UDAAN

2026

Trigonometry

MATHS LECTURE-5

BY-RITIK SIR

Topics *to be covered*

A Introduction to Trigonometric Identities

Reciprocal identity

$\sin\theta \longleftrightarrow \operatorname{cosec}\theta$

$\cos\theta \longleftrightarrow \sec\theta$

$\tan\theta \longleftrightarrow \cot\theta$

Quotient identity

$\tan\theta = \frac{\sin\theta}{\cos\theta}$ $\quad \cot\theta = \frac{\cos\theta}{\sin\theta}$

'1' or Square wali

$\sin^2\theta + \cos^2\theta = 1$

$\sin^2\theta = 1 - \cos^2\theta$

$\cos^2\theta = 1 - \sin^2\theta$

$\sec^2\theta = 1 + \tan^2\theta$

$\sec^2\theta - 1 = \tan^2\theta$

$\sec^2\theta - \tan^2\theta = 1$

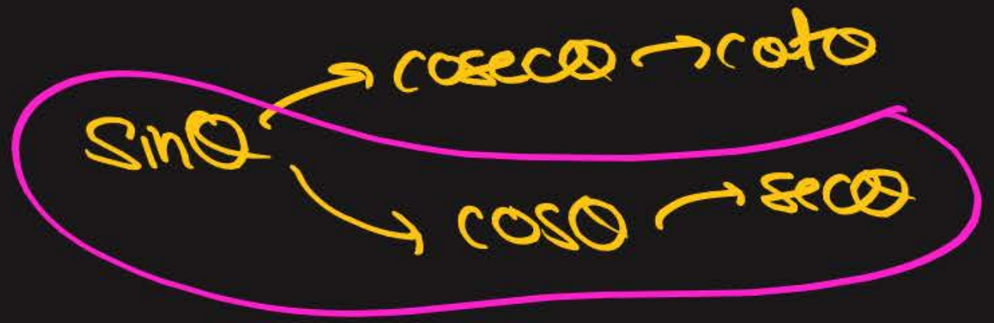
$\operatorname{cosec}^2\theta = 1 + \cot^2\theta$

$\operatorname{cosec}^2\theta - 1 = \cot^2\theta$

$\operatorname{cosec}^2\theta - \cot^2\theta = 1$

Kisi bhi T-Ratio ko kisi or T-Ratio main convert karna seekho

$\sin\theta \rightarrow \sec\theta$



$\sin^2\theta + \cos^2\theta = 1$

$\sin^2\theta = 1 - \cos^2\theta$

$\sin\theta = \sqrt{1 - \cos^2\theta}$

$\sin\theta = \sqrt{1 - \frac{1}{\sec^2\theta}}$

$$\sin\theta = \sqrt{\frac{\sec^2\theta - 1}{\sec^2\theta}}$$

$$\cos\theta = \frac{1}{\sec\theta} = \frac{1}{\sqrt{1+\tan^2\theta}}$$

$$\sec^2\theta = 1+\tan^2\theta$$

$$\sec\theta = \sqrt{1+\tan^2\theta}$$

Q $\sin\theta \longrightarrow \cot\theta$

$$\sin\theta = \frac{1}{\operatorname{cosec}\theta} = \frac{1}{\sqrt{1+\cot^2\theta}}$$

$$\operatorname{cosec}^2\theta = 1+\cot^2\theta$$

$$\operatorname{cosec}\theta = \sqrt{1+\cot^2\theta}$$

Q $\sec\theta \longrightarrow \cot\theta$

$$\sec^2\theta = 1+\tan^2\theta$$

$$\sec\theta = \sqrt{1+\tan^2\theta}$$

$$= \sqrt{1+\frac{1}{\cot^2\theta}}$$

$$\sec\theta = \sqrt{\frac{\cot^2\theta+1}{\cot^2\theta}}$$

#Q. Write all the other trigonometric ratios of $\angle A$ in terms of sec A.

$\sin A$
$\cos A$
$\tan A$
$\cot A$
$\operatorname{cosec} A$
$\rightarrow \sec A$

$\sin A \longrightarrow \sec A$

$\sin A \rightarrow \cos A \rightarrow \sec A$
$\sin A \rightarrow \operatorname{cosec} A$

$\sin^2 A + \cos^2 A = 1$

$\sin A = \sqrt{1 - \cos^2 A}$

$\sin A = \sqrt{1 - \frac{1}{\sec^2 A}}$

$$\sin A = \sqrt{\frac{\sec^2 A - 1}{\sec^2 A}}$$

$\cos A \rightarrow \sec A$

$\cos A \rightarrow \sec A$
$\cos A \rightarrow \sin A$

$$\cos A = \frac{1}{\sec A}$$

$\tan A \rightarrow \sec A$

$\tan A \rightarrow \sec A$
$\tan A \rightarrow \cot A$

$1 + \tan^2 A = \sec^2 A$

$\tan^2 A = \sec^2 A - 1$

$$\tan A = \sqrt{\sec^2 A - 1}$$

$\cot A \rightarrow \sec A$

$\cot A \rightarrow \tan A \rightarrow \sec A$
$\cot A \rightarrow \operatorname{cosec} A$

$$\cot A = \frac{1}{\tan A}$$

$$\cot A = \frac{1}{\sqrt{\sec^2 A - 1}}$$

$\text{cosec}A \rightarrow \sec A$

$\text{cosec}A \rightarrow \sin A \rightarrow \cos A \rightarrow \sec A$

$\text{cosec}A \rightarrow \cot A \rightarrow \tan A \rightarrow \sec A$

$\text{cosec}^2A = 1 + \cot^2 A$

$\text{cosec}A = \sqrt{1+\cot^2 A}$

$= \sqrt{1+\frac{1}{\tan^2 A}}$

$\text{cosec}A = \sqrt{\frac{\tan^2 A+1}{\tan^2 A}}$

$\text{cosec}A = \sqrt{\frac{\sec^2 A}{\sec^2 A - 1}}$

#Q. Prove the following identity: $(1 - \sin^2\theta)\sec^2\theta = 1$

L.H.S

$(1 - \sin^2\theta)\sec^2\theta$

$(\cos^2\theta)\sec^2\theta$

$\frac{1}{\sec\theta} \times \sec\theta$

$= 1$

$=$ R.H.S

H.P.

99.99%

L.H.S → R.H.S

R.H.S → L.H.S

L.H.S = R.H.S

#Q. Prove the following identity : $\cos^2\theta\,(1+\tan^2\theta)=1$

L.H.S

$\cos^2\theta(1+\tan^2\theta)$

$\cos^2\theta(\sec^2\theta)$

$\cancel{\cos^2\theta} \times \frac{1}{\cancel{\cos^2\theta}}$

$= 1$

$=$ R.H.S

H.P.

#Q. Prove the following identity :

$$= \cos^2\theta + \frac{1}{1+\cot^2\theta} = 1$$

L.H.S

$$= \cos^2\theta + \frac{1}{\operatorname{cosec}^2\theta}$$

$$= \cos^2\theta + \sin^2\theta$$

$$= \boxed{1}$$

#Q. Prove the following identity :

$$\cot^2\theta - \frac{1}{\sin^2\theta} = -1$$

L.H.S

$= \cot^2\theta - \frac{1}{\sin^2\theta}$

$= \cot^2\theta - \operatorname{cosec}^2\theta$

$= \cot^2\theta - (1 + \cot^2\theta)$

$= \cot^2\theta - 1 - \cot^2\theta$

$= -1$

#Q. Prove the following identity :

L.H.S

$$= \tan^2\theta - \frac{1}{\cos^2\theta} = -1$$

$$= \tan^2\theta - \sec^2\theta$$

$$= \tan^2\theta - (1 + \tan^2\theta)$$

$$= \tan^2\theta - 1 - \tan^2\theta$$

$$= \boxed{-1}$$

#Q. Prove the following identity : $(1 + \tan^2 \theta)(1 + \sin \theta)(1 - \sin \theta) = 1$

L.H.S

$= (1+\tan^2\theta)(1+\sin\theta)(1-\sin\theta)$

$= (1+\tan^2\theta)(1^2-\sin^2\theta)$

$= \sec^2\theta \times \cos^2\theta$

$= \frac{1}{\cos^2\theta} \times \cos^2\theta$

$= \boxed{1}$

#Q. Prove the following identity :

$$\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta}=2\sec^2\theta$$

L.H.S

$$=\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta}$$

$$=\frac{1(1+\sin\theta)+1(1+\sin\theta)}{(1+\sin\theta)(1-\sin\theta)}$$

$$=\frac{1-\sin\theta+1+\sin\theta}{1^2-\sin^2\theta}$$

$$=\frac{2}{\cos^2\theta}$$

$$=2\times\frac{1}{\cos^2\theta}$$

$$=\boxed{2\sec^2\theta}$$

$$=\text{R.H.S}$$

H.P.

#Q. Prove the following identity :

$$\frac{\cos\theta}{1-\sin\theta}+\frac{\cos\theta}{1+\sin\theta}=2\sec\theta$$

L.H.S $\dfrac{\cos\theta}{1-\sin\theta}+\dfrac{\cos\theta}{1+\sin\theta}$

$\cos\theta\left[\dfrac{1}{1-\sin\theta}+\dfrac{1}{1+\sin\theta}\right]$

$\cos\theta\left[\dfrac{1+\sin\theta+1-\sin\theta}{(1-\sin\theta)(1+\sin\theta)}\right]$

$= \cos\theta\left[\dfrac{2}{1^2-\sin^2\theta}\right]$

$= \cos\theta\left[\dfrac{2}{\cos^2\theta}\right]$

$= \dfrac{\cos\theta \times 2}{\cos\theta \times \cos\theta}$

$= \dfrac{2\times 1}{\cos\theta} = \boxed{2\sec\theta}$

$\frac{1+2}{3} = \frac{1}{3} + \frac{2}{3}$

#Q. Prove the following identity :

$$\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$$

$\frac{a^2}{b^2} = \left(\frac{a}{b}\right)^2$

L.H.S

$= \sqrt{\frac{1-\sin\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}}$

$= \sqrt{\frac{(1-\sin\theta)^2}{1^2-\sin^2\theta}}$

$= \sqrt{\frac{(1-\sin\theta)^2}{\cos^2\theta}}$

$= \sqrt{\left(\frac{1-\sin\theta}{\cos\theta}\right)^2}$

$= \frac{1-\sin\theta}{\cos\theta}$

$= \frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}$

$= \sec\theta - \tan\theta$

#Q. Prove the following identity :

$$\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$$

LHS

$$= \sqrt{\frac{1+\cos\theta}{1-\cos\theta} \times \frac{1+\cos\theta}{1+\cos\theta}}$$

$$= \sqrt{\frac{(1+\cos\theta)^2}{1^2-\cos^2\theta}}$$

$$= \sqrt{\frac{(1+\cos\theta)^2}{\sin^2\theta}}$$

$$= \sqrt{\left(\frac{1+\cos\theta}{\sin\theta}\right)^2}$$

$$= \frac{1+\cos\theta}{\sin\theta}$$

$$= \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$

$$= \operatorname{cosec}\theta + \cot\theta$$

#Q. Prove the following identity :

$$\frac{1-\sin\theta}{1+\sin\theta} = (\sec\theta - \tan\theta)^2$$

L.H.S

$$= \frac{1-\sin\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}$$

$$= \frac{(1-\sin\theta)^2}{1^2-\sin^2\theta}$$

$$= \frac{(1-\sin\theta)^2}{\cos^2\theta}$$

$$= \left(\frac{1-\sin\theta}{\cos\theta}\right)^2$$

$$= \left(\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}\right)^2$$

$$= \boxed{(\sec\theta - \tan\theta)^2}$$

#Q. Prove the following identity :

#Gpl

$$\frac{1-\cos\theta}{1+\cos\theta} = (\operatorname{cosec}\theta - \cot\theta)^2$$

Achieve all goals till June end!

1. Buy a carpet.
2. Save 10~~000~~
3. Buy a new a phone case.
4. hive ~~a happy life~~ Mind
5. ~~Start~~ your own business

#Q. Prove the following identity :

$$\frac{\sin\theta}{1-\cos\theta} = \operatorname{cosec}\theta + \cot\theta$$

L.H.S

$$= \frac{\sin\theta}{1-\cos\theta} \times \frac{1+\cos\theta}{1+\cos\theta}$$

$$= \frac{\sin\theta(1+\cos\theta)}{1^2-\cos^2\theta}$$

$$= \frac{\sin\theta(1+\cos\theta)}{\sin^2\theta}$$

$$= \frac{1+\cos\theta}{\sin\theta}$$

$$= \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$

$$= \boxed{\operatorname{cosec}\theta + \cot\theta}$$

#Q. Prove the following identity :

$$(\operatorname{cosec}\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$$

$$\text{L.H.S} = (\operatorname{cosec}\theta - \cot\theta)^2$$

$$= \left(\frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}\right)^2$$

$$= \left(\frac{1-\cos\theta}{\sin\theta}\right)^2$$

$$= \frac{(1-\cos\theta)^2}{(\sin\theta)^2}$$

$$= \frac{(1-\cos\theta)(1-\cos\theta)}{1^2-\cos^2\theta}$$

$$= \frac{(1-\cos\theta)(1-\cos\theta)}{(1-\cos\theta)(1+\cos\theta)} = \boxed{\frac{1-\cos\theta}{1+\cos\theta}}$$

#Q. Prove the following identity :

$$\cot\theta - \tan\theta = \frac{2\cos^2\theta - 1}{\sin\theta\cos\theta}$$

L.H.S

$= \cot\theta - \tan\theta$

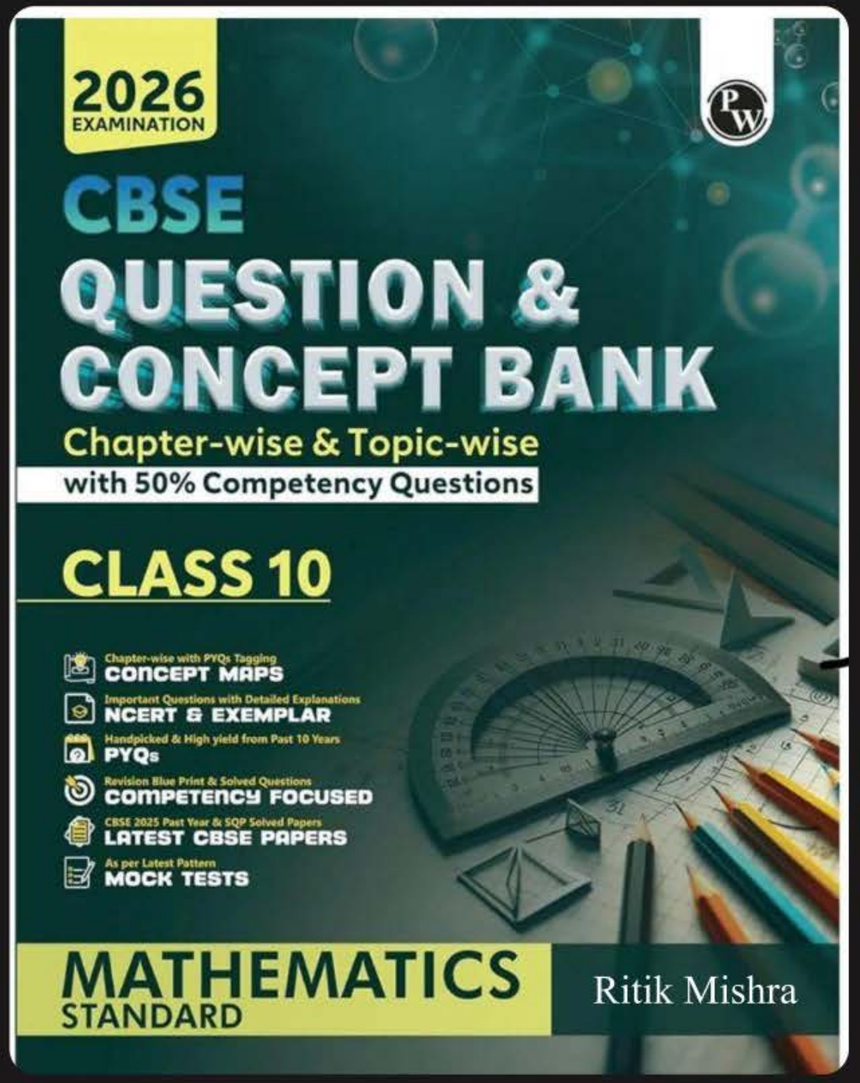
$= \frac{\cos\theta}{\sin\theta} - \frac{\sin\theta}{\cos\theta}$

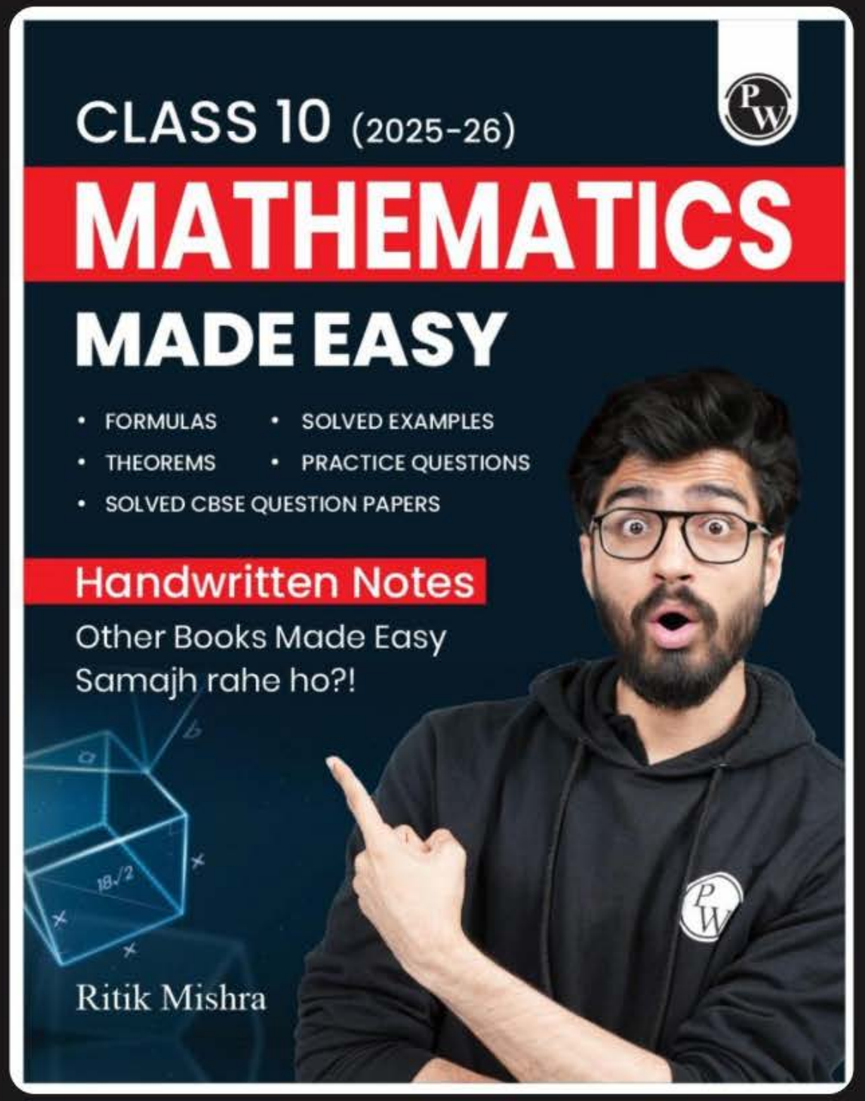
$= \frac{\cos^2\theta - \sin^2\theta}{\sin\theta\cos\theta}$

$= \frac{\cos^2\theta - (1-\cos^2\theta)}{\sin\theta\cos\theta}$

$= \frac{\cos^2\theta - 1 + \cos^2\theta}{\sin\theta\cos\theta}$

$= \boxed{\frac{2\cos^2\theta - 1}{\sin\theta\cos\theta}}$


2026
EXAMINATION
CBSE
QUESTION &
CONCEPT BANK
Chapter-wise & Topic-wise
with 50% Competency Questions
CLASS 10
Chapter-wise with PYQs Tagging
CONCEPT MAPS
Important Questions with Detailed Explanations
NCERT & EXEMPLAR
Handpicked & High yield from Past 10 Years
PYQs
Revision Blue Print & Solved Questions
COMPETENCY FOCUSED
CBSE 2025 Past Year & SQP Solved Papers
LATEST CBSE PAPERS
As per Latest Pattern
MOCK TESTS
MATHEMATICS
STANDARD
Ritik Mishra


CLASS 10 (2025-26)
MATHEMATICS
MADE EASY
• FORMULAS
• SOLVED EXAMPLES
• THEOREMS
• PRACTICE QUESTIONS
• SOLVED CBSE QUESTION PAPERS
Handwritten Notes
Other Books Made Easy
Samajh rahe ho?!
Ritik Mishra

RITIK SIR

JOIN MY OFFICIAL TELEGRAM CHANNEL


WORK HARD
DREAM BIG
NEVER GIVE UP

Thank You