

Probability, Statistics & Trigonometry: Trigonometry

Stage 1 Desired Results		
ESTABLISHED GOALS: Competencies: - Students will demonstrate perseverance and strategic thinking by identifying the underlying meaning of a problem, planning a logical solution pathway, working through challenges, and verifying the reasonableness of their answers. - Students will demonstrate the ability to decontextualize (represent symbols) and contextualize (understand the meaning of quantities) by converting real-world situations into mathematical symbols for manipulation, and interpreting symbolic results back into practical contexts. - Students will demonstrate logical thinking and communication skills by building justified mathematical arguments, comprehending the justification of others, and critiquing their reasoning. - Students will demonstrate application skills by using mathematical concepts and symbols to represent, analyze, and solve problems arising in everyday life, society, and the workplace. - Students will demonstrate resourcefulness by evaluating and selecting the most effective tools to solve mathematical problems and deepen their understanding of concepts. - Students will demonstrate accuracy and clarity using correct mathematical terminology, specifying units of measure, and calculating with the degree of precision appropriate for the problem context. - Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials. - Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences. - Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style. Content Standards: - HSG.SRT.C.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. - HSG.SRT.C.7 Explain and use the relationship between the sine and cosine of complementary angles. - HSG.SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. - HSG.SRT.D.9 (+) Derive the formula $A = \frac{1}{2} ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite - HSN.VM.A.1 (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\mathbf{v}$, $\mathbf{v}$, $\mathbf{v}$, v). - HSN.VM.A.2 (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.	Transfer	
	Students will be able to independently use their learning to understand and make predictions involving periodic phenomena.	
	Meaning	
	ENDURING UNDERSTANDINGS Students will understand that... in order to solve problems involving physical phenomena which carry a direction, the mathematics must consider both the magnitude and the direction.	ESSENTIAL QUESTIONS - How can we use trigonometry to solve problems with real world applications? - How can we use trigonometry as a tool to describe the world around us?
	Acquisition	
	Students will know... - that trig definitions describe a specific ratio between two sides of a right triangle and are unitless. - that right triangles can be used to solve problems that would be impossible to solve using direct measure. - six trig definitions from two contexts - coordinate standpoint x, y, r - geometric standpoint opposite leg length, adjacent leg length, hypotenuse length - exact and decimal values of trig ratios for the construction triangles: 45°-45°-90° and 30°-60°-90° - the basic trig identities. - the cofunction theorem. - that 1 degree = 60 minutes and 1 minute = 60 seconds $r@\theta^\circ$ format for vector quantities - that approximately 6 radians exist on the edge of a given circle relative to its size - that radians are unitless but a more accurate measure than degrees. - the difference between linear and angular velocities	Students will be skilled at... - calculating exact and decimal values of six trig functions given one. (x,y) point on the terminal side of theta ϑ in standard position. - calculating exact and decimal values of six trig functions given one angle and one side of a right triangle. - calculating exact and decimal values of six trig functions given only an angle that is an increment of 30° or 45°. - calculating exact and decimal values of remaining trig functions given one trig ratio in any quadrant. - calculating and interpreting a reference angle given a trig ratio. - using trig identities to prove equivalencies. - converting angle measure between decimal degrees and degrees, minutes, seconds formats. - determining the measurements of missing sides and angles in a right triangle, including multiple right triangles in a single situation. - calculating the height of an object indirectly - representing vectors accurately using graph paper, ruler, protractor to scale as well as abstractly. - drawing and labeling an accurate representation of

- CCSS.MATH.CONTENT.HSN.VM.A.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors. - HSN.VM.B.4 (+) Add and subtract vectors. - Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. - HSN.VM.B.5 (+) Multiply a vector by a scalar. - Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$. - MP1 Make sense of problems and persevere in solving them. - MP2 Reason abstractly and quantitatively. - MP4 Model with mathematics. - MP6 Attend to precision. - MP7 Look for and make use of structure. - MP8 Look for and express regularity in repeated reasoning.	<i>how unit analysis can assist to solve for missing information and to interpret given information.</i> <i>how the graphs of sine, cosine and tangent connect</i> <i>the criteria needed to determine which Law to apply when trying to find missing information given an oblique triangle.</i> <i>Law of Sines and Law of Cosines</i> <i>Vocabulary: initial side or ray, terminal side or ray, standard position, positive angle, negative angle, rotation, coterminal angles, sine, cosine, tangent, cosecant, secant, cotangent, reference angle, reciprocal identities, ratio identities, Pythagorean identities, odd-even identities,, refined angular measurement: degrees, minutes, seconds, angle of elevation, angle of depression, bearing vs. course, vector, scalar, vector components, resultant vector</i>	<i>a vector equation(i.e. $\vec{r}=3\vec{u}+2\vec{v}$ if $\vec{u}=3\text{cm}@20^\circ$ and $\vec{v}=7\text{cm}@52^\circ$).</i> <i>adding and subtracting vectors.</i> <i>multiplying a scalar by a vector.</i> <i>modeling navigation by using vectors.</i> <i>sketching angles of rotation in standard position given a radian or degree measure.</i> <i>converting angles between degree and radian measure.</i> <i>determining the reference angle for a given theta of rotation (in degrees or radian form)</i> <i>interpreting and using all values labeled on the unit circle.</i> <i>calculating and interpreting arc length in context</i> <i>calculating and interpreting area sector in context</i> <i>calculating and interpreting linear and angular velocities given a real life context.</i> <i>solving equations using inverse functions.</i> <i>graphing sine, cosine and tangent functions.</i> <i>applying Law of Cosines depending on the given information</i> <i>calculating the area of an oblique triangle given only SAS or SSS information.</i>
Content Area Literacy Standards		21st Century Skills
- RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. - RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. - RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 11-12 texts and topics</i>. - RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. - RST.11-12.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. - RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. - RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.		<i>reason effectively</i> <i>use systems thinking</i> <i>solve problems</i> <i>be flexible</i>

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S):

	OTHER EVIDENCE:
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Stage 3 – Learning Plan <i>Summary of Key Learning Events and Instruction</i>	
<i>Language Arts Integration</i>	<i>Mathematics Integration</i>
1.OA.1 Use	1.OA.1 Use
<i>Technology Integration</i>	<i>District Materials</i>
1.OA.1 Use	