Summary

HL Trigonometry

Subject	Year	Start date	Duration
Mathematics: analysis and approaches	IB1	Week 3, November	4 weeks

Course Part

Description

Trigonometry allows us to quantify the physical world, enhancing our spatial awareness in two and three dimensions. This topic provides us with the tools for analysis, measurement and transformation of quantities, movements and relationships

Inquiry & Purpose

Inquiry / Higher Order Questions

Type	Inquiry Questions
Debatable	If the angles of a triangle can add up to less than 180°, 180° or more than 180°, what does this tell us about the nature of mathematical knowledge?
Debatable	Trigonometry was developed by successive civilizations and cultures. To what extent is mathematical knowledge embedded in particular traditions or bound to particular cultures? How have key events in the history of mathematics shaped its current form a

Curriculum

Aims

Take action to apply and transfer skills to alternative situations, to other areas of knowledge and to future developments in their local and global communities

Objectives

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

Syllabus Content

Topic 3: Geometry and trigonometry

SL Content

SL 3.1

The distance between two points in three- dimensional space, and their midpoint.

Volume and surface area of three-dimensional solids including right-pyramid, right cone, sphere, hemisphere and combinations of these solids.

The size of an angle between two intersecting lines or between a line and a plane.

SL 3.2

Use of sine, cosine and tangent ratios to find the sides and angles of right-angled triangles.

The sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

The cosine rule: $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$; $f(x) = \frac{ax + b}{cx^2 + dx + e'}$, and $f(x) = \frac{ax^2 + bx + c}{dx +}$

Area of a triangle as $\frac{1}{2}ab\sin C$.

SL 3.3

Applications of right and non-right angled trigonometry, including Pythagoras's theorem.

Angles of elevation and depression.

Construction of labelled diagrams from written statements.

SL 3.4

The circle: radian measure of angles; length of an arc; area of a sector.

SL 3.5

Definition of $\cos\theta, \sin\theta$ in terms of the unit circle.

Definition of $\tan\theta$ as $\frac{\sin\theta}{\cos\theta}$.

Exact values of trigonometric ratios of $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$ and their multiples.

Extension of the sine rule to the ambiguous case.

SL 3.6

The Pythagorean identity $\cos^2\theta + \sin^2\theta = 1$. Double angle identities for sine and cosine.

The relationship between trigonometric ratios.

SL 3.7

The circular functions $\sin x, \cos x,$ and $\tan x$; amplitude, their periodic nature, and their graphs

Composite functions of the form $f(x) = a\sin(b(x + c)) + d$

Transformations.

Real-life contexts.

SL 3.8

Solving trigonometric equations in a finite interval, both graphically and analytically.

Equations leading to quadratic equations in $\sin x, \cos x$ or $\tan x$

AHL Content

AHL 3.9

Definition of the reciprocal trigonometric ratios $\sec\theta$, $\csc\theta$ and $\cot\theta$.

Pythagorean identities: $1 + \tan^2\theta = \sec^2\theta$
$1 + \cot^2\theta = \csc^2\theta$

The inverse functions $f(x) = \arcsin x$, $f(x) = \arccos x$, $f(x) = \arctan x$; their domains and ranges; their graphs.

AHL 3.10

Compound angle identities.

Double angle identity for tan.

AHL 3.11

Relationships between trigonometric functions and the symmetry properties of their graphs.

ATL Skills

Approaches to Learning

Thinking

- In this unit, we will

ask students to formulate a reasoned argument to support their opinion or conclusion

give students time to think through their answers before asking them for a response

reward a new personal understanding, solution or approach to an issue

ask open questions

set students a task which required higher-order thinking skills (such as analysis or evaluation)

build on a specific prior task

help students to make their thinking more visible (for example, by using a strategy such as a thinking routine)

require students to take an unfamiliar viewpoint into account when formulating arguments

ask questions that required the use of knowledge from a different subject from the one you are teaching

include a reflection activity

make a link to TOK

Developing IB Learners

Learner Profile

- Inquirers
- Knowledgeable
- Thinkers
- Communicators
- Reflective