Marietta City Schools

2024–2025 District Unit Planner

Advanced Algebra: Concepts & Connections

Unit title	Unit 7 (DOE Unit 6): Trigonometry and the Unit Circle	**Unit duration (hours)**	*13.5*

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

GA DoE Standards

Standards

AA.GSR.7: Develop an introductory understanding of the unit circle; solve trigonometric equations using the unit circle.

AA.GSR.7.1 Define the three basic trigonometric ratios in terms of x, y, and r using the unit circle centered at the origin of the coordinate plane.

Fundamentals

- This learning objective is applicable to all four quadrants of the unit circle.
- Students should connect the parts of the right triangle in the first quadrant to the corresponding parts of the unit circle where the hypotenuse is the radius, the adjacent side is x, and the opposite side is y.
- 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 $5\pi/6 \approx 2.617$ 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.

AA.GSR.7.2 Apply understanding of the angle measures and coordinates of the unit circle to solve practical, real-life problems involving trigonometric equations.

Fundamentals

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

Relevance and Application

- Students should find exact values from the unit circle to solve contextual problems such as a Ferris Wheel Rider's height above ground during a one revolution ride.
- Students should have the opportunity to solve situations like: If the tide height at a marina is modeled by $y = 3\cos(t) + 5.5$ with y measured in feet and t measured in hours, at what time is the tide a height of 4 feet.

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

AA.MM.1.1 Explain applicable, mathematical problems using a mathematical model.

Fundamentals

• Students should be provided with opportunities to learn mathematics in the context of culturally relevant problems.

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

AA.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

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

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

Fundamentals

• Students should be able to:

o analyze functions, graphs, tables, and equations and make decisions about the real-life situations they describe based upon their understanding of mathematical functions.

o analyze statistical results to decide the best course of action or approach to a problem.

Example

• Given a rectangle with length = (x – 2) and width = (2x + 3), a student could discover and articulate that the area = (x – 2)(2x + 3) = 2x2 – x – 6. From the student's understanding of parabolas, a student would know that the parabola that represents all possible areas of this rectangle opens upwards and that there is no maximum area possible for this rectangle.

AA.MM.1.4 Use various mathematical representations and structures to represent and solve real-life problems.

Fundamentals

• Students should be able to generate models, graphs, charts, and equations, to represent real-world phenomena in order to solve problems.

• Students should be provided opportunities to generate representations of real-world phenomena utilizing technology to show these phenomena and to solve problems.

Concepts/Skills to support mastery of standards

- Understanding the unit circle concept and its properties.
- Proficiency in calculating and interpreting sine, cosine, and tangent ratios on the unit circle.
- Application of trigonometric equations and concepts to solve real-life problems.
- Mastery of the relationship between angle measures and coordinates on the unit circle.
- Ability to use the unit circle to solve trigonometric equations algebraically and graphically.

Vocabulary

Arcsine	Arccosine	Arctangent	Central Angle	Circle	Circumference
Coordinate	Cosine	Coterminal Angle	Degree	Initial Side	Intercept
Minor Arc	Pi	Quadrant	Radian	Radius	Reference Angle
Reference Side	Rotation	Sine	Standard Position	Terminal Side	Unit Circle

Notation

sin(θ): Sine function, representing the ratio of the length of the opposite side to the length of the hypotenuse in a right triangle.
cos(θ): Cosine function, representing the ratio of the length of the adjacent side to the length of the hypotenuse in a right triangle.
tan(θ): Tangent function, representing the ratio of the length of the opposite side to the length of the adjacent side in a right triangle.
(x,y): Coordinates of a point on the unit circle, where x is the cosine of the angle and y is the sine of the angle.
r: Radius of the unit circle, typically equal to 1 unit.
θ: Angle measure, often represented in radians or degrees.

Essential Questions

What is the unit circle, and how does it relate to trigonometric functions?

How are the coordinates (x, y) of points on the unit circle related to the angle measure (θ) in radians or degrees?

What are the sine, cosine, and tangent ratios, and how are they defined in terms of the coordinates and radius on the unit circle?

How can understanding the unit circle help in solving trigonometric equations?

What strategies can be employed to solve practical, real-life problems involving trigonometric equations?

What are the limitations of trigonometric solutions in practical applications, and how can these limitations be addressed?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

Unit Quiz

Summative Assessment(s):

Unit will be assessed in the Cumulative Final Assessment of the course.

Learning Experiences Add additional rows below as needed.		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation** All information included by PLC in the differentiation box is the responsibility and ownership of the local school to review and approve per Board Policy IKB.
AA.FGR.7.1 **AA.FGR.7.2** **AA.MM.1**	**Right Triangles and The Unit Circle:** In this learning plan, students will be introduced to the unit circle and its relationship to trigonometric functions. They will explore the coordinates of points on the unit circle, the concept of reference angles, and the patterns and properties of sine, cosine, and tangent values. **Learning Goals** 1. I can find the reference angle of any angle on the unit circle. 2. I can evaluate the trig functions of any angle of the unit circle using reference angles. 3. I understand that the coordinates of a point on the unit circle at θ radians can be written as $(cos\theta, sin\theta)$. 4. I can use sine and cosine to figure out points rotating around a circle.	Using technology supports: DESMOS Graphic Organizers
Content Resources		
Textbook Correlation: enVision A|G|A - Algebra 2 **AA.GSR.7.1** - Lessons 7-2 **AA.GSR.7.2** - Lessons 7-2, 7-3		