UDAAN

2026

Trigonometry

MATHS **LECTURE-10**

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Topics to be covered

A Questions (Last class of Trigonometry, Aao Maze Karein)

#Q. Find the value of x for which

x Ans

2025

$$(\sin A + \text{cosec}\, A)^2 + (\cos A + \sec A)^2 = x + \tan^2 A + \cot^2 A$$

#Q. Prove the following identity :

$(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$

L.H.S

$= \sin^2\theta + \text{cosec}^2\theta + 2\sin\theta\,\text{cosec}\,\theta + \cos^2\theta + \sec^2\theta + 2\cos\theta\sec\theta$

$= 1 + 1 + \cot^2\theta + 2\cancel{\sin\theta} \times \frac{1}{\cancel{\sin\theta}} + 1 + \tan^2\theta + 2\cancel{\cos\theta} \times \frac{1}{\cancel{\cos\theta}}$

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

$= \boxed{7 + \cot^2\theta + \tan^2\theta}$

#Q. Prove that $\frac{\cos A+\sin A-1}{\cos A-\sin A+1} = \operatorname{cosec} A - \cot A$

2025

#GP4

$$\frac{\frac{c+s-1}{s}}{\frac{c-s+1}{s}}$$

#Q. Prove the following identity :

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

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

D

L.H.S

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

$$= \frac{(\sec\theta + \tan\theta) - [(\sec\theta + \tan\theta)(\sec\theta - \tan\theta)]}{D}$$

$$= \frac{(\sec\theta + \tan\theta)[1 - (\sec\theta - \tan\theta)]}{D}$$

$$= \frac{(\sec\theta + \tan\theta)\cancel{(1 - \sec\theta + \tan\theta)}}{\cancel{(\tan\theta - \sec\theta + 1)}}$$

$$= \sec\theta + \tan\theta$$

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

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

#Q. Prove the following identity :

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

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

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

LHS

$$= \frac{\cot A + \operatorname{cosec} A - [\operatorname{cosec}^2 A - \cot^2 A]}{D}$$

$$= \frac{(\operatorname{cosec} A + \cot A) - [(\operatorname{cosec} A + \cot A)(\operatorname{cosec} A - \cot A)]}{D}$$

$$= \frac{(\operatorname{cosec} A + \cot A)\cancel{[1 - \operatorname{cosec} A + \cot A]}}{\cancel{(\cot A - \operatorname{cosec} A + 1)}}$$

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

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

$= \boxed{\frac{1 + \cos A}{\sin A}}$

#Q. Prove the following identity :

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

$\boxed{\sin^2 A + \cos^2 A = 1}$

#GPH

L.H.S divide by $\cos\theta$

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

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

#Q. If $\cot\theta + \cos\theta = p$ and $\cot\theta - \cos\theta = q$, prove that $p^2 - q^2 = 4\sqrt{pq}$.

2025

#QT

#Q. If $\boxed{\tan\theta + \sin\theta = m}$, $\boxed{\tan\theta - \sin\theta = n}$, show that $\boxed{m^2 - n^2 = 4\sqrt{mn}.}$

L.H.S

$= m^2 - n^2$

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

$= (t^2 + s^2 + 2ts) - (t^2 + s^2 - 2ts)$

$= \cancel{t^2} + \cancel{s^2} + 2ts - \cancel{t^2} - \cancel{s^2} + 2ts$

$= \boxed{4\tan\theta\sin\theta}$

R.H.S

$= 4\sqrt{mn}$

$= 4\sqrt{(t+s)(t-s)}$

$= 4\sqrt{t^2 - s^2}$

$= 4\sqrt{\frac{s^2}{c^2} - s^2}$

$= 4\sqrt{s^2\left(\frac{1}{c^2} - 1\right)}$

$= 4\sqrt{\frac{s^2(1-c^2)}{c^2}}$

$= 4\sqrt{\frac{s^2 \cdot s^2}{c^2}}$

$= 4\sqrt{\left(\frac{s \cdot s}{c}\right)^{\cancel{2}}}$

$= 4 \cdot \frac{s}{c} \cdot s$

$= \boxed{4\tan\theta\sin\theta}$

#Q. If $a \sec\theta + b \tan\theta = m$ and $b \sec\theta + a \tan\theta = n$, prove that $a^2 + n^2 = b^2 + m^2$

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$$a^2 + n^2 = b^2 + m^2$$

$$\boxed{a^2 - b^2 = m^2 - n^2}$$

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

#Q. If a $\cot\theta$ + b $\operatorname{cosec}\theta$ = p and b $\cot\theta$ + a $\operatorname{cosec}\theta$ = q, then $p^2 - q^2$.

(A) $a^2 - b^2$

(B) $b^2 - a^2$

(C) $a^2 + b^2$

(D) $b - a$

$$= p^2 - q^2$$
$$= (a\cot\theta + b\operatorname{cosec}\theta)^2 - (b\cot\theta + a\operatorname{cosec}\theta)^2$$
$$= a^2\cot^2\theta + b^2\operatorname{cosec}^2\theta \cancel{\mp 2ab\cot\theta\operatorname{cosec}\theta}$$
$$- b^2\cot^2\theta - a^2\operatorname{cosec}^2\theta \cancel{- 2ab\cot\theta\operatorname{cosec}\theta})$$
$$= \cot^2\theta(a^2 - b^2) + \operatorname{cosec}^2\theta(b^2 - a^2)$$
$$= \cot^2\theta(a^2 - b^2) - \operatorname{cosec}^2\theta(a^2 - b^2)$$
$$= a^2 - b^2(\cot^2\theta - \operatorname{cosec}^2\theta)$$
$$= a^2 - b^2(-1) = \boxed{-a^2 + b^2}$$

#Q. Prove that :

2025

$$\frac{\cos\theta - 2\cos^3\theta}{\sin\theta - 2\sin^3\theta} + \cot\theta = 0$$

$-\cot\theta$

#Q. Prove the following identity :

$$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$$

L.H.S

$$= \frac{\sin\theta\,[1-2\sin^2\theta]}{\cos\theta\,[2\cos^2\theta-1]}$$

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

$$= \tan\theta\left[\frac{1-2+2\cos^2\theta}{2\cos^2\theta-1}\right]$$

$$= \tan\theta\left[\frac{\cancel{2\cos^2\theta-1}}{\cancel{2\cos^2\theta-1}}\right]$$

$$= \boxed{\tan\theta}$$

#Q. Prove that :

#GPU

$$\sec^2\theta - \left[\frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta}\right] = 1$$

$\tan^2\theta$

#Q. If $\sin\theta + \cos\theta = x$, prove that :

2025

$$\sin^4\theta + \cos^4\theta = \frac{2 - (x^2 - 1)^2}{2}$$

L.H.S

$= s^4 + c^4$

$= (s^2)^2 + (c^2)^2$

$= (s^2 + c^2)^2 - 2s^2c^2$

$= \boxed{1 - 2s^2c^2}$

R.H.S

$= \dfrac{2 - [(s+c)^2 - 1]^2}{2}$

$= \dfrac{2 - [s^2 + c^2 + 2sc - 1]^2}{2}$

$= \dfrac{2 - [\cancel{1} + 2sc - \cancel{1}]^2}{2}$

$= \dfrac{2 - 4s^2c^2}{2} = \boxed{1 - 2s^2c^2}$

#Q. If $\sin\theta + \cos\theta = x$, prove that $\sin^6\theta + \cos^6\theta = \frac{4-3\left(x^2-1\right)^2}{4}$.

$1 - 3s^2c^2$

#Q. If $x = a\sec\theta\cos\phi$, $y = b\sec\theta\sin\phi$ and $z = c\tan\theta$, show that :

phi

2026

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1$$

L.H.S

$$= \frac{(a\sec\theta\cos\phi)^2}{a^2}+\frac{(b\sec\theta\sin\phi)^2}{b^2}-\frac{(c\tan\theta)^2}{c^2}$$

$$= \frac{\cancel{a^2}\sec^2\theta\cos^2\phi}{\cancel{a^2}}+\frac{\cancel{b^2}\sec^2\theta\sin^2\phi}{\cancel{b^2}}-\frac{\cancel{c^2}\tan^2\theta}{\cancel{c^2}}$$

$$= \sec^2\theta\cos^2\phi+\sec^2\theta\sin^2\phi-\tan^2\theta$$

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

#Q. If cosec θ – sin θ = a^3 and sec θ – cos θ = b^3, prove that : $a^2b^2(a^2 + b^2) = 1$.

2026

$\csc\theta - \sin\theta = a^3$

$\frac{1}{s} - s = a^3$

$\frac{1-s^2}{s} = a^3$

$\frac{c^2}{s} = a^3$

$\left(\frac{c^2}{s}\right)^{1/3} = a$

$\boxed{\frac{c^{2/3}}{s^{1/3}} = a}$

$\sec\theta - \cos\theta = b^3$

$\frac{1}{c} - c = b^3$

$\frac{1-c^2}{c} = b^3$

$\frac{s^2}{c} = b^3$

$\left(\frac{s^2}{c}\right)^{1/3} = b$

$\boxed{\frac{s^{2/3}}{c^{1/3}} = b}$

L.H.S

$= a^4b^2 + a^2b^4$

$= \left(\frac{c^{2/3}}{s^{1/3}}\right)^4 \left(\frac{s^{2/3}}{c^{1/3}}\right)^2 + \left(\frac{c^{2/3}}{s^{1/3}}\right)^2 \left(\frac{s^{2/3}}{c^{1/3}}\right)^4$

$= \frac{c^{8/3}}{\cancel{s^{4/3}}} \cdot \frac{\cancel{s^{4/3}}}{c^{2/3}} + \frac{\cancel{c^{4/3}}}{s^{2/3}} \cdot \frac{s^{8/3}}{\cancel{c^{4/3}}}$

$= c^{6/3} + s^{6/3}$

$= c^2 + s^2$

$= 1$ Ans.

#Q. Prove that :

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

$$\frac{1}{1+S^2}+\frac{1}{1+C^2}+\frac{1}{1+\frac{1}{C^2}}+\frac{1}{1+\frac{1}{S^2}}$$

$$\frac{1}{1+S^2}+\frac{1}{1+C^2}+\frac{C^2}{C^2+1}+\frac{S^2}{S^2+1}$$

$$\frac{\cancel{1+S^2}}{\cancel{1+S^2}}+\frac{\cancel{1+C^2}}{\cancel{1+C^2}}=1+1=2$$

#QT

#Q. If sin α and cos α are the roots of the equation $px^2 + qx + r = 0$, then show that $p^2 - q^2 + 2pr = 0$.

$px^2+qx+r=0$

$a=p,\ b=q,\ c=r$

$\text{Sum} = -\frac{b}{a}$; $\text{product} = \frac{c}{a}$

$\boxed{\sin\alpha+\cos\alpha = -\frac{q}{p}}$ $\boxed{\sin\alpha\cos\alpha = \frac{r}{p}}$

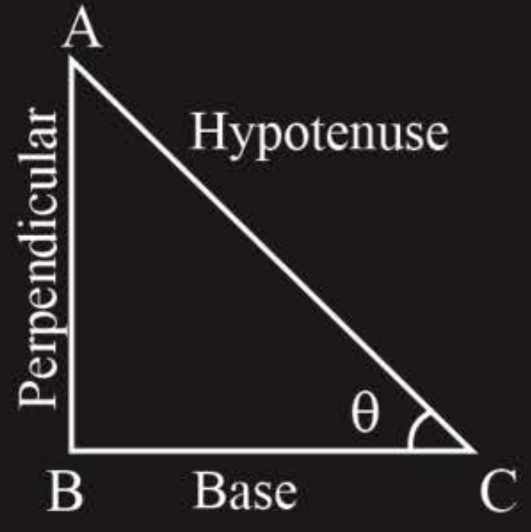
S.B.S

$(\sin\alpha+\cos\alpha)^2 = \left(-\frac{q}{p}\right)^2$

$\sin^2\alpha+\cos^2\alpha+2\sin\alpha\cos\alpha = \frac{q^2}{p^2}$

$1+\frac{2r}{p} = \frac{q^2}{p^2} \rightarrow -\frac{q^2}{p^2}+1+\frac{2r}{p}=0$

#GPK



$\sin\theta = \frac{AB}{AC}$

$\cos\theta = \frac{BC}{AC}$

$\tan\theta = \frac{AB}{BC}$

$\operatorname{cosec}\theta = \frac{AC}{AB}$

$\sec\theta = \frac{AC}{BC}$

$\cot\theta = \frac{BC}{AB}$

Right angled triangle

Introduction to Trigonometry

Trigonometric ratios and angles

$\sin\theta = \frac{1}{\operatorname{cosec}\theta} \Rightarrow \operatorname{cosec}\theta = \frac{1}{\sin\theta}$

$\cos\theta = \frac{1}{\sec\theta} \Rightarrow \sec\theta = \frac{1}{\cos\theta}$

$\tan\theta = \frac{1}{\cot\theta} \Rightarrow \cot\theta = \frac{1}{\tan\theta}$

Trigonometric Identities

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

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

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

Trigonometric ratios of some specific angles

T. Ratios / θ	0°	30°	45°	60°	90°
sin θ	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
cos θ	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
tan θ	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Not defined
cosec θ	Not defined	2	$\sqrt{2}$	$2/\sqrt{3}$	1
sec θ	1	$2/\sqrt{3}$	$\sqrt{2}$	2	Not defined
cot θ	Not defined	$\sqrt{3}$	1	$1/\sqrt{3}$	0

Priorities

(1) All 10 lectures questions solve yourself

(2) Complete all dpps again (if not done already)

(3) Practice sheet de rha hun (krlo)

(4) Solve questions banks/reference books

#pyaari

#upload

Practice Sheet

1. Prove that: $\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}=\operatorname{cosec} A$

2. Prove that: $(\sec A-\tan A)^2=\frac{1-\sin A}{1+\sin A}$

3. Prove that: $\frac{1}{\sec A-1}+\frac{1}{\sec A+1}=2\operatorname{cosec} A\cot A$

4. Prove that: $\frac{\tan A+\tan B}{\cot A+\cot B}=\tan A\tan B$

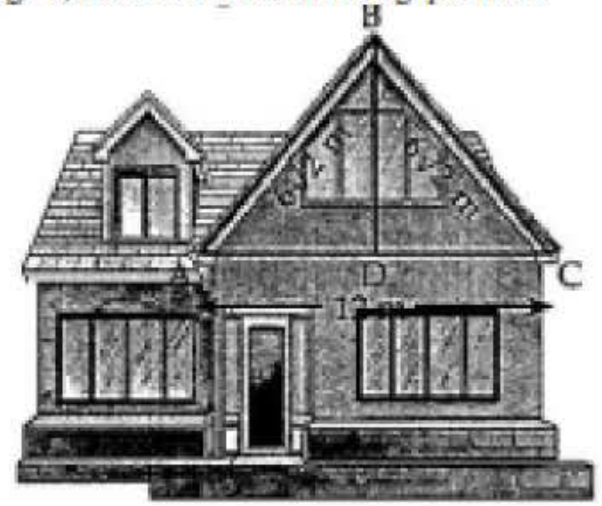
5. Prove that:
$\tan^2 A\sec^2 B-\sec^2 A\tan^2 B=\tan^2 A-\tan^2 B$

6. If $\sin\theta+\cos\theta=\sqrt{3}$, then find the value of $\sin\theta\cos\theta$.

7. Prove that:
$(\operatorname{cosec} A-\sin A)(\sec A-\cos A)=\frac{1}{\cot A+\tan A}$

8. Show that: $\sin^6 A+3\sin^2 A\cos^2 A=1-\cos^6 A$

9. Aanya and her father go to meet her friend Juhi for a party. When they reached to Juhi's place, Aanya saw the roof of the house, which is triangular in shape. If she imagined the dimensions of the roof as given in the figure, then answer the following questions.



(i) If D is the mid point of AC, then find BD.
(ii) Find the measures of ∠A and ∠C.
(iii) Find the value of sin A + cos C.

10. If m = cos A − sin A and n = cos A + sin A, then show that $\frac{m}{n}-\frac{n}{m}=\frac{4\sin A\cos A}{\cos^2 A-\sin^2 A}=-\frac{4}{\cot A-\tan A}$

11. If $\sin\theta-\cos\theta=0$, then find the value of $(\sin^4\theta+\cos^4\theta)$.

12. Prove that : $\frac{\operatorname{cosec} A-\cot A}{\operatorname{cosec} A+\cot A}+\frac{\operatorname{cosec} A+\cot A}{\operatorname{cosec} A-\cot A}=2(\operatorname{cosec}^2 A-1)=2\left(\frac{1+\cos^2 A}{1-\cos^2 A}\right)$

13. Prove that :
$$\frac{\sec^3\theta}{\sec^2\theta-1}+\frac{\operatorname{cosec}^3\theta}{\operatorname{cosec}^2\theta-1}=\sec\theta\operatorname{cosec}\theta(\sec\theta+\operatorname{cosec}\theta)$$

14. If θ is acute and $\frac{\cos^2\theta}{\cot^2\theta-\cos^2\theta}=3$, then θ is equal to:
(A) 60° (B) 30°
(C) 90° (D) None of these

15. If 4 cos θ = 11 sin θ, then the value of $\frac{11\cos\theta-7\sin\theta}{11\cos\theta+7\sin\theta}$ is:
(A) 93/149 (B) 94/149
(C) 91/149 (D) 97/149

16. $\tan^2\theta\sin^2\theta$ is equal to:
(A) $\tan^2\theta-\sin^2\theta$ (B) $\tan^2\theta+\sin^2\theta$
(C) $\frac{\tan^2\theta}{\sin^2\theta}$ (D) $\sin^2\theta\cot^2\theta$

17. If $\sqrt{3}\sec(3x-21)^\circ=2$, then find the value of $\sin^2(x+13)^\circ+\cot^2(x+13)^\circ$.


RITIK SIR
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NEVER GIVE UP

Thank You