

06 Circles

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **4 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

[NJSLs Geometry Overview](#)

In this unit, students analyze relationships between segments and angles in circles. This will require that students develop and understanding of arc measure, arc length and the interplay among chords, secants, and tangents. This allows for the exploration of properties of figures inscribed in a circle. Also addressed is the area of a sector and an introduction to radian measure. This unit also continues to develop the connection between equations of circles and equations of other conic sections.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives: In this unit, students analyze relationships between segments and angles in circles. This will require that students develop and understanding of arc measure, arc length and the interplay among chords, secants, and tangents. This allows for the exploration of properties of figures inscribed in a circle. Also addressed is the area of a sector and an introduction to radian measure. This unit also continues to develop the connection between equations of circles and equations of other conic sections.

Essential Questions:

- How is the measure of an arc related to the angle that intercepts the arc?
- How is the length of an arc related to the angle that intercepts the arc?
- What do the properties of inscribed angles tell us about particular polygons?
- How are the equations of conic sections developed?

Enduring Understandings:

- Radii, chords, secants and tangents all interact with each other and circles in specific ways.
- The measure of an arc is directly connected to the measure of the angle that intercepts that arc.
- A radian is the ratio of the arc length to the radius of the arc.
- Specific conic sections have specific equations based on the features of the conic.

CONTENT AREA 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.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.5	Use appropriate tools strategically.
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.
MA.G-GPE.A.2	Derive the equation of a parabola given a focus and directrix.
MA.G-GPE.A.3	Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.2.d	Evaluate and select technological tools that can be used to collaborate on a project.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
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.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- All circles are similar
- Specific relationships exist among the various types of angles associated with a circle and the measure of the arc intercepted
- Minor arcs measure between 0 and 180 degrees.
- Major arcs measure between 180 and 360 degrees
- Semi Circles measure 180 degrees
- Central and inscribed angles are determined by the location of the vertex
- The measure of a central angle is equal to the measure of its intercepted arc
- The measure of an inscribed angle is one half the measure of its intercepted arc
- Properties of inscribed angles provide insight into inscribed polygons.
- Arc length is a fraction of the length of the circumference
- Area of sector is a fraction of the amount of the total area of the circle.
- Conic sections have specific equations that describe them based on specific features.

Procedural Knowledge

Students will be able to:

- Identify the following parts of a circle: radius, diameter, chord, sector, minor arc, major arc, semi circle, tangent, secant. *Recall*
- Derive the equation of a circle of given center and radius using the Pythagorean Theorem. *Knowledge Utilization*
- Derive the formula for the area of a sector. *Knowledge Utilization*
- Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius. *Knowledge Utilization*
- Prove properties of angles for a quadrilateral inscribed in a circle. *Knowledge Utilization*
- Prove that all circles are similar. *Knowledge Utilization*
- Construct the inscribed and circumscribed circles of a triangle. *Analysis*
- Complete the square to find the center and radius of a circle given by an equation. *Comprehension*
- Identify and describe relationships among inscribed angles, radii, and chords. *Comprehension*

EVIDENCE OF LEARNING

Formative Assessments

- Student feedback/questioning/observation

- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Task completion and review of quizzes and material presented in the Geometry class

Summative Assessments

There will be no formal assessments in this course.

RESOURCES (Instructional, Supplemental, Intervention Materials)

NJ DOE Model Curriculum unit: [Circles and Expressing Geometric Properties through Equations](#)

Illustrative Mathematics unit: [Circles](#)

Khan Academy unit: [Circles](#)

NJCTL unit: [Circles](#)

Desmos Activities: [Self checking Circle Vocabulary](#), [minor and major arc activity](#) [area of sector activity](#), [angle relationships in circles](#)

Course approved textbook

Kuta Software worksheets

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.

