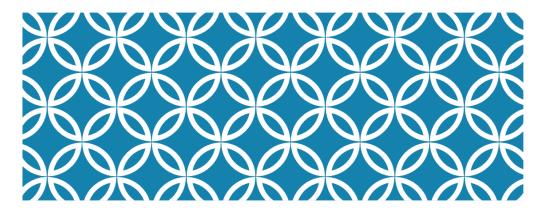
# Module 10: Circles

Sunday, April 14, 2024 11:32 PM

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# 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.

### MA.912.GR.6.4

Solve mathematical and real-world problems involving the arc length and area of a sector in a given circle.

# MA.912.GR.6.3

Solve mathematical problems involving triangles and quadrilaterals inscribed in a circle

## MA.912.GR.5.3

Construct the inscribed and circumscribed circles of a triangle.

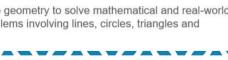


# MA.912.GR.3.3 Print quadrilaterals.

#### MA.912.GR.3.2

Given a mathematical context, use coordinate geometry to classify or justify definitions, properties and theorems involving circles, triangles or quadrilaterals.

Use coordinate geometry to solve mathematical and real-world geometric problems involving lines, circles, triangles and

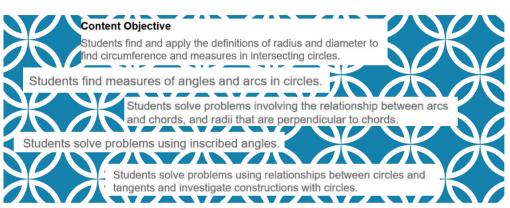


# MA.912.GR.7.2

Given a mathematical or real-world context, derive and create the equation of a circle using key features.

#### MA.912.GR.7.3

Graph and solve mathematical and real-world problems that are modeled with an equation of a circle. Determine and interpret key features in terms of the context.



Students solve problems using relationships between circles, tangents, and secants.

> Students write and graph the equations of circles using key features.

**Parts of Circles** 

A circle is the set of all points in a plane that are the same distance from a given point called the center of a circle. The center of the circle below is C.

A radius of a circle (plural radii) is a line segment from D the center to a point on a circle.  $\overline{CD}$ ,  $\overline{CE}$ , and  $\overline{CF}$  are radii of circle C. Its measure is half the diameter.

A **chord of a circle** is a segment with endpoints on the circle.  $\overline{AB}$  and  $\overline{DE}$  are chords of circle C.

A diameter of a circle is a chord that passes through the center of a circle.  $\overline{DE}$  is a diameter of circle C. The measure is twice the radius.

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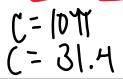
Parts of Circles

# Key Concept: Circumference Formula

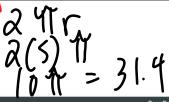
Words If a circle has diameter d or radius r, the circumference C equals the diameter times pi or twice the radius

nimes pi.

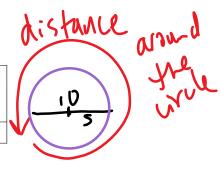
Symbols  $C = \pi d$   $C = 2\pi r$ 



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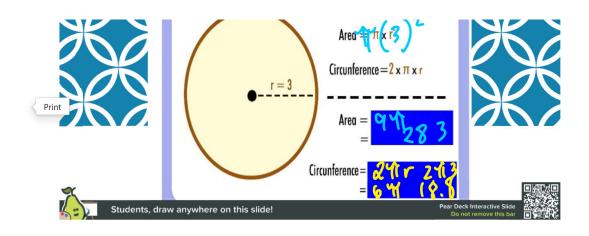










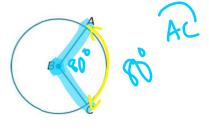


**Measuring Angles and Arcs** 

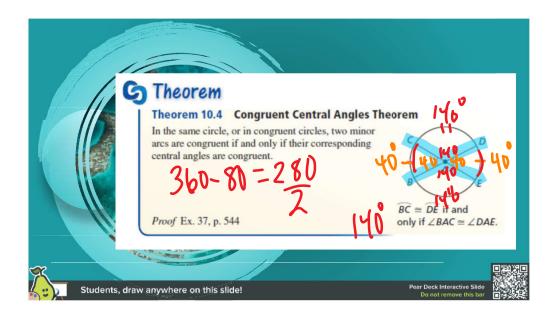
A central angle of a circle is an angle with a vertex at the center of a circle and sides that are radii.  $\angle ABC$  is a central angle of  $\bigcirc B$ .

A **degree** is  $\frac{1}{360}$  of the circular rotation about a point. This leads to the following relationship.

360



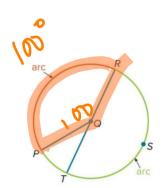




Measuring Angles and Arcs

An **arc** is part of a circle that is defined by two endpoints. A central angle separates the circle into two arcs with measures related to the measure of the central angle.

A minor arc has a measure less than 180°. The measure of a minor arc is equal to the measure of its related central angle.





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Learn

Measuring Angles and Arcs

minorarc

A major arc has a measure greater than 180°. The measure of a major arc is equal to  $360^{\circ}$  minus the measure of the minor arc with the same endpoints,  $mPSR = 360^{\circ} - mPR$ .

HD (COS) MANGO PR

760

A semicircle is an arc that measures exactly 180°. The endpoints of a semicircle lie on a diameter. mRST = 180°.



P5R



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**Congruent arcs** are arcs in the same or congruent circles that have the same measure.





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Arc Length and Radian Measure

215.140 =

Key Concept: Arc Length in Degrees

Words

The ratio of the length of

Words	The ratio of the length of an arc $\ell$ to the circumference of the circle is equal to the ratio of the degree measure of the arc to $360^{\circ}$ .		
Proportion	$\frac{\ell}{2\pi r} = \frac{x}{360^{\circ}}$		
Equation	$\ell = \frac{x}{360^{\circ}} \cdot 2\pi r \qquad \qquad C = 2 \text{ M/} \cdot . \text{ /40}$		

360



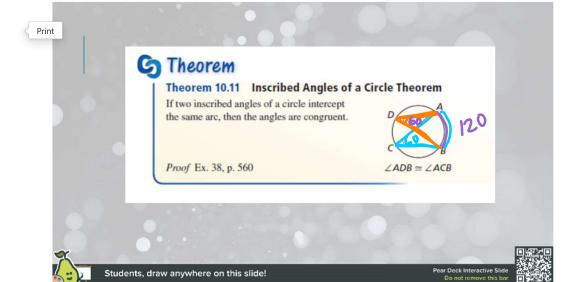


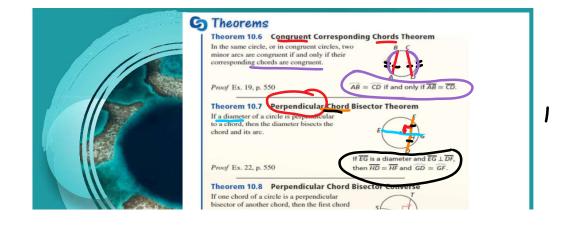
Inscribed Angles

For each of these cases, the following theorem holds true.

# Theorem 10.7: Inscribed Angle Theorem

Words	If an angle is in cribed in a circle, then the measure of the angle equals one half the measure of its intercept		
	arc.		
Example	$m \angle 1 = \frac{1}{2} m \widehat{AB}$ and $m \widehat{AB} = 2m \angle 1$		
	Centrale		
	A B		
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Arcs and Chords

In addition to Theorem 10.3, you can use the following theorem to determine whether two chords in a circle are congruent.

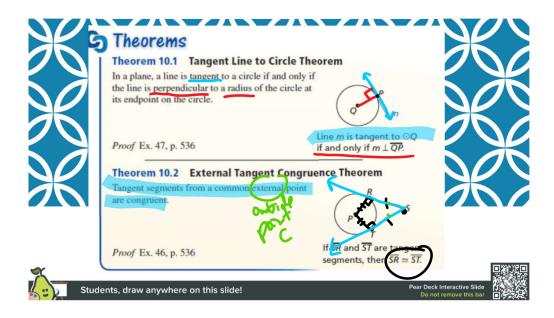
# Theorem 10.6

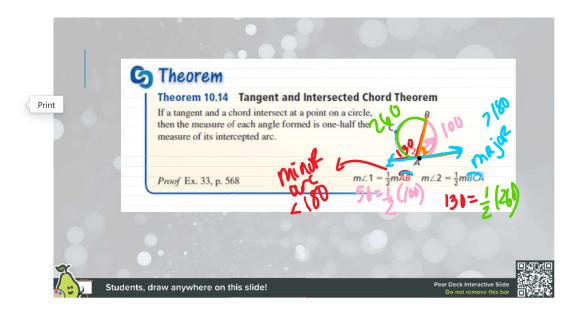
Words	In the same circle or in congruent circles, chords are congruent if and only if they are equidistant from the center.	F X G
Example	$\overline{FG} \cong \overline{JH}$ if and only if $LX = LY$ .	J

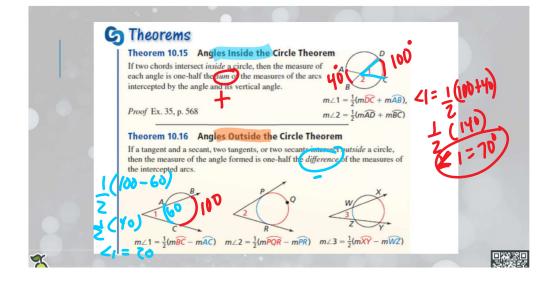






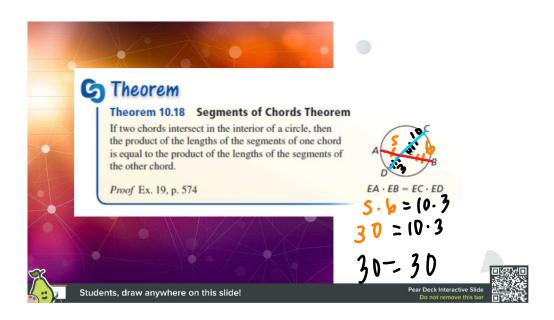


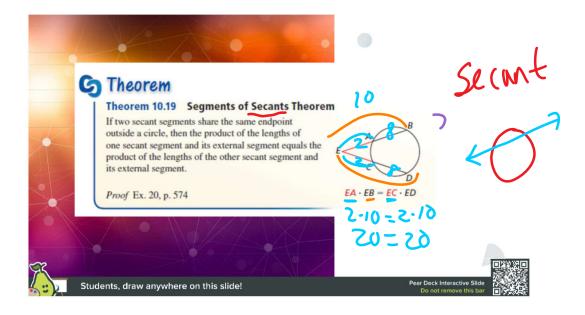






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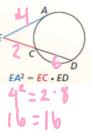




# Theorem 10.20 Segments of Secants and Tangents Theorem

If a secant segment and a tangent segment share an endpoint outside a circle, then the product of the lengths of the secant segment and its external segment equals the square of the length of the tangent segment.

Proof Exs. 21 and 22, p. 574



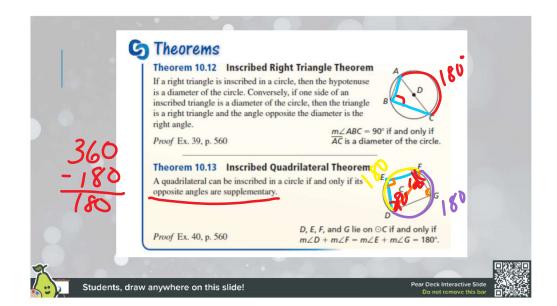


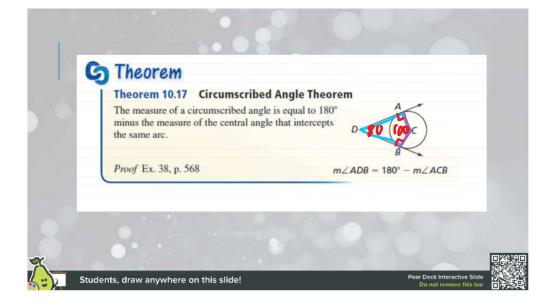
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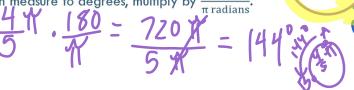






Arc Length and Radian Measure 270 × 10 - 270 (
Key Concept: Degree and Radian Conversion Rules)

- **1.** To convert a degree measure to radians moltiply by
- **2.** To convert a radian measure to degrees, multiply by  $\frac{180^{\circ}}{\pi \text{ radians}}$ .

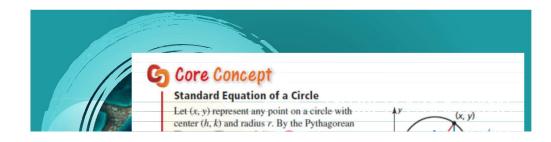


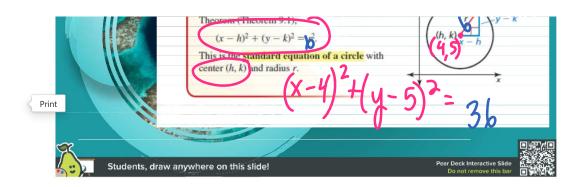


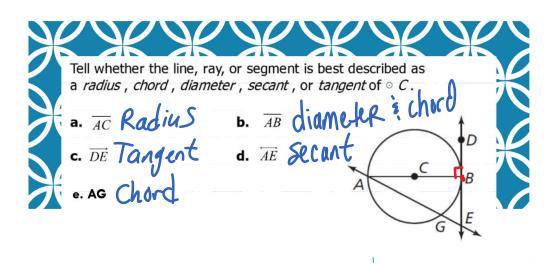
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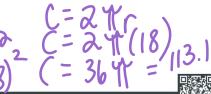
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# Example 3

Find Circumference and Area

TRAFFIC CIRCLES Traffic circles, also known as radius = 18 roundabouts, are circular roadways that reflow traffic in one direction around an island. A car enters a traffic circle and is 18 meters from the center of the island. If the car drives around the traffic circle until it is back to its original position, what is the circumference of the car's path? What is the area of the roundabout, including the island in the middle?







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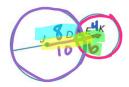
# Example 4

Find Diameter and Radius

Find the diameter and radius of a circle to the nearest hundredth if the circumference of the circle is 77.8

centimeters.

The diameter of  $\bigcirc K$  is 12 units, the diameter of  $\bigcirc J$  is 20 units, and JD =8 units Find EK. 4





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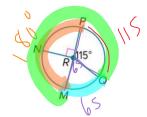


Example 2

Classify Arcs and Find Arc Measures

 $\overline{PM}$  is a diameter of  $\bigcirc R$ . Identify each arc as a major arc, minor arc, or semicircle. Then find its measure.

a. MQ central angle 65° b. MNP Semi circle



# c. MNQ Major arc (80°+115° = 295°



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