UbD: Geometry - Circles

<table>
<tr><td>Time Frame: 14 Lessons</td><td>Unit 7: Circles</td><td>Course Name: Geometry</td></tr>
<tr><td colspan="3">Stage 1: Desired Results</td></tr>
<tr><td>Established Goal(s)</td><td colspan="2">Transferable Skills</td></tr>
<tr><td rowspan="3">Standards Addressed:

HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
HSA-SSE.A.1 Interpret expressions that represent a quantity in terms of its context. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.
HSG-C.A.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.
HSG-C.A.3 Construct the inscribed and circumscribed circles of a triangle, and prove the properties of angles for a quadrilateral inscribed in a circle.
HSG-C.B.5 Derive using similarity the fact that the length of the arc intercepted by an angle is</td><td colspan="2">Students will be able to independently use their learning to...

● prove and apply theorems about circles
● find arc lengths and areas of sectors of circles
● apply mathematical knowledge, skill, and reasoning to solve real-world problems.
● develop clear and effective communication.
● increase self-direction.
● develop creative and practical problem-solving.
● become responsible and involved citizens.
● develop informed and integrative thinking.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td><u>Understandings</u>
Students will understand that...
● math is a continuum, Algebra is needed for Geometry, and math concepts will build on themselves as we develop our mathematical understandings.
● prior knowledge and skills like using the Pythagorean theorem, triangle sum theorem, and distance formula will be applied to circles to prove new theorems.
● where the formulas for the area of a sector, and the length of an arc come from and they could derive them independently.
● they can apply theorems about circles to solve problems.
● they can find arc lengths and areas of sectors of circles.</td><td><u>Essential Questions</u>
● Where do circles show up in the natural world?
● Where do circles appear in architecture?
● How can we use circles to solve real-life problems?</td></tr>
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UbD: Geometry - Circles

	Acquisition	
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. **HSG-CO.C.9** Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. **HSG-CO.C.10** Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. **HSG-GMD.A.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. **HSG-MG.A.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	*Students will know...* • what chords, arcs, and central angles are. • that an inscribed angle is half the measure of the central angle that defines the same arc. • that a line tangent to a circle is perpendicular to the radius drawn to the point of tangency. • how to explain why the perpendicular bisectors of a triangle's sides meet at a single point. • how to explain why the angle bisectors of a triangle meet at a single point. • any point on an angle bisector is equidistant from the rays that form the angle. • that when a circle is dilated, some ratios, like the ratio of the circumference to the diameter, stay constant. • that the radian measure of an angle whose vertex is the center of a circle is the ratio of the length of the arc defined by the angle to the circle's radius. • the relative sizes of angles measured in radians. • that the 3 perpendicular bisectors of the sides of a triangle meet at a single point, called the triangle's circumcenter and that this point is the center of the triangle's circumscribed circle. • that the 3 angle bisectors of a triangle meet at a single point, called the triangle's incenter and this point is the center of the triangle's inscribed circle. • that the 3 medians of a triangle meet at a single point, called the centroid - the center of mass of a triangle. • that the 3 altitudes of a triangle meet at a single point, called the triangle's orthocenter. • the radian measure of the angle is the ratio of the length of the arc defined by the angle to the circle's radius. • the difference between inscribed and circumscribed figures.	*Students will be able to...* • use the relationship between central and inscribed angles to calculate angle measures and prove geometric theorems. • use the relationship between tangent lines and radii to calculate angle measures and prove geometric theorems. • prove a theorem about opposite angles in quadrilaterals inscribed in circles. • construct the inscribed circle of a triangle. • gather information about a sector to draw conclusions about the entire circle. • show that the radian measure of an angle can be thought of as the slope of the line. • use properties of circles to solve geometric problems. • construct the circumscribed circle of a triangle. • calculate lengths of arcs and areas of sectors in circles. • calculate the area of a sector whose central angle measure is given in radians. • construct an incenter, a circumcenter, a centroid, and an orthocenter. • define and use geometry-specific vocabulary words that were introduced in this unit. Mathematical Practices: • make sense of problems and persevere in solving them. • reason abstractly and quantitatively. • construct viable arguments and critique the reasoning of others. • model with mathematics.

UbD: Geometry - Circles

HSG-SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **HSG-SRT.C.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	• what a cyclic quadrilateral is and the relationships between opposite vertices. • how to define and correctly use the glossary terms: arc, central angle, chord, inscribed angle, tangent (line), circumscribed, cyclic quadrilateral, circumcenter, incenter, sector, and radian.	• use appropriate tools strategically. • attend to precision. • look for and make use of structure. • look for and express regularity in repeated reasoning.