Unit 9: Circles

Content Area: **Mathematics**
Course(s): **English I, Geometry, Honors Geometry**
Time Period: **March**
Length: **2 weeks**
Status: **Published**

Unit Overview

- Define and apply properties tangents, radii, arcs, and central angles, and chords in proofs.
- Define and apply the terms related to circles and spheres.
- Recognize circumscribed and inscribed polygons and circles.
- Solve problems and prove statements involving inscribed angles, angles formed by chords, secants, and tangents.
- Solve problems and prove statements involving lengths of chords, secant, segments, and tangent segments.

Enduring Understandings

- Coordinate geometry can be used to represent and verify geometric and algebraic relationships.
- Geometric figures can be described and compared through measurement.
- Valid argument and presentation of clearly conclusive evidence is essential to writing a proof.

Essential Questions

- How are plane figures measured and compared?
- How are solids measured and compared?
- How can we best represent and verify geometric/algebraic relationships?
- How do coordinates allow us to verify geometric relationships?
- What are valid justifications in proofs and why are they necessary?
- Where are the skills used to write proofs used outside of geometry?

Lesson Titles/Objectives

- To apply theorems about the chords of a circle
- To apply theorems that relate tangents and radii
- To define a circle, a sphere, and terms related to them
- To define and apply properties of arcs and central angles
- To recognize circumscribed and inscribed polygons and circles
- To solve problems and prove statements involving angles formed by chords, secants, and tangents
- To solve problems and prove statements involving inscribed angles

- To solve problems involving lengths of chords, secant segments, and tangent segments

Standards

	Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
	Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
MA.G-C.A	Understand and apply theorems about circles
MA.G-C.B.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.
	Geometry
	Connections to Equations.

Indicators

MA.G-C.A.1	Prove that all circles are similar.
MA.G-C.A.2	Identify and describe relationships among inscribed angles, radii, and chords.
MA.G-C.A.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
MA.G-C.A.4	Construct a tangent line from a point outside a given circle to the circle.
MA.G-C.B.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.
MA.G-GPE.A.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.
	Analytic geometry connects algebra and geometry, resulting in powerful methods of analysis and problem solving. Just as the number line associates numbers with locations in one dimension, a pair of perpendicular axes associates pairs of numbers with locations in two dimensions. This correspondence between numerical coordinates and geometric

points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof. Geometric transformations of the graphs of equations correspond to algebraic changes in their equations.

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21st Century Skills and Career Ready Practices

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

Inter-Disciplinary Connections

LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
STEM.9-12.9.4.12.O.(1).12	Model technical competence by developing and applying processes and concepts in the design process.

Instructional Strategies. Learning Activities. and Levels of Blooms/DOK:

- Intro. a circle and the terminology to go with it
- Intro. a sphere and the terminology to go with it
- Intro. angles formed by a secant and a tangent
- Intro. angles formed by chords and tangents
- Intro. angles formed by two chords
- Intro. angles formed by two chords
- Intro. angles formed by two secants
- Intro. angles formed by two tangents
- Intro. Arc addition postulate
- Intro. Arcs and their measures
- Intro. central angles and their measures
- Intro. Chords of a circle and their measure
- Intro. circumscribed circles
- Intro. concentric circles and spheres
- Intro. congruent and similar circles
- Intro. congruent tangents to a circle
- Intro. corollaries related to inscribed angles
- Intro. inscribed angles and their measure
- Intro. inscribed circles
- Intro. intercepted arcs
- Intro. relationship between segments formed by two chords
- Intro. relationship between segments formed by two secants
- Intro. relationship of segments formed by a secant and a tangent
- Intro. tangent to a circle
- Intro. theorems related to arcs and chords
- Review anticipatory Set
- Review Homework
- Review HSPA warmup
- Review Quiz
- Students will take a quiz on 9.1-9.4
- Students will take quiz 9.5-9.7
- Students will take the chapter 9 test

Modifications:

ELLs Modifications

- Utilize explicit learning strategies that are well planned in advance (intentional planning)
- 1:1 testing
- Offer alternate/or modify assessments
- Tap prior knowledge

IEP & 504 Modifications

- math tests could have formula's available on the test and/or sample problems
- modeling and showing lots of examples
- scaffolded notes

G&T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- Determine where students' interests lie and capitalize on their inquisitiveness. (Is there a Invite students to explore different points of view on a topic of study and compare the two.
- Encourage students to make transformations- use a common task or item in a different way.
- nquiry based learning

Formative Assessment

- closure finding arc and angle lengths
- closure use products of chord to find lengths of segments
- journal write
- pass out of class
- think-pair-share
- warm up angle and arc relationships
- warm up segments and arcs of circles

Summative Assessment

- Test arcs, chords, secants, tangents, central and inscribed angles of circles
- Test interior and exterior angles, products of chords and tangents

Resources & Technology

Resources and Materials

- Compass
- Geometry Text Book- McDougal – Littell
- Geometry Text Book- McDougal – Littell
- Manipulatives
- Protractors
- Ruler
- Teacher Created worksheets
- Teacher Generated worksheets

Technology

- Geometer sketchpad
- Mathxl
- Ti-84 calculator
- Videos

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.