Marietta City Schools

2023–2024 District Unit Planner

Honors Geometry: Concepts & Connections

Unit title	Unit 6: Making Sense of Circles	MYP year	5	Unit duration (hrs)	20 hours

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GA DoE Standards

Standards

G.GSR.7: Explore the concept of a radian measure and special right triangles.

G.GSR.7.1 Explore and interpret a radian as the ratio of the arc length to the radius of a circle.

Strategies and Methods

• Students should be given opportunities to make sense of the meaning of radians conceptually through exploration with visual tools.

• Using hands on tools and technology visualizations, students should have opportunities to explore and develop an understanding of the relationship between the radius of a circle, an arc length, and the associated radian measure.

G.GSR.7.2 Explore and explain the relationship between radian measures and degree measures and convert fluently between degree and radian measures.

Fundamentals

• Students should be able to convert fluently (flexibly, accurately, and efficiently) between degree and radian measures to solve real-life problems.

Strategies and Methods

• Students should have opportunities to explore and discover experimentally the relationship between radian measure and degree measure using visual tools.

G.GSR.7.3 Use special right triangles on the unit circle to determine the values of sine, cosine, and tangent for 30° ($\pi/6$), 45° ($\pi/4$) and 60° ($\pi/3$) angle measures. Use reflections of triangles to determine reference angles and identify coordinate values in all four quadrants of the coordinate plane.

Fundamentals

• Students should be able to articulate the pattern associated with angle measures in all four quadrants of the unit circle, e.g., 150° as 180°-30°, 210° as 180°+30°, 330° as 360°-30°, etc.

• Students should explore, interpret, and use radian measures based on conversions from degree measures, such as 150°, 210°, etc., and articulate the patterns associates with those radian measures, including the connection of 5π 6 ≈ 2.617 radius units measured along the arc length of the circle.

• Through explorations, students develop an understanding that a unit circle has a radius equal to 1.

• This learning objective is limited to angle measures of 30° ($\pi/6$), 45° ($\pi/4$) and 60° ($\pi/3$), and their associated reflected angles within one counterclockwise revolution of the unit circle.

G.GSR.8: Examine and apply theorems involving circles; describe and derive arc length and area of a sector; and model and explain real-life situations involving circles.

G.GSR.8.1 Identify and apply angle relationships formed by chords, tangents, secants and radii with circles.

Fundamentals

• Real-life frameworks should include:

o angles based on the location of the vertex: central, inscribed, interior, and exterior.

o the angle formed at the intersection of the radius of a circle and a segment tangent to the circle (point of tangency); determining these segments are perpendicular.

o triangles inscribed in and circumscribed about circles.

o opposite angles of a quadrilateral inscribed in a circle; determining these angles are supplementary.

G.GSR.8.2 Using similarity, derive the fact that the length of the arc (arc length) intercepted by an angle is proportional to the radius; derive the formula for the area of a sector. Solve mathematically applicable problems involving applications of arc length and area of sector.

Fundamentals

• Students should be able to apply strategic thinking and complex reasoning when solving problems involving arc length and area of a sector of a circle.

Strategies and Methods

• Students should be given opportunities to use interactive tools to engage with the content in order to develop a conceptual understanding of arc length and area of a sector.

G.GSR.8.3 Write and graph the equation of circles in standard form.

Terminology

• The general form of the equation for a circle is $x^2 + y^2 + Cx + Dy + E = 0$. • The standard form of the equation for a circle is $(x-h)^2 + (y-k)^2 = r^2$.

Fundamentals

• Students should be able to identify the center and radius of a circle from an equation in standard form or from the graph of a circle.

• Students should be able to write the equation of a circle in standard form given the graph of the circle.

• Students should be able to graph a circle from the standard form equation of a circle.

• As students convert equations in general form to standard form in this course, the leading coefficient of the quadratic terms should be limited to 1.

Strategies and Methods

• Students may use a variety of methods to convert the equation of a circle in general form to the equation of a circle in standard form for a specific, circumstantial purpose. One strategy used by students may include (but is not limited to) completing the square.

G.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

G.MM.1.1 Explain mathematically applicable problems using a mathematical model.

Fundamentals

• Students should be provided with opportunities to learn mathematics through the exploration of real-life problems.

• Mathematically applicable problems are those presented in context where the context makes sense, realistically and mathematically, and allows for students to make decisions about how to solve the problem (model with mathematics).

G.MM.1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.

Fundamentals

• Students should be able to use the content learned in this course to create a mathematical model to explain real-life phenomena.

G.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a mathematically applicable situation.

Fundamentals

• Students should be able to connect learning of geometric shapes and their properties to describe objects.

• Students should be able to apply geometric methods and data to make decisions about structures and solve real-world problems.

G.MM.1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems.

Fundamentals

• Students should be able to construct a model by selecting and creating algebraic and geometric representations that describe relationships between variables in context.

Concepts/Skills to support mastery of standards

● Identify different angles in circles

- Convert between radians and degrees
- Connect special right triangles and unit circle
- Graph and write equations of circles
- Derive area of sectors within circles

Vocabulary

Arc	Arc Length	Arc Measure	Central Angle	Chord	Circumcenter
Circumference	Circumscribed Circle	Inscribed	Inscribed Angle	Inscribed Circle	Major Arc
Minor Arc	Point of Tangency	Secant Line	Secant Segment	Sector	Tangent Line
Radian	Unit Circle	Sine	Cosine	Tangent	Standard Form

Notation

Rationalization of Radians $ax^2 + by^2 + cx + dy + e = 0$ $(x - h)^2 + (y - k)^2 = r$ $\sin(\theta)$ $\cos(\theta)$ $\tan(\theta)$

Key concept	Related concept(s)	Global context
Form	Equivalence, Patterns	Scientific and Technical Innovation - Mathematical puzzles, principles, and discoveries

Statement of inquiry
Analyzing the forms and patterns of circles can help to discover mathematical principles.

Inquiry questions

Factual—

- What are the parts of a circle?
- What are the properties of tangents?
- What are the properties of chords in a circle?
- What are the formulas for arc length and sector area?

Conceptual—

- How is a tangent line related to the radius of a circle at the point of tangency?

- How can we solve for angles and arcs by intersecting chords, tangents, and secants?

Debatable-

- How can you use measure and geometric knowledge of circles to design space cities with specific parameters?

MYP Objectives	Assessment Tasks	
What specific MYP __objectives__ will be addressed during this unit?	*__Relationship__ between summative assessment task(s) and statement of inquiry:*	*List of common formative and summative assessments.*
MYP A Knowledge and Understanding **MYP B** Patterns	Students will apply their knowledge and understanding of the Unit Circle to solve more complex problems. Students will be able to describe and effectively use the relationship between area and sectors of a circle to derive and justify the sector area formula for all sectors of circles.	**Formative Assessment(s):** CFA - Angles in Circles MYP B - Sector Area TOTD - Equations of Circles **Summative Assessment(s):** Unit 6 Part A Quest (MYP A) - Unit Circle Unit 6 Part B Test - Angles and Equations of Circles

Approaches to learning (ATL)
CFA and TOTD **Category:** Thinking Skills **Cluster:** Transfer **Skill Indicator:** Combine knowledge, understanding & skills to create products or solutions **Unit 6 Part A Quest** **Category:** Thinking Skills **Cluster:** Transfer **Skill Indicator:** Apply skills and knowledge in unfamiliar disciplines

Learning Experiences		
Add additional rows below as needed.		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
G.GSR.7.3 Students will use special right triangles and reflections to derive the unit circle.	**Special Right Triangles on the Coordinate Plane -** Diagnostic, Engage, Explore, Apply (DOE) https://teacher.desmos.com/activitybuilder/custom/6492fd48d5528f408544f4c1 **Description:** In this learning plan, students will use Desmos to locate special right triangles on the unit circle to determine the values of sine and cosine for 30° ($\pi/6$), 45° ($\pi/4$) and 60° ($\pi/3$) angle measures. **Learning Goals:** ● I can use my knowledge of special right triangles to find angle measures on the unit circle. ● I understand the relationship between cosine and sine and the x and y coordinates. ● I can explain how the unit circle connects to right triangles.	- Provide guided notes structure for Desmos activity - Provide hands-on visualization of Unit Circle - Extend: Guide students to discover or ponder other points on the unit circle not formed by the special right triangles
Content Resources		

Textbook Correlation: enVision A|G|A - Geometry

G.GSR.7.1 - Lesson 10-1; Algebra 2: Lesson 7-2

G.GSR.7.2 - Algebra 2: Lesson 7-2

G.GSR.7.3 - Algebra 2: Lesson 7-3

G.GSR.8.1 - Lesson 10-2, 10-3, 10-4, 10-5, Topic 10 - Mathematical Modeling in 3 Acts

G.GSR.8.2 - Lesson 10-1

G.GSR.8.3 - Lesson 9-3