

# 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

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

## Standards

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LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.K-12.NJSLSA.L5	Demonstrate understanding of word relationships and nuances in word meanings.
MA.F-BF.B.4	Find inverse functions.
MA.F-BF.B.4a	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.
MA.F-BF.B.4b	Verify by composition that one function is the inverse of another.
MA.F-BF.B.4c	Read values of an inverse function from a graph or a table, given that the function has an inverse.
MA.F-BF.B.4d	Produce an invertible function from a non-invertible function by restricting the domain.
MA.F-TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
MA.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.
MA.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, cosines, and tangent for $\pi - x$ , $\pi + x$ , and $2\pi - x$ in terms of their values for $x$ , where $x$ is any real number.
MA.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.
TEC.K-12.8.1	All students will use computer applications to gather and organize information and to solve problems.
TEC.K-12.8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual society, and the environment.
WORK.K-12.9.1	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.
WORK.K-12.9.2	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.

## Transfer

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- Noticing repetitive, circular movements that could be applied from pendulum swings.
- Recognizing trigonometric graphs in waves of water, light, and sound.

## Essential Questions

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

## Essential Understandings

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- Inverse trigonometric functions are related to the angles in a triangle.
- Reference angles can be used to find trig values of special angles. (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

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- 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

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- 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.

## Evidence/Performance Tasks

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### 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
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- Answer essential questions
  - Calculate the arc length and area of a sector with a given radius and central angle.
  - Class discussion of daily topic
  - Draw angles in standard position, showing initial side, terminal side, and direction.
  - Evaluate inverse trigonometric expressions.
  - Find  $\sin 150^\circ$  by knowing  $\sin 30^\circ$ .
  - Find the remaining five trigonometric functions, given information about one of them.
  - Have students create and share with the class a trig reference sheet that combines all important facts about trig including special triangles, unit circle, signs based on quadrants, etc.
  - Measure angles using degrees/minutes and radians interchangeably.
  - Provide alternative means of assessments for certain students
  - Teacher Observation
  - Tests and quizzes that assess the essential questions
  - Use the unit circle or  $30^\circ$ - $60^\circ$ - $90^\circ$ / $45^\circ$ - $45^\circ$ - $90^\circ$  triangles to find trigonometric values of special angles.
  - Utilize reference and co-terminal angles to evaluate trig expressions.
  - Written assignments that assess the essential questions that involves providing explanations

## Learning Plan

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- Arc length and area of a sector.
- Sine, cosine, and tangent with the use of calculators.
- Cotangent, secant, and cosecant of special angles without a calculator.

- Cotangent, secant, and cosecant with the use of calculators.
- Draw angles in standard position.
- Preview the essential questions and connect to learning throughout the unit.
- Radian measure.
- Sine, cosine, and tangent of special angles without a calculator.
- The graphing calculators will be used to enhance the graphs of the trigonometric functions and their inverses.
- The trigonometric inverse functions.

## **Materials**

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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 activities
- Teacher created notes
- Whiteboard tables

## **Suggested Strategies for Modifications**

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[Possible accommodations/modification for CP PreCalc & Trig](#)