

# Unit #4: Circles and Expressing Geometric Properties through Equations

Content Area: **Mathematics**  
Course(s): **Geometry**  
Time Period: **Semester 2**  
Length: **4 weeks**  
Status: **Published**

## Standards

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MA.G-CO.A.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MA.K-12.4	Model with mathematics.
MA.G-CO.C.11	Prove theorems about parallelograms.
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	Find arc lengths and areas of sectors of circles
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.B.4	Use coordinates to prove simple geometric theorems algebraically.
MA.G-GPE.B.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
MA.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

## Enduring Understandings

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1. Relationships exist among angles, segments, lengths, circumference, and area of circles.
2. Coordinates are useful for proving a wide range of geometry theorems.
3. There are several ways to construct polygons in and around circles.

## Essential Questions

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1. How are the lengths of segments related to a circle applied?

2. How are angles and intercepted arcs of circles applied?
3. How does coordinate geometry apply to circles?
4. How can we write an equation of a median and altitude to a triangle?

## Knowledge and Skills

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Circles:

- Identify characteristics of circles
- Recognize parts and special relationships of a circle
- Identify different types of arcs
- Identify and solve problems involving secants and tangents
- Recognize angles related to a circle
- Apply the relationship between congruent chords of a circle
- Apply the relationships between the measures of angles and their minor arcs
- Identify inscribed and circumscribed polygons
- Apply the power theorems
- Determine circumference and arclength of a circle
- Identify and create various forms of linear equations
- Use and apply the distance and midpoint formulas
- Write equations that correspond to circles

Equations of Lines:

- Apply the principles of coordinate geometry in a variety of situations
- Use and apply the midpoint and distance formulas
- Write equations of lines through a point
- Write an equation of a line parallel or perpendicular to another line
- Write an equation of a median and altitude to a triangle

## Transfer Goals

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Recognize and solve practical or theoretical problems involving Geometry, including those for which the solution approach is not obvious, by using mathematical reasoning and strategic thinking.

Converting a graph to an equation unlocks many new ways to solve a problem.

## Resources

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Informal Geometry, by Cox

Geometry for Enjoyment and Challenge, by Rhoad

Moises Geometry, by Moise

[Khan Academy](#)

[PurpleMath](#)

[KutaSoftware](#)

[CK-12](#)

[Quizlet](#)

[Albert I/O](#)

[Desmos](#)

[Problem-Attic](#)

[Classkick](#)