Trigonometry and Statistics

2013-2014

Chris Foley cfoley@lrhsd.org ext. 8465

Chris Callinan ccallinan@lrhsd.org ext. 8364

Robert Kibler rkibler@lrhsd.org ext. 8583

Mike Spera mspera@lrhsd.org ext. 8340

Unit #2 Trigonometry

Stage 1 – Desired Results

Established Goals

2009 NJCCC Standard(s), Strand(s)/CPI #
(http://www.nj.gov/education/cccs/2009/final.htm)

Common Core Curriculum Standards for Math and English
(http://www.corestandards.org/)

Reasoning with Equations A.REI: #10
- Represent and Solve Equations and Inequalities Graphically

Creating Equations A.CED: #2
- Create Equations that Describe Numbers and Relationships

Interpreting Functions F.IF: #1,2,4,5,7
- Understand the Concept of a Function and Function Notation
- Interpret Functions that Arise in Applications in Terms of the Context

Interpreting Categorical and Quantitative Data S.ID: #7
- Interpret Linear Models

21st Century Themes
(www.21stcenturyskills.org)

___ Global Awareness
_x__Financial, Economic, Business and Entrepreneurial Literacy
___Civic Literacy
___Health Literacy
___Environmental Literacy

21st Century Skills

Learning and Innovation Skills:
_x__Creativity and Innovation
_x__Critical Thinking and Problem Solving
_x__Communication and Collaboration

Information, Media and Technology Skills:
___Information Literacy
___Media Literacy
_x__ICT (Information, Communications and Technology) Literacy

Trigonometric Functions F.TF: #1-9 • Extend the Domain of the Trigonometric Functions Using the Unit Circle • Model Periodic Phenomena with Trigonometric Functions • Prove and Apply Trigonometric Identities **Similarity, Right Triangles and Trigonometry G.SRT: #9-11** • Apply Trigonometry to General Triangles **Building Functions: F.BF: #1** • Build a Function that Models a Relationship between Two Quantities **Building Functions: F.BF: #4** • Build New Functions from Existing Functions **Similarity, Right Triangles and Trigonometry G.SRT: #8** • Define Trigonometry Ratios and Solve Problems Involving Right Triangles	*Life and Career Skills:* _x__Flexibility and Adaptability _x__Initiative and Self-Direction ___Social and Cross-Cultural Skills _x__Productivity and Accountability _x__Leadership and Responsibility
Enduring Understandings: *Students will understand that .* *EU 1* trigonometric functions and inverse trigonometric functions can be used to solve real world problems. *EU 2* the language of mathematics is used to express ideas precisely through reasoning, graphical representations, and communication. *EU 3* algebraic and geometric properties are used in trigonometry to solve problems and justify reasoning.	**Essential Questions:** *EU1* • How can you apply the properties of trigonometric functions to help solve real life phenomena? • How does modeling of functions lead to more effective decisions? *EU2* How do you evaluate trigonometric functions using the unit circle? *EU 3* • What are the relationships between the sides and angles of special right triangle as it relates to trigonometry? • How can you use the graph of a trigonometric function to determine its characteristics?

Knowledge: *Students will know . . .*	**Skills:** *Students will be able to . . .*
EU 1 that properties of triangles can be used to make connections to trigonometric functions values.	*EU 1* identify and find side lengths of right triangles.
EU 2 • the similarities between sine and cosine graphs • a relationship exists between radians and degrees. • the unit circle can be used to evaluate the trigonometric functions of special angles.	*EU 2* • graph the sine and cosine curves and identify their similarities. • shift trigonometric function graphs. • find coordinates of points on the unit circle. • apply the Unit Circle to evaluate trigonometric functions. • convert angles from radians to degrees. • measure an angle using radians. • determine a reference angle from a given angle.
EU 3 • each trigonometric function has an reciprocal function. • each trigonometric function has an inverse function. • each non-acute angle has a reference angle that can be obtained and its trigonometric values calculated.	*EU 3* using the relationship between the trigonometric functions, convert trigonometric value from one trigonometric function to another trigonometric function

Stage 2 – Assessment Evidence

Recommended Performance Tasks (*EU 1,2*)

During one year, the amount of daylight each day on the Arctic and Antarctic Circles varies from 0 hours to 24 hours. Knowing that both graphs are periodic and one of the circles is represented by the sine and the other by the cosine curve, describe specifically how the graphs are related and the sunlight at a given time during the year is relatable to both circles. Describe in your presentation how, if you lived at one of the circles, you could calculate the light at the other circle.

Provide an oral/written/visual presentation of your finished product, including the calculations used in your project to your class.

All other specifications and requirements are to be determined by the classroom teacher.

Other Recommended Evidence: *Tests, Quizzes, Prompts, Self-assessment, Observations, Dialogues, etc.*

Tests and quizzes to include:

- Conversion of angles from degrees to radians and vice versa;
- giving the six trig values of an angle in standard position using the special right triangles;
- sketching the graph of the sine and cosine wave;
- using a trig value of a given angle to find obtain the other trig values for that same angle;
- using the inverse trig functions to find the values of a angle given two sides of a right triangle.

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: *Consider the WHERETO elements. Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer*

TI-Nspire Activity # 1: Trig Rations (M,T)

- Students will identify the effects of changing the lengths of the sides and the measures of angles on the sine and cosine ratio in a right triangle
- Students will connect the terms sine, cosine, and tangent with appropriate ratios in a right triangle
- Students will look for and make use of structure
- http://education.ti.com/calculators/timathnspired/US/Activities/Detail?sa=5024&t=9122&id=13145

TI-Nspire Activity# 2: Triangle Trigonometry and Circles (M,T)

- Students will understand that trigonometric functions of an angle do not depend on the size of the triangle within which the angle is contained, but rather on the ratios of the sides of the triangle
- Students will understand the meaning of reference angles and use reference angles to determine the trigonometric functions of a given angle
- Students will create an algorithm to determine the trigonometric functions of an angle based on its reference angle
- Students will reason abstractly and quantitatively
- http://education.ti.com/calculators/timathnspired/US/Activities/Detail?sa=5025&t=5075&id=17027

Learning Activity# 3: (M,T)
A guy wire runs from the ground to a cell tower. The wire is attached to the ground 150 feet from the base of the tower. The angle formed between the wire and the ground is 43 degrees. How long is the guy wire? How tall is the cell tower?

Critical Vocabulary: right triangles, hypotenuse, opposite, adjacent, sine, cosine, tangent, cosecant, secant, cotangent, radians, radian measure, inverse trigonometric functions

Below is the suggested sequence of learning activities and number of days for the Trigonometry and Statistics class. Adjustments should be made accordingly to level.

Approximate time for unit: 22 Days

- Defining and implementing Periodic Data and Special Right Triangles (A,M)
- Activity #3
- Define and compare Angles Measured in Degrees (A,M)
- Comparing and contrasting Angle measured in Degrees and Angles measured in Radians (A,M)
- Relating Special Right Triangles Angles and defining the Unit Circle (A,M)
- Ti-Nspire Activity #1
- Developing the 6 trigonometric functions and their fractional relations(A,M)
- Defining the Sine functions and its values and its restrictions on values (man and min) (M, T)
- Defining the Cosine functions and its values and its restrictions on values (man and min) (M, T)
- Defining the tangent function and it values and the relationship to the sine and cosine functions(M, T)
- Using the sine fractional values and the Unit Circle to develop a graph of the sine wave (A,M)
- Using the sine fractional values and the Unit Circle to develop a graph of the cosine wave (A,M)
- Ti-Nspire Activity# 2
- Manipulation of the sine wave by changing its angles, coefficient or translating the graph (M,T)
- Manipulation of the cosine wave by changing its angles, coefficient or translating the graph (M,T)
- Discovering the cosecant, secant and cotangent ratios by manipulation of the sine, cosine and tangent ratios (M,T)
- Implementation of the Inverse trig functions and the Special Right Triangles (A, M, T)