Warm Up:

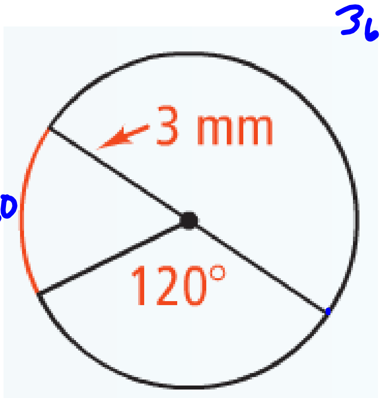
Find the arc length in red.

$\frac{60}{360}(2\pi(3))$

3.14mm

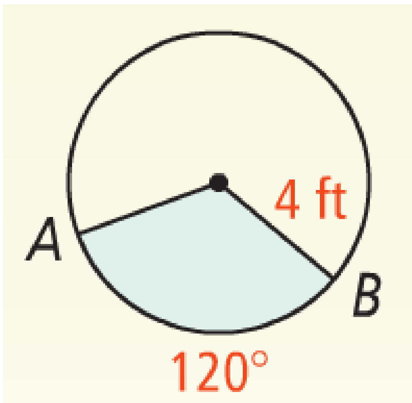
1.

60



Find the area of the shaded sector.

2.



$\frac{120}{360}\pi(4)^2$ 16.8 ft²

Learning Goal: Today I will learn about tangent lines.

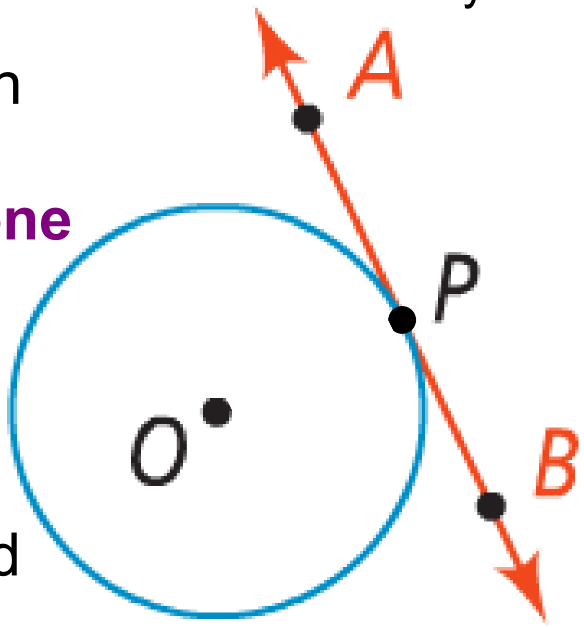
Success Criteria: I am able to determine if a line is a tangent and use its properties to problem solve.

12-1 Tangent Lines

*Tangent to a Circle

ys

Tangent to a circle - A line in the plane of the **circle** that touches a circle at exactly **one point** (P).



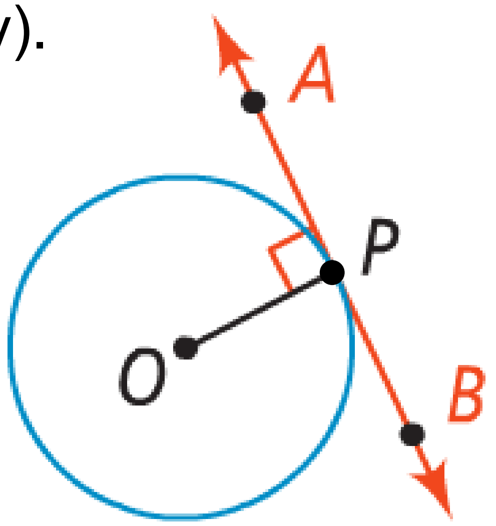
Point of Tangency - The point where the **tangent** and **circle** intersect.

Theorem 12-1Tangent Lines gs

If a line is tangent to a circle, then it is perpendicular to the radius at the point of intersection (tangency).

OR

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



gs

take note

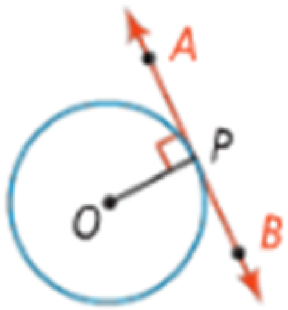
Theorem 12-2

Theorem

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.

If . . .

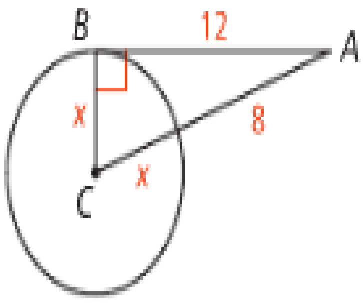
$\overleftrightarrow{AB} \perp \overline{OP}$ at P



Then . . .

$\overleftrightarrow{AB}$ is tangent to $\odot O$

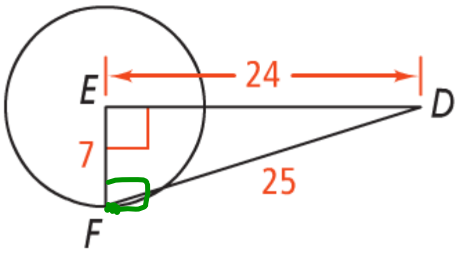
What is the radius of $\odot C$?



$AC^2 = AB^2 + BC^2$	Pythagorean Theorem
$(x + 8)^2 = 12^2 + x^2$	Substitute.
$x^2 + 16x + 64 = 144 + x^2$	Simplify.
$16x = 80$	Subtract x^2 and 64 from each side.
$x = 5$	Divide each side by 16.

The radius is 5.

5. Error Analysis A classmate insists that $\overline{DF}$ is a tangent to $\odot E$. Explain how to show that your classmate is wrong.



$25^2 = 7^2 + 24^2$

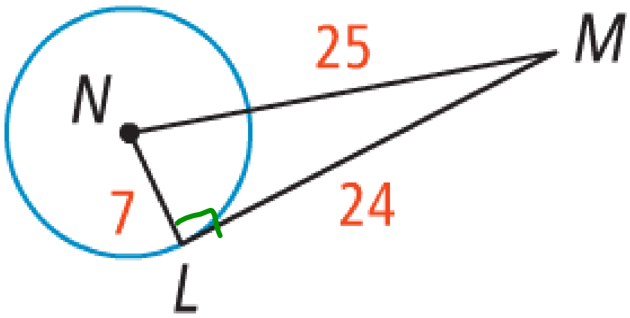
$625 = 625$

Right angle is not ⊥ to radius so not tangent

Tangent Lines

Is $\overline{ML}$ tangent to circle N?

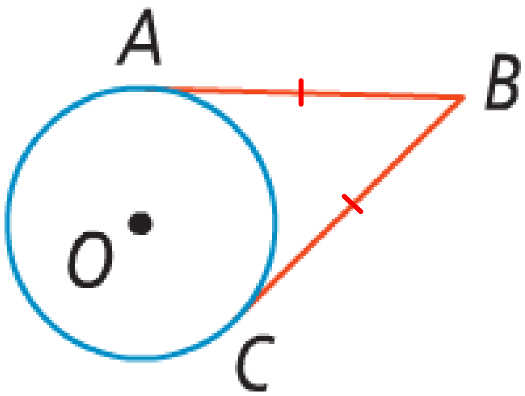
$25^2 = 7^2 + 24^2$



*Theorem 12-3Tangent Lines

gs

If 2 tangent segments share a common point outside the circle, then the segments are congruent. $\overline{AB} \cong \overline{BC}$

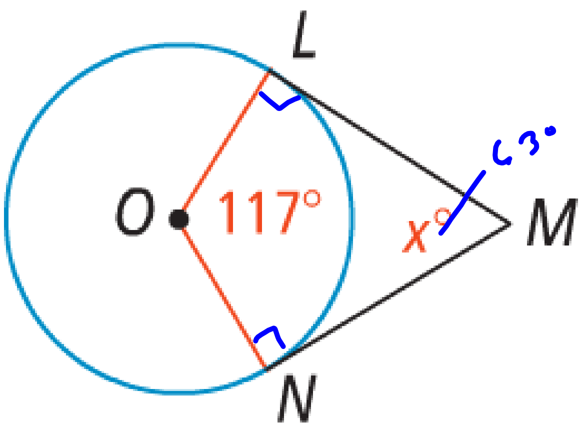


If . . .	Then . . .
$\overline{BA}$ and $\overline{BC}$ are tangent to $\odot O$	$\overline{BA} \cong \overline{BC}$

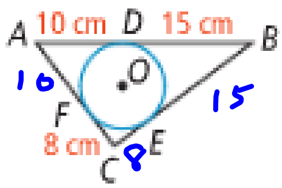
Tangent Lines

360 - 90 - 90 - 117

What is the value of x if $\overline{ML}$ and $\overline{MN}$ are tangent to circle O?



$\odot O$ is inscribed in $\triangle ABC$. What is the perimeter of $\triangle ABC$?



$AD = AF = 10$ cm
$BD = BE = 15$ cm
$CF = CE = 8$ cm

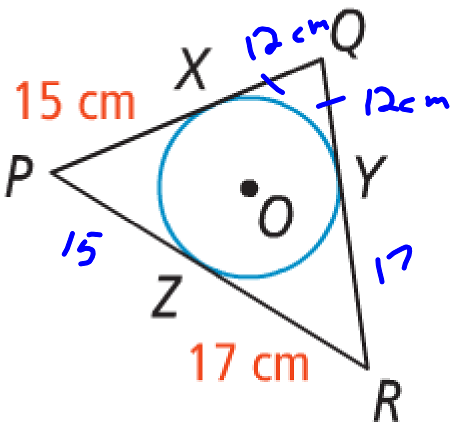
Two segments tangent to a circle from a point outside the circle are congruent, so they have the same length.

$p = AB + BC + CA$	Definition of perimeter p
$= AD + DB + BE + EC + CF + FA$	Segment Addition Postulate
$= 10 + 15 + 15 + 8 + 8 + 10$	Substitute.
$= 66$	

The perimeter is 66 cm.

Tangent Lines

$\odot O$ is inscribed in $\triangle PQR$, which has a perimeter of 88 cm. What is the length of $\overline{QY}$?



$88 = 15 + 15 + 17 + 17 + x + x$

$88 = 64 + 2x$

$-64 \quad -64$

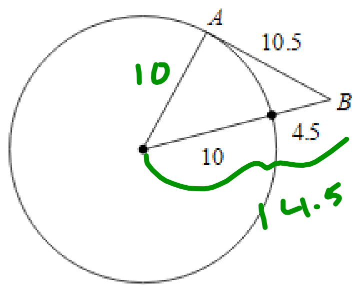
$24 = 2x$

$x = 12$

Is the line AB tangent to the circle? Use pythagorean theorem to find out.

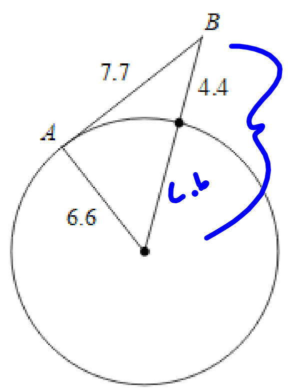
$10^2 + 10.5^2 \stackrel{?}{=} 14.5^2$

1)



Tangent

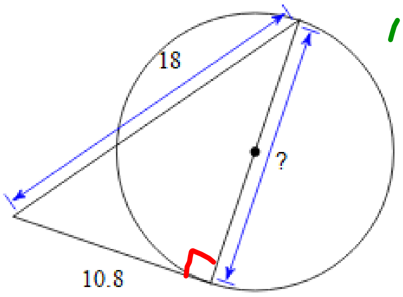
2)



Not tangent

Find the segment length indicated. Assume that lines which appear to be tangent are tangent.

3)

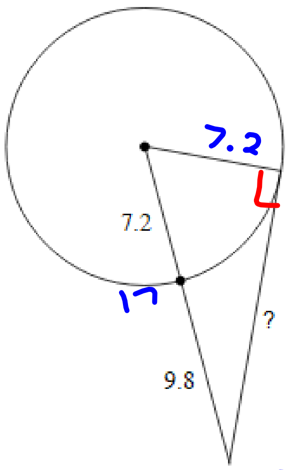


$18^2 - 10.8^2 = a^2$

$\sqrt{207.36}$

14.4

4)

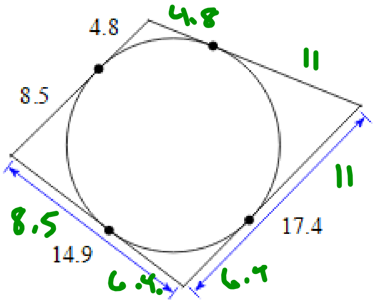


15.4

$17^2 - 7.2^2 = b^2$

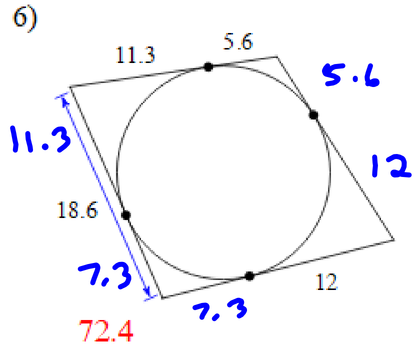
Find the perimeter of each polygon. Assume that lines which appear to be tangent are tangent.

5)



61.4

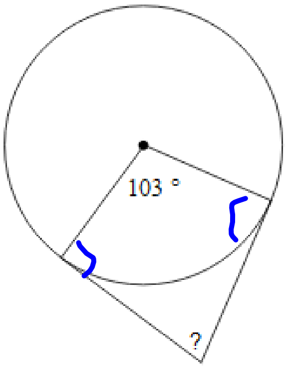
6)



72.4

Find the angle measure indicated. Assume that lines which appear to be tangent are tangent.

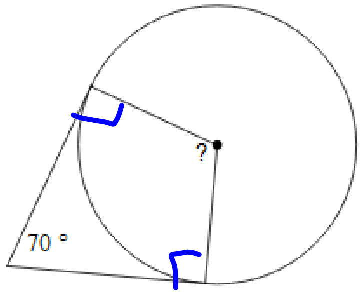
7)



360-90-90-103

77°

8)



110°

360-90-90-70

Closure: Today I learned about tangent lines and their properties.