Unit 05 Trigonometric Identities and Equations

Content Area: **Mathematics**
Course(s): **Trigonometry/Pre-Calculus**
Time Period: **February**
Length: **5 weeks**
Status: **Published**

Unit Overview

In this unit we will review fundamental identities. Students will verify trigonometric identities. They will learn how to apply sum, difference, double and half angle identities. We will be able to solve all types of trig equations. Students will then find the normal form of a line and the distance from a point to a line.

Enduring Understandings

- Mathematics can give us tools that we can apply to complex problems that involve relationships

- Reasoning and/or proof can be used to verify or refute conjectures or identities in trigonometry

- Sometimes it becomes necessary to simplify an identity by translating it to another form

Essential Questions

- How are patterns of change related to the behavior of the function?

- How can change be best represented mathematically?

- what is the best solution to a complex problem? How can I know? How can I best defend and comunicate my thinking?

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Standards

MA.F-TF.C	Prove and apply trigonometric identities

Indicators

| MA.F-TF.C.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. |
| MA.F-TF.C.9 | Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. |

Student Learning Objectives

- SWBAT find the distance between two parallel lines

- SWBAT find the distance from a point to a line

- SWBAT identify and use reciprocal identities, quotient identities and pythagorean identities

- SWBAT solve trigonometric equations

- SWBAT use the basic trigonometric identities to verify other identities

- SWBAT use the double and half angle identities for sine, cosine and tangent functions

- SWBAT use the sum and difference identities for the sine, cosine and tangent functions.

- SWBAT write linear equations in normal form

- SWBAT write the standard form of a linear equation given the length of the normal and the angle it makes with the x axis

Lesson Titles

- Basic Trigonometric Identities

- Distance from a Point to a Line

- Double Angle and Half Angle Identities

- Normal Form of a Linear Equation

- Solving Trigonometric Equations

- Sum and Difference Identities

- Verifying Trigonometric Identities

Equity Considerations

Asian American and Pacific Islander Mandate

Students will engage in learning different AAPI mathematicians that have contributed to mathematical processes and developments.

LGBTQ and Disabilities Mandate

Students will engage in learning different mathematicians from the LGBTQ community along with those with disabilities that have made significant impacts in math.

STEM

LGBTQ:

Sir Francis Bacon (1561–1626)

Florence NightingaleFrancis Bacon | Philosophy, Scientific Method, & Facts | Britannica(1820-1910)

George Washington Carver (1861-1943)

Sara Josephine Baker (1873-1945)

Alan Turing (1912-1954)

Allan Cox (1926-1987)

Sally Ride (1951-2012)

Ben Barres (1954-2017)

Ruth Gates (1962-2018)

Tim Cook (1960)

Disabilities:

Leonardo da Vinci (1452-1519)- Dyslexia

Isaac Newton (1664-1727)- Epilepsy

Thomas Edison (1847-1931)- Hearing

[Charles Darwin (1809-1882)](#)- Stutter, Dyslexia

[Alexander Graham Bell (1847-1922)](#)- Deaf

[Albert Einstein (1879-1955)](#)- Aspergers

[Florence B. Seibert (1897-1991)](#)- Mobility

[Stephen Hawking (1942-2019)](#)- ALS

[John Forbes Nash (1928-2015)](#)- Schizophrenia

[Temple Grandin (1947)](#)- Autism

Climate Change

Students will examine ways trig is embedded in climate change through the following activity. This lesson plan will enable students to apply simple trigonometric functions to understand the phenomenon of climate change

https://tropicsu.org/lesson-plan-trigonometry-and-sea-level-rise/

SCI.HS-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

Inter-Disciplinary Connections

LA.RL.11-12.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (e.g., Shakespeare as well as other authors.)
LA.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 grades 11-12 texts and topics.
LA.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
LA.WHST.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented.
9-12.HS-ETS1-4.5	Using Mathematics and Computational Thinking

Instructional Strategies/Learning Activities/Levels of Blooms/DOK

- discuss strategies for simplifying and applying fundamental identies,
- review algebraic skills of manipulating algebraic expressions/equations in preparation for simplifying

trigonometric identities

- review homework

- review point slope formula

- review study guides

- show how to write all 6 functions in terms of one, boardwork, use for classwork worksheet (1-6)

- to apply half angle identities, go over hw, review identities emphasize proofs on board, classwork worksheet double and half angle identities, students can work together

- to apply sum and difference identities for tangent function, go over hw, develop tangent identities then apply to 4 skill types, do problems on board

- to derive and apply the normal form of a line, go over hw, define terms, derive normal form of a line on board, show conversion, do selected examples,

- to develop and apply double angle identities, go over hw, derive double angle identities on board apply to each of the 4 skills on board,

- to develop and apply half angle identities, go over hw, derive half angle identities, do selected examples on board for each skill, emphasize proofs,

- to develop and apply sum/difference identities for two angles, develop identities, demonstrate how to apply identities to each skill set, do additional examples on board, start worksheet.

- to find the distance between a point and a line and two parallel lines, list formulas, apply strategies, work through examples, start classwork.

- To introduce verfying trig identities, go over quiz, explain strategies needed to verify identities, use worksheet for board problems, work thru each one

- to simplify and verify trig identities, go over packet, go over study guide discuss strategies and identities, work thru additional problems on board

- to solve all types of trig equations, go over hw, review solving different types of equations, include factoring, substitution, calculator, quadratic equation, complete the square,

- to verify trig identities, hand out group packet, break into groups of 4, review strategies, outline requirements, start packet

- tutoring during Delsea One

- use fundamental identities to simplify other identities

MODIFICATIONS

ELL Modifications

- 1:1 testing

- Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience

- Digital translators

- Establish a framework allowing ELL students to understand and assimilate new ideas and information

- Intentional scheduling/grouping with student/teacher who speaks the same language if possible

- Offer resources for specific topics in primary language (Youtube web resources)

- Provide ELL students with multiple literacy strategies

IEP & 504 Modifications

- allow student to edit with teacher comments the first attempt at a graded written assignment

- allowing co-teaching with general education and special education teachers in the same classroom so that the special education teacher can re-teach students with special needs in a different way in a smaller group (pulled to the side)

- eaching the main ideas/concepts (limiting not needed details)to be taught and repeating them in several different ways over several different days

- for testing - rewording questions so that there are not higher level vocabulary within the question (you are testing for understanding of the content not the ability to understand the question)

- for testing- allowing student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)

- llowing student to take notes in class for reinforcement but also providing a copy of completed/correct notes to study from

- math tests could have formula's available on the test and/or sample problems

- providing study guides that don't lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides

- students could use calculator and/or other math tools (x grids, chips, ect)

- tutoring during Delsea One

G & T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.

- Effective questioning techniques (focus on what's important, provide processing time, require higher order thinking

- Encourage students to explore concepts in depth and encourage independent studies or investigations.

- Math- provide additional rigorous challenge problems for advanced students

- Refrain from having them complete more work in the same manner.

At Risk Modifications

- additional help during tutoring/Delsea One/Academic Enrichment

- allowing student to take notes in class for reinforcement but also providing a copy of completed/correct notes to study from

- guided notes and study guides

- speaking to students privately when redirecting behaviors

- testing modifications

Benchmark Assessments

Skill based assessment- math practice

Alternative Assessments

Formative Assessment

- anticipatory set
- closure
- groupwork
- homework
- participation
- pop quizes
- Quiz on Double and Half Angle Identities
- Quiz on Simplifying Trig Identities
- Quiz on Solving Trig Equations
- student boardwork
- warm up

Summative Assessment

- Alternate Assessment
- Benchmark assessment
- Group packet on trig proofs
- Marking Period Assessment
- Midchapter Proving Identities
- Midchapter Test on Normal Form of a Linear Equation and Distance from a point to a line
- Midchapter Test on Sum, Difference, Double and Half Angle Identities

Resources & Materials

- Advanced Mathematical Concepts Precalculus with Applications textbook
- Cooperative learning explorations
- Evoke student participation from their seats and at the board
- google classroom

- Mathpower4u math videos
- PowerPoint lessons
- Teacher generated worksheets
- youtube videos for demonstration of topics

Technology

- Chromebook
- Demos Graphing calculator
- Equatio
- Graphing Calculator
- Promethean Board
- Quizizz

TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.