Lesson 10.5 and 10.6 Tangents and Secants

Monday, May 08, 2023 8:35 PM

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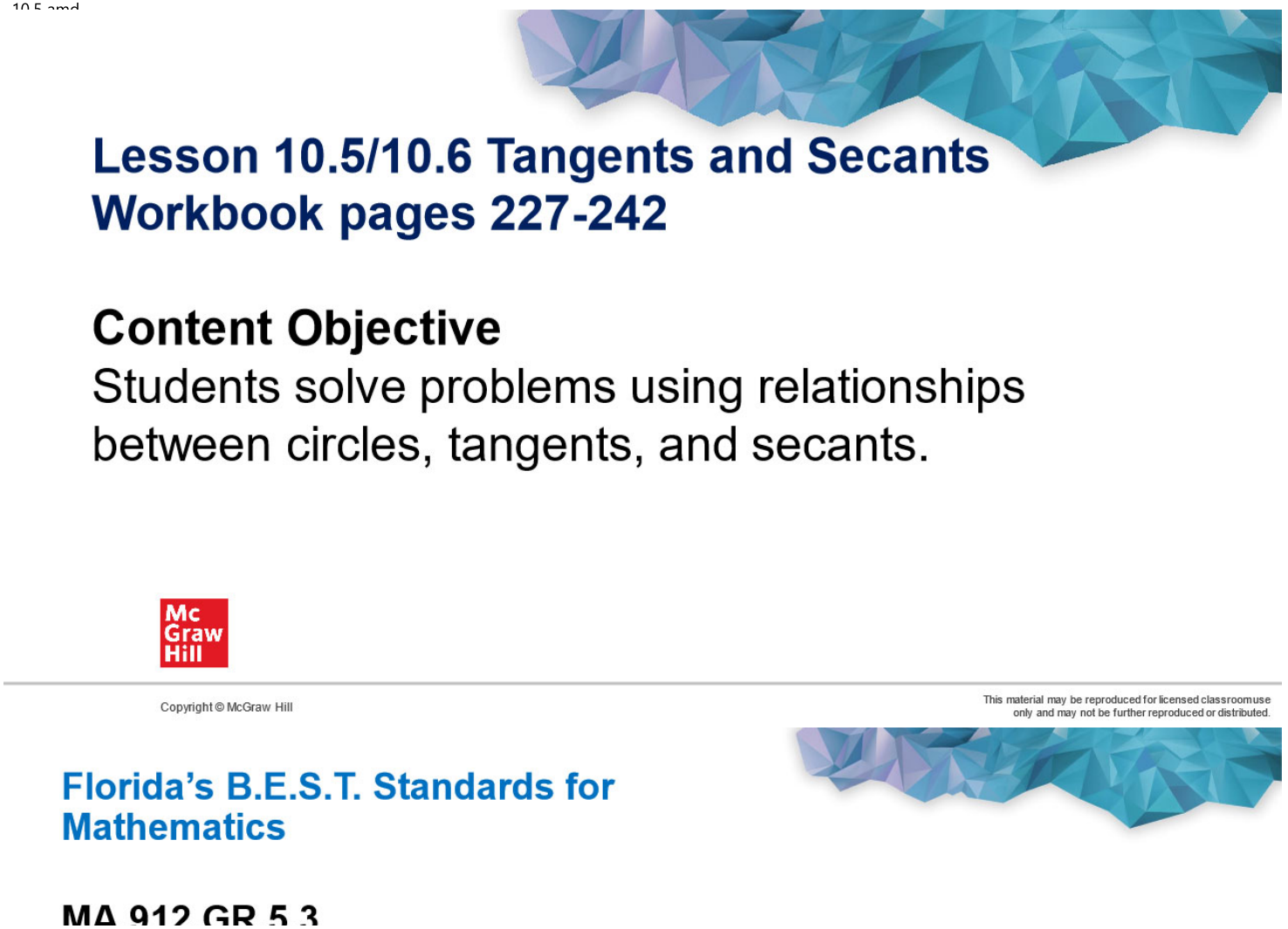
Lesson
10.5 and



Construct the inscribed and circumscribed circles of a triangle.

MA.912.GR.6.1

Solve mathematical and real-world problems involving the length of a secant, tangent, segment or chord in a given circle.

MA.912.GR.6.2

Solve mathematical and real-world problems involving the measures of arcs and related angles.

Learn
Tangents

A **tangent to a circle** is a line or segment in the plane of a circle that intersects the circle in exactly one point and does not contain any points in the interior of the circle. For a line that intersects a circle in one point, the **point of tangency** is the point at which they intersect.

McGraw Hill | Tangents

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Learn
Tangents

Theorem 10.11

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.

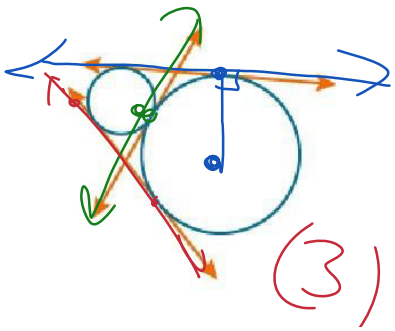
Theorem 10.12: Tangent to a Circle Theorem

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

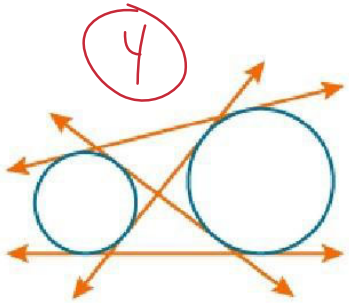
Example 1
Identify Common Tangents

Identify the number of common tangents that exist between each pair of circles. If no common tangent exists, state *no common tangent*.

a.



b.



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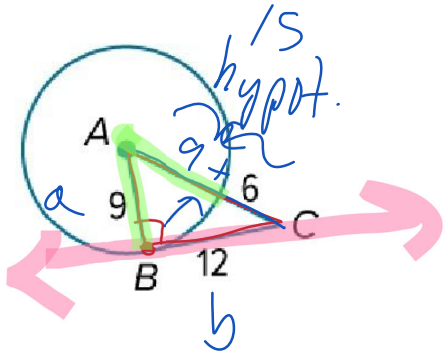
Example 2
Identify a Tangent

$\overline{AB}$ is a radius of $\odot A$. Determine whether $\overline{BC}$ is tangent to $\odot A$. Justify your answer.



$c^2 = a^2 + b^2$

$15^2 = 9^2 + 12^2$

$225 = 81 + 144$

$225 = 225$ ✓

Right = hypot.

< acute

> obtuse

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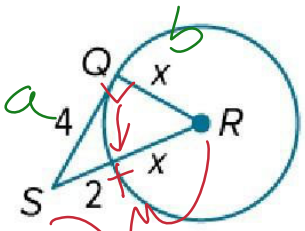
Example 3
Use a Tangent to Find Missing Values

$\overline{QS}$ is tangent to $\odot R$ at Q. Find the value of x.



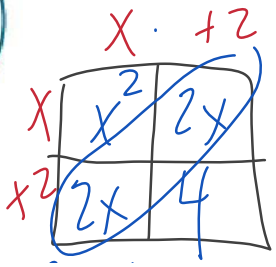
First Outside Inside Last

$c^2 = a^2 + b^2$

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

$(x+2)(x+2) = 16 + x^2$

$2 + x$



$x^2+8x+16 = 16+x^2$

$-x^2 \quad 4x+4=16$

$-4 \quad -4$

$\frac{4x}{4} = \frac{12}{4}$

$x=3$

x^2+4x+4

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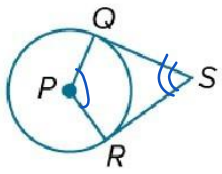
Learn

Circumscribed Angles

A **circumscribed angle** is an angle with sides that are tangent to a circle.

Theorem 10.13

Words	If two segments or lines are tangent to a circle, then the circumscribed angle and the central angle that intercept the arc formed by the points of tangency are supplementary. 180°	
Example	If $\overline{QS}$ and $\overline{RS}$ are tangent to $\odot P$, then $m\angle P + m\angle S = 180°$.	

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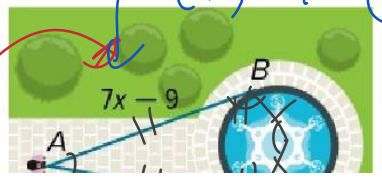
Example 4

Use Congruent Tangents to Find Measures

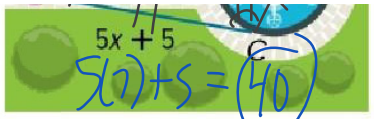
PHOTOGRAPHY A photographer wants to take a picture of a local fountain. She positions herself at point *A* so that the fountain will be centered in the picture

$7(7)-9=40$



fountain will be centered in the picture.

$\overline{AB}$ and $\overline{AC}$ are tangent to the fountain as shown. If the lengths of the tangents are given in feet, find *AB*.



$5(7)+5=40$

$2x=14$

$x=7$

$7x-9=5x+5$

$+9 \quad +9$

$\frac{2x}{2}=\frac{5x+14}{2x}$

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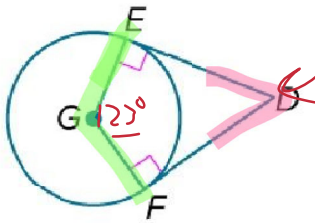
Example 5

Use Circumscribed Angles to Find Measures

$19(6)+9=123°$

If $m\angle EGF = (19x + 9)°$ and $m\angle D = (10x - 3)°$, find $m\angle D$.



$10(6)-3=57°$

$19x+9+10x-3=180$

$29x+6=180$

$-6 \quad -6$

$\frac{29x}{29}=\frac{174}{29}$

$x=6$

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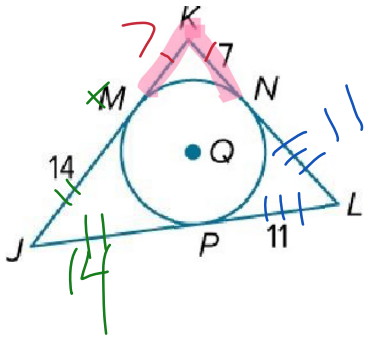
Example 6

Find Measures in Circumscribed Polygons

△*JKL* is circumscribed about ⊙*Q*. Find the perimeter of △*JKL*.

$7(2) + 14(2) + 11(2) = 64^{\circ}$



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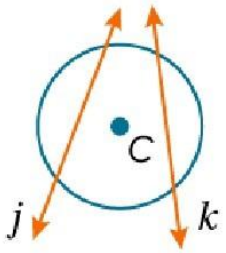
Learn

Tangents, Secants, and Angle Measures

A **secant** is any line or ray that intersects a circle in exactly two points. Lines *j* and *k* are secants of ⊙*C*.



When two secants intersect inside a circle, the angles formed are related to the arcs they intercept.

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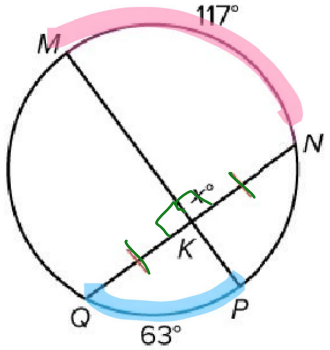
Example 1
Intersecting Chords or Secants

Find the value of *x*.

$\frac{117+63}{2}$

$\frac{180}{2} = 90$



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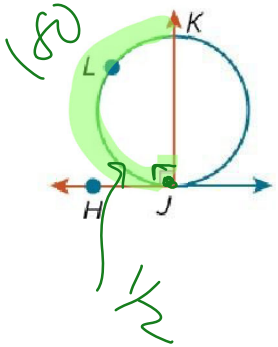
Example 2
Secants and Tangents Intersecting on a Circle

Find ~~$m\overline{JKL}$~~.

$\overset{\frown}{JLK}$

180



180

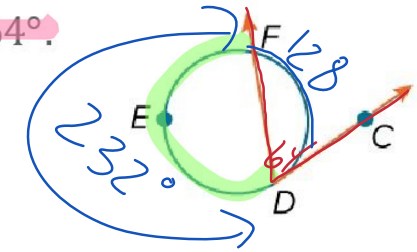
$\frac{1}{2}$

Example 2

Secants and Tangents Intersecting on a Circle

Check $232 + 128 = 360$ ✓

Find $m\overset{\frown}{DEF}$ if $m\angle FDC = 64°$.

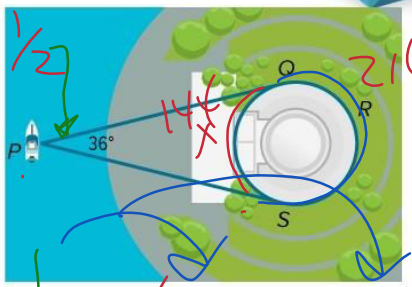


$360 - 128 = 232$

Example 3

Tangents and Secants Intersecting Outside a Circle

MEMORIALS A photographer is taking a photo of the Thomas Jefferson Memorial in Washington, D.C., from a boat in the Tidal Basin. The photographer's lines of sight are tangent to the memorial at points Q and S. If the camera's viewing angle measures 36°, what portion of the memorial will be visible in the photo?



$216 - 144 = 72$

$\frac{72}{2} = 36$

$\frac{1}{2}$

216

144

x

$360 - x$

QRS

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

$x = 144$

$\frac{1}{2}(360-2x)=36\cdot 2$

$360-2x=72$

$-360 \quad -360$

$\frac{-2x}{-2}=\frac{-288}{-2}$

$x=144$

$180-1x=36$

$-180 \quad -180$

$\frac{-1x}{-1}=\frac{-144}{-1}$

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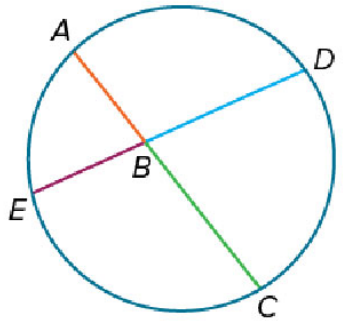
Learn
Tangents, Secants, and Segment Lengths

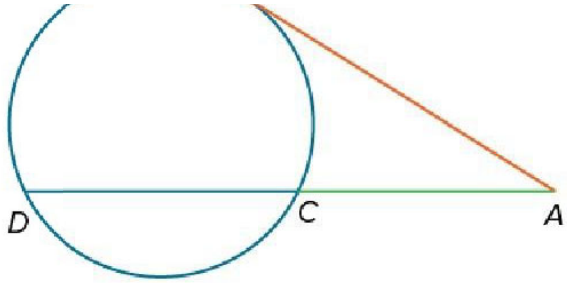
Theorem 10.17 Segments of Chords Theorem

Words	If two chords intersect in a circle, then the products of the lengths of the chord segments are equal.	
Example	$AB \cdot BC = DB \cdot BE$	

Learn
Tangents, Secants, and Segment Lengths

Theorem 10.19

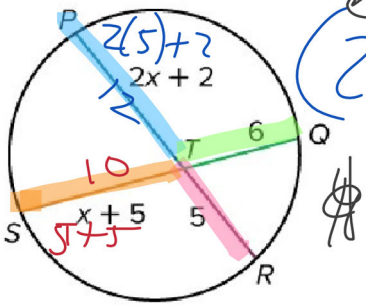
Words	If a tangent and a secant intersect in the exterior of	

	a circle, then the square of the measure of the tangent is equal to the product of the measures of the secant and its external secant segment.	
Example	$AB^2 = AC \cdot AD$	

Example 4

Use the Intersection of Two Chords

Find *PT*.



$12(5) = 10(6)$

$60 = 60$

$(2x+2)5 = (x+5)(6)$

$10x + 10 = 6x + 30$

$-6x \quad -6x$

$4x + 10 = 30$

$-10 \quad -10$

$\frac{4x}{4} = \frac{20}{4}$

$x = 5$

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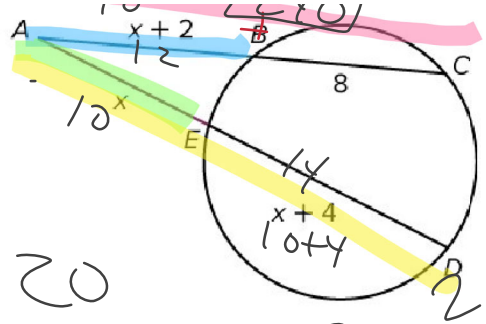
Example 5

Use the Intersection of Two Secants

$10(24) \quad 12(20)$

Find *AB*.



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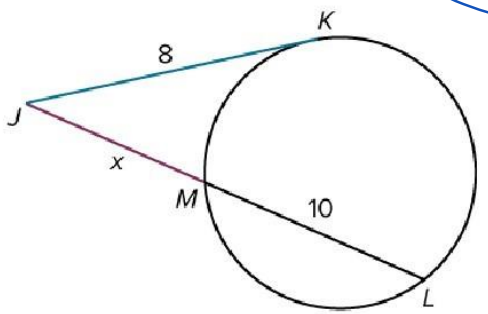
Example 6

Use the Intersection of a Secant and a Tangent

$\overline{JK}$ **is tangent to the circle. Find *JL*. Round to the nearest tenth.**



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