example 4: Triangle ADC is circumscribed about Circle O. Find the perimeter of Triangle ADC if $EC = DE + AF$

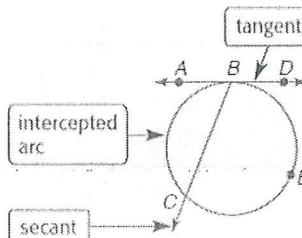
$P = 100 \text{ units}$



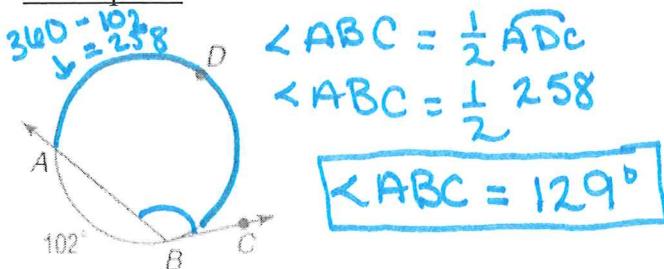
THEOREM 10.13

If a secant and a tangent intersect at the point of tangency, then the measure of each angle formed is one-half the measure of its intercepted arc.

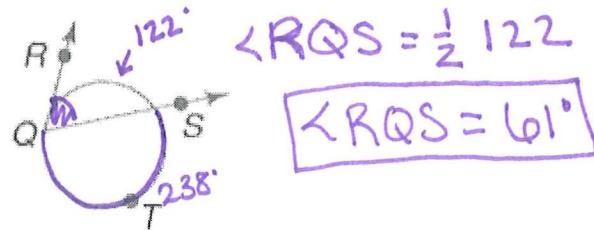
Examples: $m\angle ABC = \frac{1}{2}m\overset{\frown}{BC}$
 $m\angle DBC = \frac{1}{2}m\overset{\frown}{BEC}$



Example 5: Find $m\angle ABC$ if $m\overset{\frown}{AB} = 102^\circ$.



Example 6: Find $m\angle RQS$ if $m\overset{\frown}{QTS} = 238^\circ$.

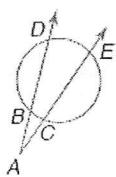


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THEOREM 10.14

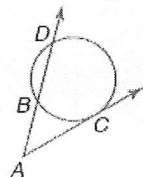
If two secants, a secant and a tangent, or two tangents intersect in the exterior of a circle, then the measure of the angle formed is one-half the positive difference of the measures of the intercepted arcs.

Two Secants



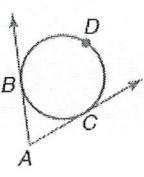
$$m\angle A = \frac{1}{2}(m\widehat{DE} - m\widehat{BC})$$

Secant-Tangent



$$m\angle A = \frac{1}{2}(m\widehat{DC} - m\widehat{BC})$$

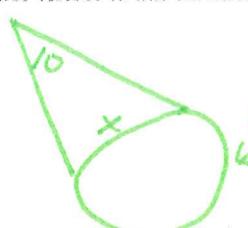
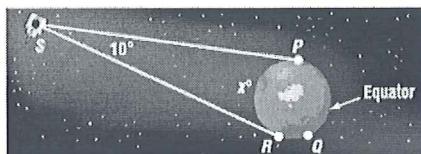
Two Tangents



$$m\angle A = \frac{1}{2}(m\widehat{BDC} - m\widehat{BC})$$

Example 8:

SATELLITES Suppose a satellite S orbits above Earth rotating so that it appears to hover directly over the equator. Use the figure to determine the arc measure on the equator visible to this satellite.



$$10 = \frac{1}{2}(360 - x - x)$$

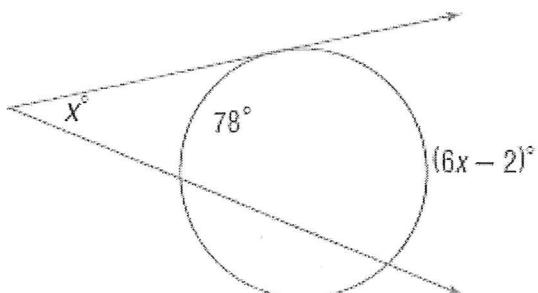
$$10 = \frac{1}{2}(360 - 2x)$$

$$10 = 180 - x$$

$$-170 = -x$$

$$\boxed{170^\circ = x}$$

Example 9: Find x.



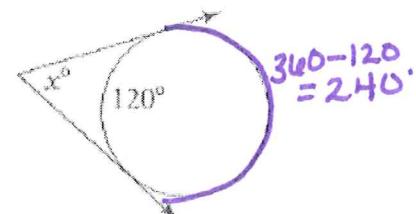
$$x = \frac{1}{2}(6x - 2 - 78)$$

$$2x = 6x - 80$$

$$-4x = -80$$

$$\boxed{x = 20^\circ}$$

Example 7:



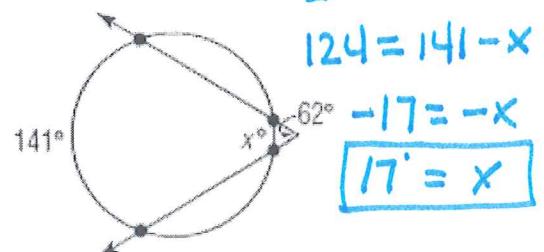
$$\angle X = \frac{1}{2}(\text{Big} - \text{little})$$

$$\angle X = \frac{1}{2}(360 - 120)$$

$$\angle X = \frac{1}{2} 120^\circ \quad \boxed{\angle X = 60^\circ}$$

Example 9: Find x.

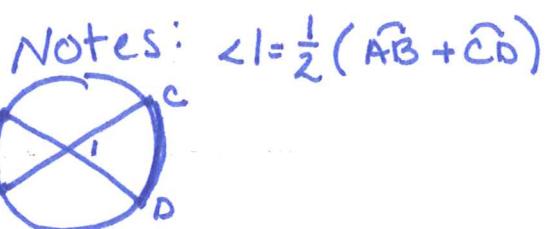
$$62 = \frac{1}{2}(141 - x)$$



$$124 = 141 - x$$

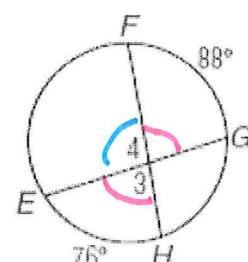
$$-17 = -x$$

$$\boxed{17^\circ = x}$$



Notes: $\angle I = \frac{1}{2}(\widehat{AB} + \widehat{CD})$

Example 10: Find m<4.



NOT
central
angles

$$\angle 3 = \frac{1}{2}(88 + 76)$$

$$\angle 3 = \frac{1}{2} 164$$

$$\boxed{\angle 3 = 82^\circ}$$

$$\angle 4 + \angle 3 = 180^\circ$$

$$x + 82 = 180$$

$$\boxed{\angle 4 = 98^\circ}$$

linear pairs
are suppl.