

Unit E - Circles

Overview

This unit provides students a thorough study of circles. Students learn about the segments (in particular tangents) and angles (central and inscribed) associated with circles. Equations of circles on the coordinate plane are taught. The formula for circle circumference is reviewed, and students explore an informal proof of the area of a circle. Arc length and sector area are introduced.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSA.REI.B.4.A
 Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

Understand and apply theorems about circles

CCSS.MATH.CONTENT.HSG.C.A.1
 Prove that all circles are similar.

CCSS.MATH.CONTENT.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.*

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects. (Analyzing)
2. Demonstrate fluency with math facts, computation and concepts.
3. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Analyzing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians flexibly use different tools, strategies, symbols, and operations to build conceptual knowledge or solve problems.
2. Mathematicians examine relationships to discern a pattern, generalizations, or structure.
3. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

- A. How does what we measure affect how we measure?
- B. What math strategies can I use to solve the problem?
- C. How do I work through problems without giving up?

Geometry Level 3 Curriculum

Acquisition:		
	<i>Students will know...</i>	<i>Students will be skilled at...</i>
<p><i>CCSS.MATH.CONTENT.HSG.C.A.3</i> Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.</p> <p><i>CCSS.MATH.CONTENT.HSG.C.A.4</i> (+) Construct a tangent line from a point outside a given circle to the circle.</p> <p>Find arc lengths and areas of sectors of circles</p> <p><i>CCSS.MATH.CONTENT.HSG.C.B.5</i> 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.</p>	<ol style="list-style-type: none"> 1. The formal definition of a circle 2. Radius is half the diameter 3. Diameter is longest possible chord 4. Radius is perpendicular to tangent line at point of tangency 5. Double tangents (drawn from same exterior point) are congruent 6. Circles have an arc measure of 360 degrees 7. Central angles have the same measure as their intercepted arc 8. Inscribed angles have half the measure of their intercepted arc 9. Arc length and sector area are proportional to the circumference and area of the whole circle 10. Whether a quadrilateral can be inscribed in a circle based on its angles 11. The equation of a circle on the coordinate plane 12. Vocabulary: circle, center, radius, diameter, chord, tangent, secant, point of tangency, double tangents, walk - around, inscribed angle, central angle, arc, sector, circumference, inscribed polygon 	<ol style="list-style-type: none"> 1. Naming segments and lines related to circles 2. Finding lengths of tangent segments using pythagorean theorem 3. Applying the double tangent theorem to walk-around problems 4. Determining measures of arcs and angles in circles 5. Finding arc length and sector area of “nice” arcs (easily divide into 360) 6. Writing equations of circles for the coordinate plane