Trigonometry

Instructional Focus: Use unit circles and inverse trigonometric functions

	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No
	4 – Iviastery	3 - FIORGER	2 - Dasic		Evidence
Use special	Can extend	Use special triangles to	Use special triangles to	Use special triangles to	Little
triangles	thinking beyond	determine the values of	determine the values of	determine the values of	evidence
(F.TF.3)	the standard,	sine, cosine, tangent,	sine, cosine, tangent,	sine, cosine and tangent for	of
	including tasks	secant, cosecant, and	secant, cosecant, and	$\pi/6$, $\pi/4$ and $\pi/3$	reasoning
	that may involve	cotangent for 0, $\pi/6$, $\pi/4$ and $\pi/3$, $\pi/2$ and $\frac{\text{use the}}{}$	cotangent for $\underline{0}$, $\pi/6$, $\pi/4$, $\pi/3$ and $\pi/2$		or
	one of the	unit circle to express the	Ny Santa <u>Ny Z</u>		application
	following:	values of sine, cosine,			to solve
		tangent, secant, cosecant,			the
	 Designing 	and cotangent for $\pi-x$, $\pi+x$,			problem
	Connecting	and 2π-x in terms of their			•
	Synthesizing	values for x, where x is any			
	-	<u>real number</u>			Does not
Use unit	7.66.78	Use the unit circle to	Use the unit circle to	Use the unit circle to	meet the
circles to	JustifyingCritiquing	express any angle, including negative angles and angles	express any angle, between 0 and 2π , in terms of its	express any angle, between 0 and 2π , in terms of its	criteria in
find values	5.1.1.4.1.18	involving more than 1	standard position to find	standard position to find	a level 1
(F.TF.4)	Analyzing	rotation, in terms of its	ALL 6 trig functions.	the <u>sine</u> , <u>cosine</u> , <u>and</u>	a level 1
	Creating	standard position to find <u>all</u>		tangent functions.	
	Proving	<u>six</u> trigonometric functions.			
Construct		Construct an invertible	Identify a domain that will	Given a portion of a	
Inverse		trigonometric function by	allow construction of the	trigonometric graph,	
trigono-		restricting the domain so	inverse of a trigonometric	identify if that part of the	
metric		that the function is always	function, because the	graph is invertible	
functions		increasing or decreasing	function would be always increasing or decreasing		
(F.TF.6)			increasing of decreasing		
Use inverse		Use inverse functions to	Use inverse functions to	Use inverse functions to	
trigono-		solve trigonometric	solve trigonometric	solve trigonometric	
metric		equations with restricted	equations with restricted	equations with <u>restricted</u>	
functions		and unrestricted domains	and unrestricted domains	<u>domains</u>	
(F.TF.7)		and interpret the solutions			
Pythagor-		in context of the situation Prove the Pythagorean	Use the Pythagorean	Use the Pythagorean	
ean		identity $sin^2(\theta) + cos^2(\theta) =$	identity $sin^2(\theta) + cos^2(\theta) =$	identity $sin^2(\theta) + cos^2(\theta) =$	
identity		1 and use it to find $sin(\theta)$,	1 to find $sin(\theta)$, $cos(\theta)$,	1 to find $sin(\theta)$, $cos(\theta)$, or	
(F.TF.8)		$cos(\theta)$, and $tan(\theta)$	and $tan(\theta)$	$tan(\theta)$	
1 1 1	/3				
Given $\cos \theta = \frac{1}{2}$	2				

F.TF.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. Functions F.TF.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

F.TF.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.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.★

F.TF.8 Prove the Pythagorean identity $sin^2(\theta) + cos^2(\theta) = 1$ and use it to find $sin(\theta)$, $cos(\theta)$, or $tan(\theta)$ given $sin(\theta)$, $cos(\theta)$, or $tan(\theta)$ and the quadrant of the angle.

Trigonometry

Instructional Focus: Graph and transform trigonometric functions

	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Symmetry and	Can extend thinking beyond	Use the unit circle to explain symmetry (odd and even) of	Use the unit circle to explain symmetry (odd and even) of	Use the unit circle to explain symmetry (odd and even) of	Little evidence
periodicity	the standard,	the six trigonometric	the sine, cosine, <u>and</u>	the sine and cosine	of
of trigono-	including tasks	functions.	tangent functions.	functions.	reasoning
metric	that may involve				or
functions	one of the	Use the periodicity of the	Use the periodicity of the	Use the periodicity of the	application
(F.TF.4)	following:	unit circle to explain the	unit circle to explain the	unit circle to explain the	to solve
		repeated cycle of the graphs	repeated cycle of the graphs	repeated cycle of the graphs	the
	 Designing 	of <u>all six</u> trigonometric	of sine, cosine, <u>and tangent</u>	of sine and cosine	problem
	 Connecting 	functions.	functions.	functions.	Does not
Identify	 Synthesizing 	Identify the effect on a	Identify the effect on a	Identify the effect on a	meet the
and Find	 Applying 	graph by replacing f(x) with	graph by replacing f(x) with	graph by replacing f(x) with	criteria in
Transfor-	 Justifying 	more than two	<u>two</u> transformations:	a single transformation:	a level 1
mations	 Critiquing 	transformations:	f(x) + k, k f(x), f(kx), f(x+k)	f(x) + k, k f(x), f(kx), f(x+k)	
(F.BF.3)	 Analyzing 	f(x) + k, k f(x), f(kx), f(x+k)	for specific positive and	for specific positive and	
	 Creating 	for specific positive and	negative values of <i>k</i>	negative values of k	
	 Proving 	negative values of <i>k</i>			
			Given the graph of a	Given the graph of a	
		Given the graph of a	function and <u>two</u>	function and a single	
		function and more than two	transformations, find the	transformation, find the	
		transformations, find the	values of the constants and	value of the constant or	
		values of the constants and	coefficients	coefficient	
		coefficients			
			Recognize even and odd	Recognize even and odd	
		Given a partial graph,	functions from graphs and	functions from graphs	
		complete the graph for	<u>equations</u>		
		both even and odd			
		functions			
Identify key		Graph trigonometric	Graph trigonometric	Given the graph or	
features of		functions, and interpret all	functions, and identify all	equation of trigonometric	
graphs		related key features of a	related key features of a	functions, identify all	
(F.IF.7)		graph in context of a real	graph.	related key features of a	
		world situation.	 asymptotes 	graph.	
		 asymptotes 	period	 asymptotes 	
		period	 midline 	period	
		 midline 	 amplitude 	 midline 	
		 amplitude 		 amplitude 	

Graphing F.TF.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

F.BF.3 (+) Identify the effect on the graph of replacing f(x) by f(x) + k, k f(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.IF.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.

Trigonometry

Instructional Focus: Prove and use trigonometric functions

	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No
					Evidence
Prove and	Can extend	Prove the addition and	Prove the addition and	Use the addition,	Little
use	thinking beyond	subtraction formulas for	subtraction formulas for	subtraction, and tangent	evidence
formulas	the standard,	sine, cosine, and tangent	sine, cosine, and tangent	formulas to solve numerical	of
(F.TF.9)	including tasks	and use the addition and	and use them to solve	problems	reasoning
	that may involve	subtraction formulas to	numerical problems		or
	one of the	solve <u>identities</u>			application
	following:				to solve
Derive		Explain how to derive the	Explain how to derive the	Find the area of any triangle	the
area	Designing	formula: $A = 1/2 ab \sin(C)$	formula: $A = 1/2 ab \sin(C)$	using the formula:	problem
formula	Designing	for the area of a triangle,	for the area of a triangle,	$A = 1/2 \ ab \ sin(C)$	prosession.
(G.SRT.9)	Connecting	and utilize it to find the area	and utilize it to find the area		Does not
	Synthesizing Applying	of a polygon composed of	of a triangle		meet the
	- Applying	multiple triangles			criteria in
	Justifying				a level 1
Law of	Critiquing	Apply the Law of Sines and	Apply the Law of Sines <u>and</u>	Apply the Law of Sines <u>or</u>	a level 1
Sines and	Analyzing	the Law of Cosines to find	the Law of Cosines to find	the Law of Cosines to find	
Cosines	Creating	unknown measurements in	unknown measurements in	unknown measurements in	
(G.SRT.10	Proving	oblique triangles <u>and</u>	oblique triangles	oblique triangles	
and 11)		interpret solutions in			
		context of real-world			
		<u>situations</u>			

F.TF.9 (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

G.SRT.9 (+) Derive the formula A = 1/2 $ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems.

G.SRT.11 (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).