

Geometry: Circles

Stage 1 Desired Results		
ESTABLISHED GOALS: Competencies: - Students will demonstrate perseverance and strategic thinking by identifying the underlying meaning of a problem, planning a logical solution pathway, working through challenges, and verifying the reasonableness of their answers. - Students will demonstrate the ability to decontextualize (represent symbols) and contextualize (understand the meaning of quantities) by converting real-world situations into mathematical symbols for manipulation, and interpreting symbolic results back into practical contexts. - Students will demonstrate resourcefulness by evaluating and selecting the most effective tools to solve mathematical problems and deepen their understanding of concepts. - Students will demonstrate structural awareness by discerning patterns and functional relationships within complex mathematical concepts to simplify and solve problems. - Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials. - Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences. - Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse Content Standards: - G.C.A.1 Prove that all circles are similar. - G.CA.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. - G.CA.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. - G.CA.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. - G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. - G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc - G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). - MP2 Reason abstractly and quantitatively. - MP5 Use appropriate tools strategically. - MP6 Attend to precision. - MP7 Look for and make use of structure. - MP8 Look for and express regularity in repeated reasoning.	Transfer	
	<i>Students will be able to independently use their learning to apply their knowledge of circles to model and solve problems.</i>	
	Meaning	
	ENDURING UNDERSTANDINGS <i>Students will understand that...</i> - circles can be used to describe angles and prove a variety of geometric theorems. - all circles are similar.	ESSENTIAL QUESTIONS Why have cultures throughout history considered circles to be the perfect shape?
	Acquisition	
	<i>Students will know...</i> - that if a line is tangent to a circle, then the line is perpendicular to the radius at the point of tangency (and the converse). - that if two tangent segments in a circle share a common endpoint outside the circle, then the two segments are congruent. - that, within a circle or in congruent circles, - congruent central angles have congruent arcs (and the converse). - congruent central angles have congruent chords (and the converse). - congruent chords have congruent arcs (and the converse). - chords equidistant from the center or centers are congruent (and the converse). - that, in a circle, - if a diameter is perpendicular to a chord, then it bisects the chord and its arc. - if a diameter bisects a chord (that is not a diameter), then it is perpendicular to the chord. - the perpendicular bisector of a chord contains the center of the circle. - the inscribed Angle Theorem and its corollaries. - the measure of an angle formed by a tangent and	<i>Students will be skilled at...</i> - applying the properties of chords, tangents, secants, and radii as they relate to each other and their corresponding circles. - proving that all circles are similar. - finding and using measures of angles formed by chords/ tangents/secants/radii and arcs. - writing the equation of a circle. - deriving the equation for a circle using the Pythagorean Theorem. - describing a circle given the equation, including completing the square to find the center and radius of a circle given by an equation. - deriving the formula for the area of a sector. - determining the measures of angles, arcs, and segments from lines intersecting (or within) a circle.

	<i>a chord is half the measure of the intercepted arc.</i> • <i>the measure of an angle formed by two lines that intersect inside a circle (secants) is half the sum of the measures of the intercepted arcs.</i> • <i>the measure of an angle formed by two lines that intersect outside a circle (2 secants, 2 tangents, 1 secant and 1 tangent) is half the difference of the measures of the intercepted arcs.</i> • <i>that, for a given point and a circle, the product of the lengths of the two segments from the point to the circle is constant along any line through the point and circle (3 cases).</i> • <i>the standard equation of a circle.</i> • <i>the radian as a unit of measure.</i> • <i>the relationships between angles and arcs in a circle.</i> <u>vocabulary:</u> sector, tangent to a circle, point of tangency, chord, inscribed angle, intercepted arc, secant, minor arc, major arc	
Content Area Literacy Standards		21st Century Skills
• RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. • RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 9-10 texts and topics</i>. • RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., <i>force, friction, reaction force, energy</i>). • RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.		• reason effectively • use systems thinking • solve problems • communicate clearly

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Language Arts Integration

- 1.OA.1 Use

Mathematics Integration

- 1.OA.1 Use

Technology Integration

- 1.OA.1 Use

District Materials