Algebra 2 Level A Unit 10

Marking Period	Unit Title	Recommended Instructional Days
4	Trigonometric Functions	15-20 days

Domain: Functions

NJSLS Strand:

Key:

Major Cluster
Supporting Cluster
Additional Cluster

A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A-CED.A.3 Represent constraints by equations or

Progress Indicator:
Tests • Quizzes • Practice problems for homework • Online textbook • Worksheets • Leveled assessments

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

Essential Question/s:
How are trigonometric functions used to solve real-world problems?

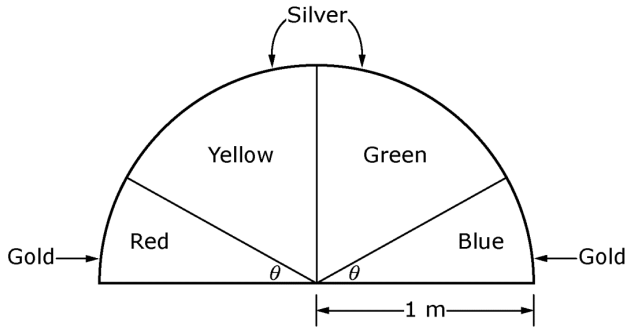
Activity Description:
Angles of Rotation
Special Right Triangles
The Unit Circle
Graphs of sine/cosine/tangent

Interdisciplinary Connections: Art Domain ; Content: Creating; NJSLS#: 1.2.8.Cr1a:
The top of a door is to be decorated with stained glass panes that are arranged in a semicircular shape as shown below. The radius of the semicircular shape is 1 meter and its outside edge is trimmed with metal cord. The red and blue sectors are trimmed with gold cord and the yellow and green sectors are trimmed with silver cord, as shown in the diagram below.

inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

F-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given in a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.**

F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function *h(n)* gives the number of person-hours it takes to



If the angle θ in the red and blue sectors measures 0.5 radians, what length of silver cord is needed?

Answer:

$\pi - 1$ meters or 2.14 meters

Example Tasks:

At the end of each topic please review the Assessment Practice and Performance Tasks questions.

Task 1

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. -√3

assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. ★

F-IF.C.7. Graph functions expressed symbolically and show key features if the graph, by hand in simple cases and using technology for more complicated cases.*

a.Graph linear and quadratic functions and show intercepts, maxima, and minima

b.Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

c.Graph polynomial functions, identifying zeros, when suitable factorizations are available, and showing end behavior.

d.(+) Graph rational functions, identifying zeros, and asymptotes when suitable factorizations are available, and showing end behavior.

e.Graph exponential and logarithmic functions, showing

b. √2
c. ½
d. 1
e. √2/2

Task 2:

Find the amplitude, the period in radians, the phase shift in radians, the vertical shift, and the maximum and minimum values. Then sketch the graph using radians.

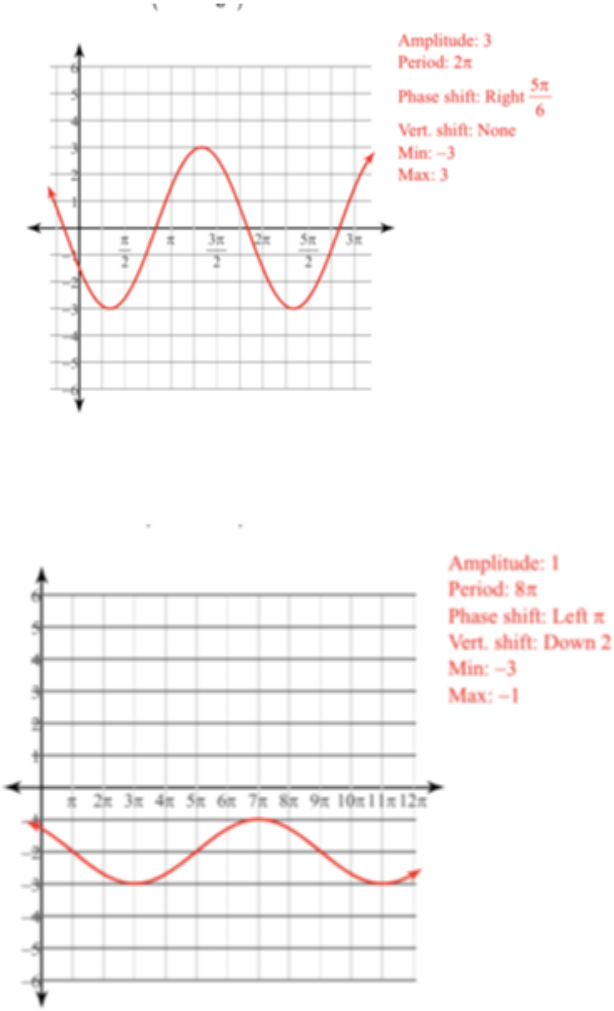
a)

$$y = 3\sin\left(\theta - \frac{5\pi}{6}\right)$$

b)

$$y = \cos\left(\frac{\theta}{4} + \frac{\pi}{4}\right) - 2$$

Answer:

intercept and end behavior, and trigonometric functions, showing period, midline, and amplitude. **F-BF.B.3** Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x +k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* **F-TF.A.1 (+)** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. **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.		

F-TF.A.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosines, and tangent for x, π + x, and 2π –x in terms of their values for x, where x is any real number. **F-TF.A.4** (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. **F-TF.B.5 (+)** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. **F-TF.B.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. **F-TF.B.7** (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret		**Task 3:** Find the transformations required to obtain the graph starting with a basic trig function. a) $y = 5\cos\left(\theta + \frac{5\pi}{6}\right)$ b) $y = 5 + \sin\left(8\theta + \frac{3\pi}{4}\right)$ c) $y = \sin\left(\theta - \frac{\pi}{6}\right) - 2$ d) $y = \frac{1}{10} \cdot \tan\left(\theta - \frac{\pi}{3}\right)$ **Answer:**

them in terms of the context.*		a) Starting with $\cos\theta$, vertically stretch by 5, translate left $\frac{5\pi}{6}$ b) Starting with $\sin\theta$, horizontally shrink by $\frac{1}{8}$, translate left $\frac{3\pi}{32}$, translate up 5 c) Starting with $\sin\theta$, translate right $\frac{\pi}{6}$, translate down 2 d) Starting with $\tan\theta$, vertically shrink by $\frac{1}{10}$, translate right $\frac{\pi}{3}$ **Task 4:** Evaluate: a. $\sin\left(\frac{7\pi}{6}\right)$ b. $\sin\left(-\frac{\pi}{6}\right)$ c. $\sin\left(\frac{11\pi}{6}\right)$ d. $\sin\left(\frac{19\pi}{6}\right)$ **Answer:** **a, b, c, d all equal -1/2** **At the end of each topic please review the Assessment Practice and Performance Tasks questions.**

ASSESSMENT PRACTICE

21. Find the key features of the function $y = 8\cos\left(\frac{\pi}{6}x\right)$. Write the correct value from the box next to each key feature.

amplitude =

period =

frequency =

midline =

3	8	12
$\frac{1}{8}$	$\frac{1}{12}$	$\frac{\pi}{3}$
$x = 0$		$y = 0$

		Performance Task Danielle is investigating how the signs of the parameters a and b create transformations of the sine function. **Part A** Graph $y = (\sin 2x)$ and $y = -\sin(2x)$ on the same coordinate plane. **Part B** How are the graphs of $y = \sin(2x)$ and $y = -\sin(2x)$ related? **Part C** Graph $y = \sin(2x)$ and $y = \sin(-2x)$ on the same coordinate plane. **Part D** How are the graphs of $y = \sin 2x$ and $y = \sin(-2x)$ related? **Part E** How is the graph of $y = a\sin(bx)$ affected when a or b is replaced with its opposite? Explain. **Spot Light on: LGBT&Q** **Wanda Diaz-Merced is an astronomer best known for using sonifications to turn large data sets into audible sound. She currently works at the International Astronomical Union Office for Astronomy Outreach in Mitaka, Japan.**

Mathematics Practices	
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reason 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.	
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.

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 Assessments:</u> ● Entry and Exit Slips ● Quizzes ● Self Assessments	**<u>Benchmarks:</u>** ● Chapter Tests ● Projects ● LinkIT **<u>Summative Assessments:</u>** ● District Assessments ● Midterms ● Standardized Tests

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**
● Savvas Envision ● Achieve the core ● Khan Academy ● Desmos	● Skill building worksheets ● Math Manipulatives	● Dictionary for native languages ● Videos in their native language.	● Leveled Assessments ● Enrichment worksheets

Supplemental Resources
Technology: ● **Chromebooks, Graphing Calculators, Smartboards** **Other:** ● **Zoom and Google Meets, Schoology,, Interactive Textbooks**

Differentiated Student Access to Content: **Recommended *Strategies & Techniques***			
Core Resources	**Alternate Core Resources**	**ELL Core Resources**	**Gifted & Talented Core**

	IEP/504/At-Risk/ESL		
• **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**

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept: Creativity and Innovation**	
	Core Ideas:	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.
	Performance Expectation/s:	• 9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. • 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
	Career Readiness, Life Literacies, & Key Skills Practices	

	Act as a responsible and contributing community member and employee. **Attend to financial well-being.** **Consider the environmental, social and economic impacts of decisions.** **Demonstrate creativity and innovation.** **Utilize critical thinking to make sense of problems and persevere in solving them.** **Model integrity, ethical leadership and effective management.** **Plan education and career paths aligned to personal goals.** **Use technology to enhance productivity, increase collaboration and communicate effectively.** **Work productively in teams while using cultural/global competence.**

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*		Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*		Standards in Action: *Climate Change*