Circular functions and Trigonometry `HL`

The Galaxy School

Poorvi Doshi on Sunday, Jan 5, 2020 at 5:36 PM

Teacher			Subject
Poorvi Doshi			Mathematics

Shared grades	Start Date	Duration	Course part
Grade 12	Week 2, August	6 Weeks	3.1,3.2,3.3,3.4,3.5,3.6,3.7

Unit description

This topic aims to explore the circular functions, to introduce some essential trigonometric identities and to solve right and ono-right angle triangles using trigonometry.

☷ INQUIRY & PURPOSE

Essential Understandings

- The student should be able to apply the relationship between the trigonometry of the right triangle and the unit circle. They should be able to define and graph the six circular functions.
- The student should be able to describe and apply the relationship between the radian measure and degree.
- The student will be to determine the period, amplitude, phase shift, and/or vertical shift of a trigonometric function.
- The student will describe the inverse relationship between trigonometric and inverse trigonometric functions, numerically, algebraically, and graphically.
- The student should be able to identify and distinguish between the graphs of trigonometric and inverse trigonometric functions.
- The student should be able to interpret and solve problems involving trigonometric functions.

Inquiry Questions

`Concept-based`	How can you model periodic behavior?
`Content-based`	Why does a trigonometric expression have multiple solution?
`Content-based`	Why is it important to understand radian measure?
`Concept-based`	Can trigonometry be defined for non right-angles triangle?

Transfer goals

How do trigonometric and circular functions model real world problems and their solutions?
How are the circular functions related to the trigonometric functions?

Missed concepts/misunderstandings

Students often misunderstand the difference between the inverse trigonometric functions and reciprocal functions.

⚖ CURRICULUM

Aims & Objectives

AIMS

Enjoy mathematics, and develop an appreciation of the elegance and power of mathematics

Develop an understanding of the principles and nature of mathematics

Communicate clearly and confidently in a variety of contexts

Develop logical, critical and creative thinking, and patience and persistence in problem-solving

Apply and transfer skills to alternative situations, to other areas of knowledge and to future developments

Appreciate how developments in technology and mathematics have influenced each other

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Appreciate the contribution of mathematics to other disciplines, and as a particular "area of knowledge" in the TOK course

OBJECTIVES

Knowledge and understanding: recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts

Problem-solving: recall, select and use their knowledge of mathematical skills, results and models in both real and abstract contexts to solve problems

Communication and interpretation: transform common realistic contexts into mathematics; comment on the context; sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology; record methods, solutions and conclusions using standardized notation

Technology: use technology, accurately, appropriately and efficiently both to explore new ideas and to solve problems

Syllabus Content

Mathematics HL Core

- 3 - Circular functions and trigonometry
  - 3.1 The circle: radian measure of angles. Length of an arc; area of a sector.
  - 3.2 Definition of $\cos\theta, \sin\theta$ and $\tan\theta$ in terms of the unit circle. Exact values of sin, cos and tan of $0, \dfrac{\pi}{6}, \dfrac{\pi}{4}, \dfrac{\pi}{3}, \dfrac{\pi}{2}$ and their multiples. Definition of the reciprocal trigonometric ratios $\sec\theta, \csc\theta$ and $\cot\theta$. Pythagorean identities: $\cos^2\theta + \sin^2\theta = 1; 1 + \tan^2\theta = \sec^2\theta; 1 + \cot^2\theta = \csc^2\theta$.
  - 3.3 Compound angle identities. Double angle identities. Not required: Proof of compound angle identities.
  - 3.4 Composite functions of the form $f(x) = a\sin(b(x+c)) + d$. Applications.
  - 3.5 The inverse functions $x \mapsto \arcsin x, x \mapsto \arccos x, x \mapsto \arctan x$; their domains and ranges; their graphs.
  - 3.6 Algebraic and graphical methods of solving trigonometric equations in a finite interval, including the use of trigonometric identities and factorization. Not required: The general solution of trigonometric equations.
  - 3.7 The cosine rule. The sine rule including the ambiguous case. Area of a triangle as $\dfrac{1}{2}ab\sin C$. Applications.

Content, Skills & Concepts

CONTENT

- To use appropriately degrees and radians to measure angles
- The student should be able to use right triangles to evaluate the six trigonometric functions.
- The relation between different trigonometric identities.
- Identify the signs of the trigonometric functions, even-odd trigonometric functions.

SKILLS

- To convert angles from degrees to radians and vice versa.
- With reference to standard angles, students will evaluate the magnitude of any angle.
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- Know and draw the graphs of the six trigonometric functions and their variations.Use of the calculator for the same. They will draw the graphs of y =cscx, y = secx and y=cotx; recognize the relationship between the graph of a cosecant function with respect to sine and the graph of a secant with respect to cosine function.
- The students will solve trigonometric equations using identities.

CONCEPTS

Compute the six trigonometric functions of any angle and use the unit circle to define the six trigonometric functions for all real numbers.

The fundamental difference between inverse and reciprocal functions.

The students will understand the concept of multiple solutions.

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◉ LEARNING EXPERIENCES

Student expectations

The student should be able to represent trigonometry functions graphically and algebraically.
The student will perform a variety of operations to prove trigonometric expressions using identities.
The students should be able to solve trigonometric equations for multiple solutions.

Learning Process

Lecture
Small group/pair work

Differentiation

Affirm identity - build self-esteem
Value prior knowledge
Scaffold learning

Lectures with notes
Guided notes
Student-led instruction
Independent problem-solving

⊘ CONNECTIONS

Approaches to Learning

Thinking
Communication
Self management
Research

Learner Profile

Inquirers

Knowledgeable

Thinkers