Unit 08: Angles, Arcs, and Sectors

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 3**
Length: **2-3 weeks**
Status: **Published**

Brief Summary of Unit

Students will be introduced to the basic terminology of trigonometry, including radian measure, the six basic trigonometric functions, and their inverses.

Revised Date: July 2025

Standards

ELA.L.SS.11–12.1	Demonstrate command of the system and structure of the English language when writing or speaking.
ELA.L.VL.11–12.3	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, including technical meanings, choosing flexibly from a range of strategies.
MATH.9-12.F.BF.B.4	Find inverse functions.
MATH.9-12.F.BF.B.4.a	Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.
MATH.9-12.F.BF.B.4.b	Verify by composition that one function is the inverse of another.
MATH.9-12.F.BF.B.4.c	Read values of an inverse function from a graph or a table, given that the function has an inverse.
MATH.9-12.F.BF.B.4.d	Produce an invertible function from a non-invertible function by restricting the domain.
MATH.9-12.F.TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
MATH.9-12.F.TF.A.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
MATH.9-12.F.TF.A.3	Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.
MATH.9-12.F.TF.B.7	Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
WRK.9.2.12.CAP.5	Assess and modify a personal plan to support current interests and post-secondary plans.
WRK.9.2.12.CAP.13	Analyze how the economic, social, and political conditions of a time period can affect the labor market.
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).

TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

Essential Questions

- How are all of the basic trigonometric functions related to the unit circle, themselves, and their inverses?

Enduring Understandings

- Inverse trigonometric functions are related to the angles in a triangle.
- Reference angles can be used to find trig values of special angles (ex: sin 150 degrees is related to sin 30 degrees).
- The radian measure of an angle is related to the arc length.
- Trigonometric functions are “circular” functions and are based on a unit circle.

Students Will Know

- How to calculate the area of a sector and the length of an arc, using both the trigonometric and geometric formula.
- How to convert from radians to degrees and vice-versa, including degrees/minutes.
- How to draw angles in standard position, showing initial side, terminal side, and direction.
- How to evaluate sin^-1, cos^-1 and tan^-1 at special angles.
- How to find and apply reference angles.
- How to find basic trigonometric values, using the 30-60-90 and 45-45-90 triangles.
- How to find basic trigonometric values, using the unit circle.
- How to use calculators to find basic trigonometric values.
- What the relationship of the inverse functions is to the unit circle.
- Why calculators do not need to have a csc, sec or cot button.

Students Will Be Skilled At

- Converting angle measures in either degrees or radians.
- Drawing any angle in standard position, labeling all important information.
- Evaluating specific angles for the inverse trigonometric equations.
- Finding and using reference angles.
- Finding basic trigonometric values in a unit circle or either of the special triangles.
- Using calculators to find basic trigonometric values, and understanding why the inverse trigonometric functions are not included.

Assessment

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Class discussion of daily topic
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Define standard position, the quadrant measures, and drawing positive and negative angles (all in degrees). Discuss coterminal angles in both positive and negative directions.
- Convert degrees to radians and radians to degrees. Use this information to reframe standard position, quadrant measures, and coterminal angles in radians.
- Introduce reference angles, and how to solve for them in each quadrant.
- Recall how to find arc length and sector area from geometry.
- Recall sine, cosine, and tangent from geometry. Specifically discuss these trigonometric ratios for special angles such as 30, 45, and 60 degrees using the unit circle.
- Introduce reciprocal trigonometric ratios, and discuss specifically for the special angles in the unit circle.
- Expand all six ratios to solving the ratios of reference angles and the quadrantal angles using the coordinate point on the unit circle.
- Solve for other five trigonometric ratios when given one ratio. This can use the unit circle or any triangle described.
- Use a calculator to solve for any of the six trigonometric ratios is the angle given is not a special angle.

Graphing calculators are encouraged to be used as an extension of these topics.

Materials

Core instructional materials: Core Book List including PreCalculus Enhanced with Graphing Utilities, Sullivan, Savvas

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activiites
- Teacher created notes
- Whiteboard tables

Integrated Accommodation & Modifications

Possible accommodations/modification for CP PreCalc & Trig