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

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

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

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

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

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

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