Unit 10: Circles

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 26**
Length: **3 Weeks**
Status: **Published**

Unit Overview

During this unit, students will investigate parts of circles and their various relationships. The relationships include those between a radius and a chord that is perpendicular to that radius, congruent chords, central angles and arc length, congruency of central angles, chords, and arcs, and congruent lengths for two tangents drawn from an external point. The students will apply these principles to solve complex problems. Students will be able to find the measure of various angles related to circles as well as missing arc lengths. They will continue to use the relationships of two inscribed or tangent-chord angles and the Power Theorem to solve problems. Students also will work with inscribed and circumscribed polygons. Finally, students will find the circumferences and the arc lengths given information regarding either the radius length, tangent length, or central angle measure.

Standards

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.

Essential Questions

1) How can understanding the properties of triangles be useful during the study

of circles?

2) How can properties of circles be used to solve real world situations?

3) How can algebraic principles be used to solve problems or prove geometric statements?

Application of Knowledge and Skills...

Students will know that...

- 1) a diameter is the longest chord of a circle.
- 10) an angle formed by two chords is half the sum of its arc and its vertical angle's arc.
- 11) an angle formed by two tangents is half the difference of its arcs.
- 12) an angle inscribed in a semi-circle is a right angle.
- 13) a polygon is inscribed in a circle if all of its vertices lie on the circle.
- 14) a polygon is circumscribed about a circle if each of its sides is tangent to the circle.
- 15) the Power Theorems can be used to find the length of segments of chords, tangents, and secants.
- 16) the length of an arc is equal to the circumference of its circle times the fractional part of the circle determined by the arc.
- 2) if a radius is perpendicular to a chord, then the chord is bisected and its arc is bisected.
- 3) chords that are equidistant from the center of the circle are congruent.
- 4) a minor arc is less than 180°, a semi-circle is 180°, and a major arc is more than 180°.
- 5) a central angle has the same measure as its minor arc.
- 6) if a line is tangent to a circle, then the radius drawn to the point of tangency is perpendicular to the tangent.
- 7) an inscribed angle has half the measure of its arc.
- 8) an angle formed by a chord and a tangent has half the measure of its arc.
- 9) an angle formed by two secants or a secant and a tangent is half the difference of its two arcs.

Students will be skilled at...

Students will be able to:

- a) use right triangle-solving techniques, such as the Pythagorean Theorem, to solve problems with a radius perpendicular to a chord.
- b) apply relationships between radii, chords, tangents, and secants to find missing measurements.
- c) solve for angles and arcs associated with a circle.
- d) find missing measurements of inscribed and circumscribed polygons.
- e) calculate circumferences, arc lengths, perimeter, and area of sectors of figures that are composed of circles.

Assessments

- Daily Formative Assessments Formative: Other written assessments Formative assessments, such as Do-Now assignments, homework assignments, Tickets-to-Leave, and SmartPal response board practice problems, will provide daily data for teachers.
- Pre-Assessment Diagnostic: Other written assessments Students will be assessed on their prior knowledge of circles and circumference.

- Unit Quiz Formative: Written Test Students will be assessed on finding missing measurements of segments, angles, and arc measures that are a part of circles.
- Unit Test Summative: Written Test Students will be assessed on finding missing measurements of segments, angles, and arc measures that are a part of circles, finding missing measurements of inscribed and circumscribed polygons, and finding perimeters of figures containing circles.

Activities

Communicator Practice

Students will complete differentiated practice problems on SmartPal response boards.

Cooperative Problem-Solving

Students will work cooperatively on challenge problems. This work may be presented by students, discussed as a class, or turned in for grading and comments.

Tangent Segment Investigation

Students will complete an investigation to find that the length of two tangents from an external point are congruent.

Inscribed Angles Investigation

Students will complete an investigation to discover that inscribed angles are half the measure of the intercepted arc measure.

Activities to Differentiate Instruction

Interactive Smartboard Activities will be utilized.

Students will work in mixed-level groups.

Students will be assigned optional and mandatory challenge problems on homework assignments.

Enrichment worksheets will be available for classwork and/or homework.

Guided notes and study guides will be provided accordingly.

Appropriately-leveled problems for students to complete. Proofs can range from having few steps to requiring multiple steps using multiple geometric figures.

Integrated/Cross-Disciplinary Instruction

Students will understand that writing geometry proofs is similar to writing persuasive essays. They must take given information, build supporting details, and draw a conclusion.

Resources

McDougal Littell *Geometry for Enjoyment and Challenge* textbook and resources

Smartboard

Smart Exchange

McDougal Littell *Activity Generator* CD-ROM

Protractors

Rulers

Smart Exchange

21st Century Skills

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.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.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.