P2 Chapter 6:: Trigonometry

Chapter Overview

This chapter is very similar to the trigonometry chapters in Year 1. The only difference is that new trig functions: sec, cosec and cot, are introduced.

1:: Understanding sec, cosec, tan and draw their graphs.

"Draw a graph of y = cosec x for $0 \le x < 2\pi$."

2:: 'Solvey' questions.

"Solve, for $0 \le x < 2\pi$, the equation $2cosec^2x + \cot x = 5$ giving your solutions to 3sf."

3:: 'Provey' questions.

"Prove that $\sec x - \cos x \equiv \sin x \tan x$

4:: Inverse trig functions and their domains/ranges.

"Show that, when θ is small, $\sin 5\theta + \tan 2\theta - \cos 2\theta \approx 2\theta^2 + 7\theta - 1$."

Specification

	5.4	Understand and use the definitions of secant, cosecant and cotangent and of arcsin, arccos and arctan; their relationships to sine, cosine and tangent; understanding of their graphs; their ranges and domains.	Angles measured in both degrees and radians.	
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5.5	Understand and use $\tan \theta = \frac{\sin \theta}{\cos \theta}$ Understand and use $\sin^2 \theta + \cos^2 \theta = 1$ $\sec^2 \theta = 1 + \tan^2 \theta \text{ and}$ $\csc^2 \theta = 1 + \cot^2 \theta$	These identities may be used to solve trigonometric equations and angles may be in degrees or radians. They may also be used to prove further identities.
5.6	Understand and use double angle formulae; use of formulae for $\sin{(A \pm B)}$, $\cos{(A \pm B)}$, and $\tan{(A \pm B)}$, understand geometrical proofs of these formulae.	To include application to half angles. Knowledge of the $\tan\left(\frac{1}{2}\theta\right)$ formulae will not be required.
	expressions for $a\cos\theta + b\sin\theta$ in the equivalent forms of $r\cos\left(\theta \pm \alpha\right)$ or $r\sin\left(\theta \pm \alpha\right)$	Students should be able to solve equations such as $a\cos\theta+b\sin\theta=c$ in a given interval.
5.7	Solve simple trigonometric equations in a given interval, including quadratic equations in sin, cos and tan and equations involving multiples of the unknown angle.	Students should be able to solve equations such as $\sin (x+70^\circ) = 0.5 \text{ for } 0 < x < 360^\circ,$ $3+5\cos 2x = 1 \text{ for } -180^\circ < x < 180^\circ$ $6\cos^2 x + \sin x - 5 = 0, \ 0 \leqslant x < 360^\circ$ These may be in degrees or radians and this will be specified in the question.
5.8	Construct proofs involving trigonometric functions and identities.	Students need to prove identities such as $\cos x \cos 2x + \sin x \sin 2x \equiv \cos x$.
5.9	Use trigonometric functions to solve problems in context, including problems involving vectors, kinematics and forces.	Problems could involve (for example) wave motion, the height of a point on a vertical circular wheel, or the hours of sunlight throughout the year. Angles may be measured in degrees or in radians.

Reciprocal Trigonometric Functions

$$\sec(x) = \frac{1}{\cos(x)}$$

Short for "secant"

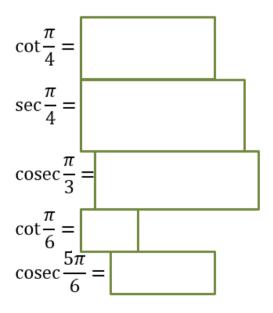
$$\csc(x) = \frac{1}{\sin(x)}$$

Short for "cosecant"

$$\cot(x) = \frac{1}{\tan(x)} \text{ or } \frac{\cos(x)}{\sin(x)} \quad \text{Short for "cotangent"}$$

Calculations

You have a calculator in A Level exams, but won't however in STEP, etc. It's good however to know how to calculate certain values yourself if needed.



$$\cot \frac{\pi}{3} = \frac{\pi}{6}$$

$$\sec \frac{\pi}{6} = \frac{\pi}{6}$$

$$\csc \frac{\pi}{2} = \frac{5\pi}{3} = \frac{\pi}{6}$$