Marking Period: 3	Unit Title: Trigonometric Functions	Recommended Instruction Days: 35 - 40

Standard-New Jersey Student Learning Standards: F-IF, F-TF, G-SRT, G-C
Trigonometric Functions (Chapter 4)

Strand:

F-IF: Interpreting Functions

Analyze functions using different representations

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

F-TF: Trigonometric Functions

Extend the domain of trigonometric functions using the unit circle

1. Understand radian measure of an angle as the lengths of the arc on the unit circle subtended by the angle.
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 transverse counterclockwise around the unit circle.
3. Use special triangles to determine geometrically the values of sine, cosine, and tangent for $\pi/3$, $\pi/4$, and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for x, π + x, and 2π - x in terms of their values for x, where x is any real number.
4. Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

Model periodic phenomena with trigonometric functions

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
6. Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
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.

G-SRT: Similarity, Right Triangles, and Trigonometry

Define trigonometric ratios and solve problems involving right triangles

8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

G-C: Circles

Find arc lengths and areas of sectors of circles

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*

Troy Lee Hudson - openly gay engineer at NASA's Jet Propulsion Laboratory

The mission is to ensure that every student is able to see themselves in our rich and diverse history.

Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***
Self-Awareness Social Awareness Self-Management Relationship Skills Responsible Decision-Making	• Recognizing the importance of self-confidence in handling daily tasks and challenges. • Demonstrate an awareness of the expectations for social interactions in a variety of ways. • Demonstrate an understanding of the need for mutual respect when viewpoints differ. • Recognize the skills needed to establish and achieve personal and educational goals. • Utilize positive communication and social skills to interact effectively with others. • Develop, implement, and model effective problem solving and critical thinking skills.

Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit

Essential Questions	**Progress Indicators**	**Activity Description**

• How can the values of trigonometric functions be determined without a calculator? • What are the main components used for graphing sinusoids? • How can inverse trigonometric functions be defined and what are they used for?	• Tests • Quizzes • Practice problems for homework • Worksheets • Leveled assessments • Projects	❖ Angles and Their Measure ❖ Trigonometric Functions of Acute Angles ❖ Trigonometry Extended: The Circular Functions ❖ Graphs of Sine and Cosine: Sinusoids ❖ Graphs of Tangent ❖ Example Tasks Below **Interdisciplinary Connections:** **Arts:Music Domain: Generating and Conceptualizing Ideas** If we know that the musical note A above middle C has a pitch of 440 Hertz, how can we model the sound produced by it at 80 decibels? **Answer:** Sound is modeled by simple harmonic motion, with frequency perceived as pitch and measured in cycles per second, and amplitude perceived as loudness and measured in decibels. So for the musical note A with a pitch of 440 Hertz, we have frequency $\frac{w}{2\pi} = 440$and therefore $w = 2\pi 440 = 880\pi$.If this note is played at a loudness of 80 decibels, we have |a| = 80. Using simple harmonic motion model $d = asinwt = 80sin880\pi t$. **Task** • Evaluate without using a calculator by using ratios in a reference triangle. a. tan 300° b. csc(3π/4) c. cos(7π/3) d. cot(13π/4) e. cos(17π/4) **Answer**

a. $-\sqrt{3}$
b. $\sqrt{2}$
c. $\frac{1}{2}$
d. 1
e. $\sqrt{2}/2$

Task

- Use the unit circle to find the values of the six trigonometric functions for each angle.

a. 45°
b. 150°
c. 315°
d. 210°
e. 330°

Answer

Sin	Cos	Tan	Csc	Sec	Cot
$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	$\frac{\sqrt{2}}{1}$	$\frac{\sqrt{2}}{1}$	1
$\frac{1}{2}$	$\frac{-\sqrt{3}}{2}$	$\frac{-\sqrt{3}}{3}$	2	$\frac{-2\sqrt{3}}{3}$	$-\sqrt{3}$
$\frac{-\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	-1	$\frac{-\sqrt{2}}{1}$	$\frac{\sqrt{2}}{1}$	-1
$\frac{-1}{2}$	$\frac{-\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$	-2	$\frac{-2\sqrt{3}}{3}$	$\sqrt{3}$
$\frac{-1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{-\sqrt{3}}{3}$	-2	$\frac{2\sqrt{3}}{3}$	$-\sqrt{3}$

Spot Light On: *Acknowledge every student's comment or response, even if it's incorrect.*

Mathematical Practices

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
7. **Look for and make use of structure.**
8. **Look for and express regularity in repeated reasoning.**

Assessments (Formative) ***To show evidence of meeting the standard/s, students will successfully engage within:***	**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***
<u>Formative Assessment:</u> ● Entry and Exit Slips ● Quizzes ● Self Assessments	**<u>Benchmarks:</u>** ● Chapter Tests ● Projects

● Focus Packets	**<u>Summative Assessments:</u>** ● District assessments

Differentiated Student Access to Content:
Teaching and Learning *Resources/Materials*

Core Resources	**Alternate Core Resources *IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core Resources**
online albert resource online achievethecore resource online learnzillion resource online khanacademy resource online desmos resource online edulastic resource	Reteaching worksheets Skill building workbook Math manipulatives Leveled practice worksheets	Dictionary for native language Video tutorial in native language Success for English Learners worksheets Leveled Strategies for English Learners Linguistic Support	Enrichment worksheets Art of Problem Solving Leveled assessments

Supplemental Resources

- Technology: Chromebooks, Graphing Calculators, Smartboards,
- Other: Zoom and Google Meets, Schoology, Google Classroom

Differentiated Student Access to Content:
Recommended *Strategies & Techniques*

Core Resources	Alternate Core Resources *IEP/504/At-Risk/ESL*	ELL Core Resources	Gifted & Talented Core Resources
Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat	Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.	Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric.	Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related

New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)											
	Amistad Law: *N.J.S.A. 18A 52:16A-88*		Holocaust Law: *N.J.S.A. 18A:35-28*	**x**	LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*	**x**	Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*		Standards in Action: *Climate Change*