

06 Foundations of Trigonometry

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **4-5 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Senior Math Analysis CP is designed for seniors who will pursue liberal arts or humanities in college. The main course objective is to strengthen and extend the concepts of algebra, geometry, and problem solving, including modeling and reasoning. The course integrates ideas of functions and trigonometry with explorations in world-life applications. Additionally, students are provided SAT review and exposure to college placement exam experiences.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

- Students will be able to solve right triangles using the Pythagorean Theorem, Trigonometric ratios, and inverse trig functions.
- Students will recognize that the Pythagorean Theorem can be proven using similar right triangles created by an altitude drawn to the hypotenuse
- Students will utilize right triangle and trigonometric relationships to model and solve problems.

Essential Questions:

- How do right triangles and similarity server as the foundation for Trigonometry?
- What specific relationships exist among right triangles that aid in problem solving?

Enduring Understandings:

- By AA similarity, any two right triangles with corresponding congruent acute angles must be similar, and therefore the exists a specific proportional relationship among the sides.
- Trigonometric functions can be used to solve for missing side lengths in right triangles if one side length and one acute angel are known.
- By applying the Pythagorean theorem to special right triangles, specific relationships among the side lengths can be developed and applied to broader cases.
- Right triangle trigonometry serves as the foundation for wider applications of trigonometric relationships which are addressed in subsequent courses.

CONTENT AREA STANDARDS

MA.G-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.7	Look for and make use of structure.
MA.G-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.
MA.G-SRT.C.7	Explain and use the relationship between the sine and cosine of complementary angles.
MA.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
MA.G-SRT.D.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.
MA.G-SRT.D.10	Prove the Laws of Sines and Cosines and use them to solve problems.
MA.G-SRT.D.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).

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.2.c	Solicit and incorporate feedback from, and provide constructive feedback to, team members and other stakeholders.
CS.K-12.2.d	Evaluate and select technological tools that can be used to collaborate on a project.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history and the social sciences; analyze the cumulative impact of specific word choices on meaning and tone.
LA.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text, to analyze information presented via different mediums.
LA.RST.9-10.4	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 9-10 texts and topics.
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

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.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Trigonometric ratios relate side lengths in right triangles to each other based on specific angle measures
- Trigonometric ratios/functions can be used to calculate side lengths in right triangles
- Inverse trig functions can be used to calculate angle measures in right triangles
- Properties of right triangle trig can be extended to develop relationships for non-right triangles

Procedural Knowledge

Students will be able to:

- (+) Derive the formula $A = 1/2 ab \sin(C)$ for the area of a triangle. *Knowledge Utilization*
- (+) Prove the Laws of Sines and Cosines and use them to solve problems. *Knowledge Utilization*
- (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles. *Analysis*
- Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.(★) *Analysis*
- Explain and use the relationship between the sine and cosine of complementary angles. *Comprehension*
- 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. *Comprehension*

EVIDENCE OF LEARNING

Formative Assessments

- Student feedback/questioning/observation

- Exit Ticket
- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Reflection questions
- Scored/evaluated class work or homework
- Task completion

Summative Assessments

Lesson Quizzes

Unit Test

Performance Tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

NJ DOE Model Curriculum unit: [Trigonometry](#)

Illustrative Mathematics unit: [Right Triangle Trigonometry](#)

Khan Academy unit: [Right Triangles and Trigonometry](#)

NJCTL unit: [Similar Triangles and Trigonometry](#)

Course approved textbook

Kuta Software worksheets

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.