Unit 9: Circles

Content Area: **Mathematics**
Course(s): **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?

Student Learning 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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Lesson Titles

- Angles formed by chords, secants, and tangents
- Arcs and central angles
- Chords of circles
- Circles and Spheres
- Circumscribed and inscribed polygons and circles
- Inscribed angles
- Lengths of chords, secant and tangent segments
- Tangents and radii

Career Readiness, Life Literacies & Key Skills

WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RL.9-10.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.RL.9-10.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
LA.RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.) and make relevant connections, to support analysis of what the text says

	explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.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 grades 9-10 texts and topics.
LA.RI.9-10.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
LA.WHST.9-10.1.E	Provide a concluding paragraph or section that supports the argument presented.

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 Quiz

- Review standardized-test practice questions for warmup
- Students will take the chapter 9 test on Circles

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
- Tutoring during Delsea One

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
- Tutoring during Delsea One

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
- Tutoring during Delsea One

At Risk Modifications

- Additional help during tutoring/Delsea One/Academic Enrichment
- Retesting
- Speaking to students privately when redirecting behaviors
- Study Guides
- Tutoring during Delsea One

Alternative assessments:

Performance tasks
Project-based assignments
Problem-based assignments
Presentations

Benchmark Assessment

Skills-based assessment- math practice

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

- Alternate Assessment
- Marking Period 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

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- 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.