Module 10: Circles

Sunday, April 14, 2024 11:32 PM

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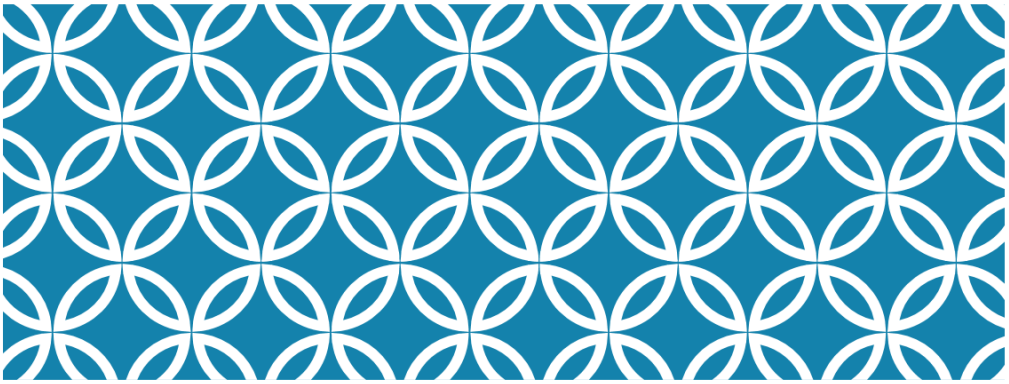
Geometry
Module 10



CHAPTER 10:
CIRCLES | Geometry

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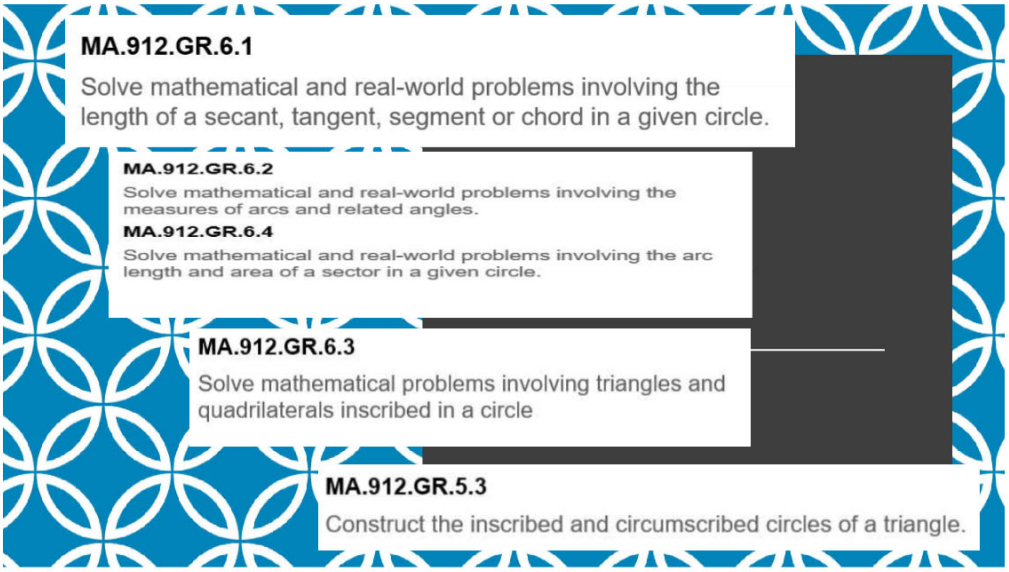
MA.912.GR.6.1
Solve mathematical and real-world problems involving the length of a secant, tangent, segment or chord in a given circle.
MA.912.GR.6.2
Solve mathematical and real-world problems involving the measures of arcs and related angles.
MA.912.GR.6.4
Solve mathematical and real-world problems 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.3.2

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

MA.912.GR.3.3

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

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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.

Content Objective

Students find and apply the definitions of radius and diameter to find circumference and measures in intersecting circles.

Students find measures of angles and arcs in circles.

Students solve problems involving the relationship between arcs and chords, and radii that are perpendicular to chords.

Students solve problems using inscribed angles.

Students solve problems using relationships between circles and tangents and investigate constructions with circles.

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

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

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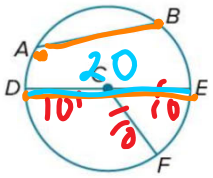
Parts of Circles

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 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

distance around

Words	If a circle has diameter d or radius r, the circumference C equals the diameter times pi or twice the radius times pi.
Symbols	$C = \pi d$ or $C = 2\pi r$

$C = \pi d$
$C = 10\pi$
$C = 31.4$

$C = 2\pi r$
$= 2(5)\pi$
$C = 10\pi$
$C = 31.4$

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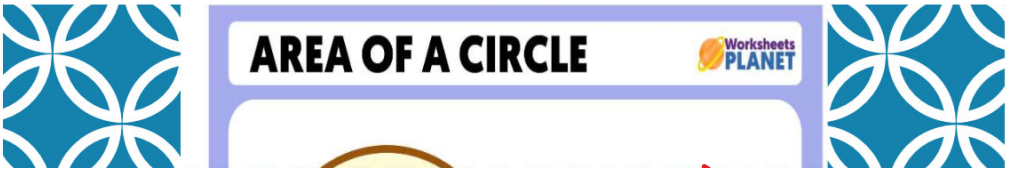

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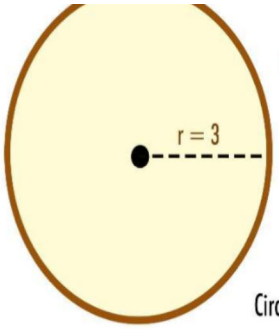

Area = πx^2 (inside)

Circumference = $2 \times \pi \times r$

Area = _____ (outside) or 9π

Circumference = $\pi(3)^2$ $= 28.3 = 9\pi$

$2\pi(3) = 6\pi = 18.8$

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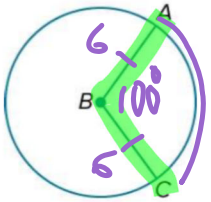
Measuring Angles and Arcs

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 $\odot B$.

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



$\overset{\frown}{AC}$

$100°$

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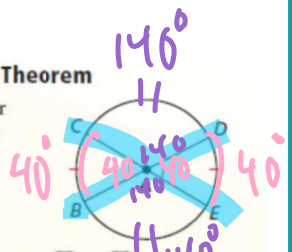
Theorem

Theorem 10.4 Congruent Central Angles Theorem

In the same circle, or in congruent circles, two minor arcs are congruent if and only if their corresponding central angles are congruent.



Proof Ex. 37, p. 544

$\overset{\frown}{BC} \cong \overset{\frown}{DE}$ if and only if $\angle BAC \cong \angle DAE$.

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$$\begin{array}{r} 360 \\ -\ 80 \\ \hline 280/2 \end{array}$$

$140°$

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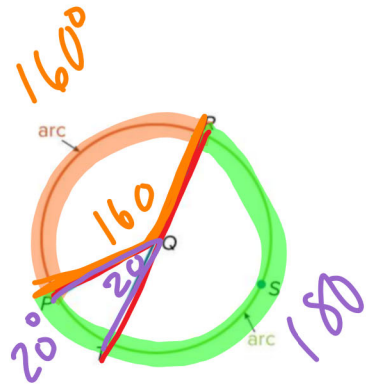
Measuring Angles and Arcs

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.



$m\overset{\frown}{PR} = m\angle PQR.$

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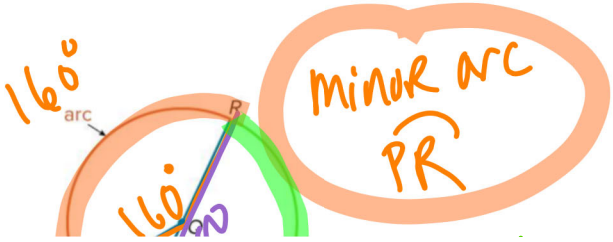
Measuring Angles and Arcs

A **major arc** has a measure greater than 180°. The measure of a major arc is equal to 360° minus the measure of the minor arc with the same endpoints. $m\overset{\frown}{PSR} = 360° - m\overset{\frown}{PR}$.



A **semicircle** is an arc that measures exactly 180°. The endpoints of a semicircle lie on a diameter. $m\widehat{RST} = 180°$.

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

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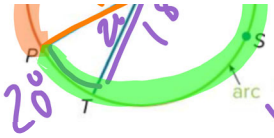

20° 180

360 − 160 = 200°

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Arc Length and Radian Measure

Key Concept: Arc Length in Degrees

Words	The ratio of the length of an arc ℓ to the circumference of the circle is equal to the ratio of the degree measure of the arc to 360°.
Proportion	$\frac{\ell}{2\pi r} = \frac{x}{360°}$
Equation	$\ell = \frac{x}{360°} \cdot 2\pi r$

$\frac{160}{360} \cdot 2\pi r$

$\frac{160}{360} \cdot \frac{2}{1} \cdot \frac{\pi}{1} \cdot \frac{5}{1}$

$\frac{502.55}{360}$

160° 160° 5

= 13.96

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