Unit #2 The Trigonometric Functions

Content Area: **Mathematics**
Course(s): **Honors Pre-Calculus**
Time Period: **October**
Length: **number of days 30**
Status: **Published**

Unit overview

The unit will review angles and angle measurement and build on this knowledge to explore trigonometric functions. Students will examine trigonometric ratios defined using right triangles. The students then will investigate the trigonometric functions of an angle in standard position on the unit circle. Students will then solve right triangles. They will also be using Law of Sines and Cosines to solve other triangles and to find the areas of triangles.

Enduring Understandings

- Mathematical models can be used to describe and quantify real-life situations.

- Representation of geometric ideas within precalculus and the relationships formed allows multiple approaches to geometric problems and connections to other contexts.

- The student will understand that navigation of ships and airplanes and surveying techniques of land require knowledge and usuage of trigonometric functions.

Essential Questions

- In what way can knowledge of triangles, trigonometry and ratios help you in any way?

- Is there a way to determine the area and/ or angles of any triangle when given only the lengths of the three sides?

- Why would triangle trigonometry be of any use to a pilot, a navigator, and a surveyor?

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.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.K-12.1	Make sense of problems and persevere in solving them.

MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.G-SRT	Similarity, Right Triangles, and Trigonometry
MA.G-SRT.C	Define trigonometric ratios and solve problems involving right triangles
MA.G-SRT.D	Apply trigonometry to general triangles
MA.F-TF	Trigonometric Functions
MA.F-TF.A	Extend the domain of trigonometric functions using the unit circle

Student Learning Objectives

- SWBAT Determine whether a triangle has zero, one or two solutions
- SWBAT evaluate inverse trigonometric functions
- SWBAT find the area of any triangle.
- SWBAT find the missing angle measurements
- SWBAT find the values of the six trigonometric functions using the unit circle
- SWBAT find the values of trigonometric ratios for acute angles of right triangles
- SWBAT identify angles that are coterminal with a given angle
- SWBAT solve right triangles
- SWBAT solve triangles by using the law of cosines.
- SWBAT solve triangles using the law of sines
- SWBAT use trigonometry to find the measures of the sides of right triangles

Lesson Titles

- Angles and Degree Measure
- Applying Trigonometric Functions
- Solving Right Triangles
- The Ambiguous Case for the Law of Sines
- The Law of Cosines
- The Law of Sines
- Trigonometric Functions on the Unit Circle
- Trigonometric Ratios in Right Triangles

Equity Considerations

Asian American and Pacific Islander Mandate

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

https://www.youtube.com/watch?v=_pUHaSapfuo

https://www.ngpf.org/blog/math/math-monday-celebrating-aapi-mathematicians/

https://ideas.ted.com/8-asian-americans-and-pacific-islanders-whose-innovations-have-changed-your-life-really/

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.

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

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.RL.11-12.9	Demonstrate knowledge of and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) eighteenth-, nineteenth- and early twentieth-century foundational works of literature, including how two or more texts from the same period treat similar themes or topics.
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-

| 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 Bloom/DOK

- Introduce trigonometry, define terms, demonstrate sketching angles, boardwork

- classwork worksheet on applying pythagorean theorem to find missing sides, then use those sides to find trig values for given angles

- define oblique triangle, review congruence theorems for triangles, review names of triangles by side and angle, explain the 4 cases,derive law of sines

- define sine, cosine and tangent relate right triangle definitions to unit circle, develop all 6 values for all 6 functions, develop sign relationships for all 6 trig functions, pop quiz

- derive all the area triangles for each case of oblique triangle, boardwork, selected examples

- derive and apply law of cosines for case 3 and case 4, do selected examples

- discuss chief soh cah toa and its application, work thru examples to find missing sides and angles in a right triangle. boardwork

- review case 2 scenarios, recognize number of solutions

- review homework

- review key words, demonstrate coverting degrees decimal form into dgrees in minutes and seconds, use graphing overhead to explain technique, discuss reference angle rules and apply them

- review law of sines explain how to model and apply given information, work on case 1 worksheet additional board problems

- review study guide

- review using right triangle to find selected angles values for all 6 trig functions, relate to unit circle, fill out circle, do selected board examples.

- tutoring during Delsea One

- use board to develop values for all quadrantal angles and 30,45,60 degree angles, explain complements of cofunctions, do selected problems on board, use right triangle to derive values, then fill in unit circle

- use graphing overhead, to find approximate values of all 6 trig functions to the nearest ten-thousandth, find angle measures given trig value, do selected problems on board

- use right triangle trig to do geometry related problems, examples and problems

MODIFICATIONS

ELL Modifications

- 1:1 testing
- Google translator for assitance

- Group students

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

- Provide ELL students with multiple literacy strategies

- Provide formal and informal verbal interaction to provide practice, increase motivation, and self-monitoring

- Use khan academy as they have several math videos in multiple languages

IEP & 504 Modifications

- 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)

- 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)

- 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)

- if not in a co-teaching setting allowing time in the schedule for a special education teacher to consult with general education teachers on what specifically can be modified or how to paraphrase things in a different way specific to that lesson

- 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)

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

- 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

- Employ differentiated curriculum to keep interest high.

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

- Encourage students to make transformations- use a common task or item in a different way.

- Math- provide additional rigorous challenge problems for advanced students

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 guide
- more resources/supports
- reducing homework length to just those tasks most important for review
- retesting

Benchmark Assessments

Skill-based assessment-math practice

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Formative Assessment

- anticipatory set
- closure
- group work
- homework
- participation
- pop quizes
- quiz on angles and their degree measure
- quiz on area of triangles
- student boardwork
- warm up

Summative Assessment

- Alternate Assessment
- Benchmark assessment
- Marking period assessment

- Mid Chapter Test Trig Functions on Unit Circle

- Midchapter test Law of Sines and Law of Cosines

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

- use youtube videos to introduce/demonstrate concepts in real-life situations

Technology

- Chromebook

- Desmos graphing calculator

- Equatio

- Graphing calculators

- 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.