UDAAN

2026

Trigonometry

MATHS LECTURE-2

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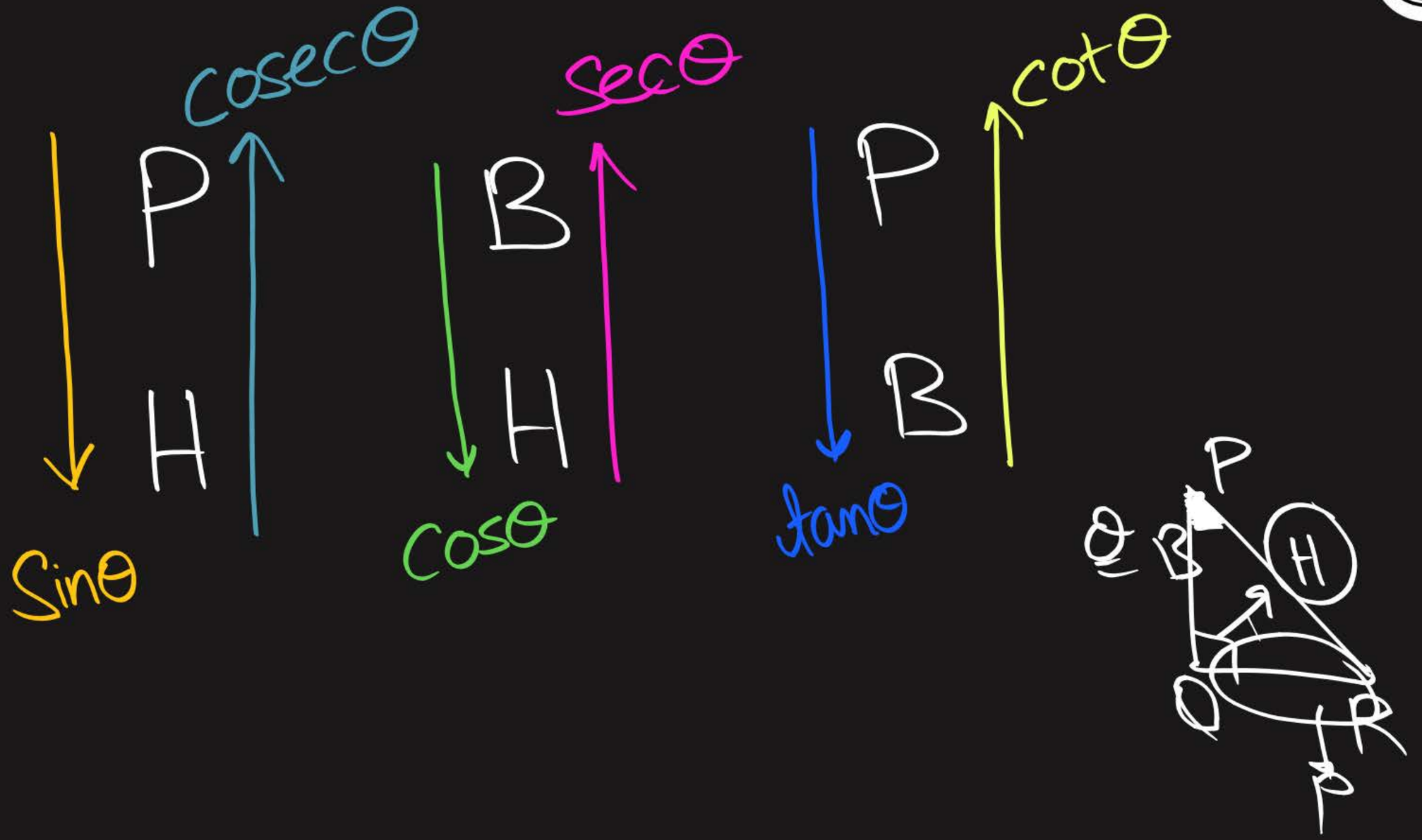
Topics *to be covered*

A Questions on T ratios

B T -ratios for some specific angles


cosecθ
secθ
cotθ
P
B
H
sinθ
cosθ
tanθ
P
θ
B
H

#GPU

#Q. In a right triangle ABC, right angled at B, the ratio of AB to AC is $1 : \sqrt{2}$.

Find the value of:

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

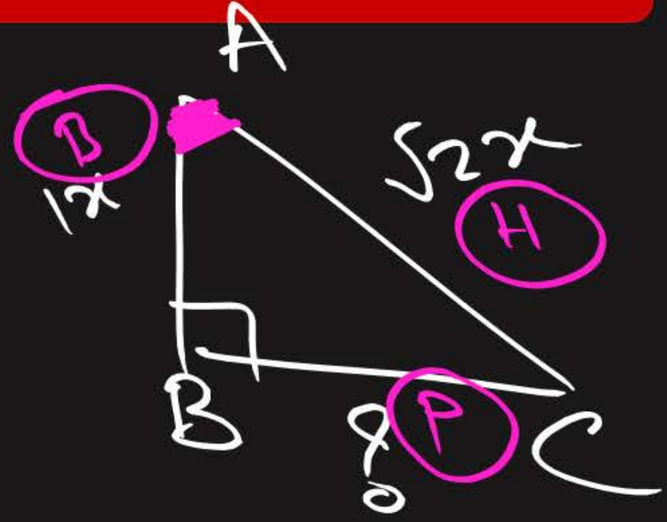
$\tan 2A = \tan A \times \tan A = (\tan A)^2$

$= (\tan A)^2$

$\tan A = \frac{P}{B} = \frac{1x}{1x} = 1$

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

$= \frac{2}{2} = 1$ Ans.



$\pm\sqrt{1x^2} = BC$

$1x = BC$

$(\sqrt{2}x)^2 = (1x)^2 + (BC)^2$

$2x^2 = 1x^2 + BC^2$

$1x^2 = BC^2$

→ $\sin\theta \neq \sin \times \theta$

→ $\sin^2\theta = (\sin\theta)^2 = \sin\theta \times \sin\theta$

→ $\sin^3\theta = (\sin\theta)^3 = \sin\theta \times \sin\theta \times \sin\theta$

→ $\sin\theta^4 \neq (\sin\theta)^4 \neq \sin\theta \times \sin\theta \times \sin\theta \times \sin\theta$

→ $\sin^4\theta = (\sin\theta)^4$

#Q. In ΔPQR, right angled at Q, PR + QR = 25 cm and PQ = 5 cm. Determine the values of sin P, cos P and tan P.

NCERT

$PR + QR = 25$

$PQ = 5$

$PR = 25 - QR$

By PT

$(PR)^2 = (PQ)^2 + (QR)^2$

$PR^2 = 25 + QR^2$

$(25 - QR)^2 = 25 + QR^2$

$(25)^2 + (QR)^2 - 2(25)(QR) = 25 + QR^2$

$625 + \cancel{QR^2} - 500R = 25 + \cancel{QR^2}$

$625 - 500R = 25$

$625 - 25 = 500R$

$600 = 500R$

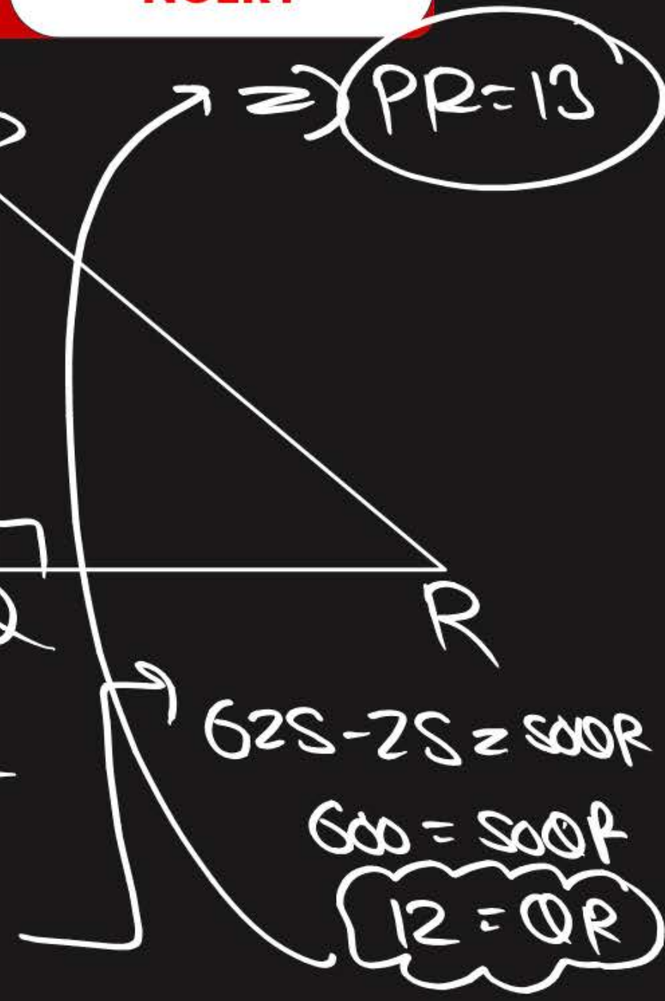
$12 = QR$

$PR = 13$

$\sin P = \frac{P}{H} = \frac{QR}{PR} = \frac{12}{13}$

$\cos P = \frac{B}{H} = \frac{PQ}{PR} = \frac{5}{PR = 13}$

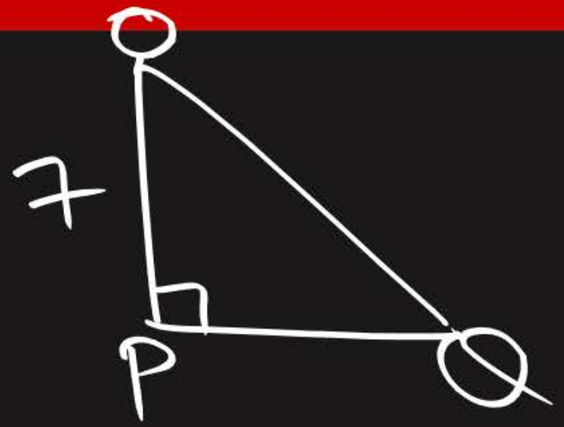
$\tan P = \frac{P}{B} = \frac{QR}{PQ} = \frac{12}{5}$



#Q. In ΔOPQ, right angled at P, OP = 7 cm, OQ – PQ = 1 cm. Determine the values of sin Q and cos Q.

#GPW

NCERT



OQ - PQ = 1

$\sin\theta = \frac{12}{S} = \frac{P}{H}$

Not Possible

$\frac{12}{S} = \frac{P}{H}$

$P = 12x$

$H = 5x$

$P > H$

Q $\sin\theta = \frac{P}{H}$

$\frac{5}{12}$ $\frac{6}{7}$ $\frac{100}{200}$

$\sin\theta$ always less than 1

#Q. State whether the following are true or false. Justify your answer.

H/B

(i) sec A = 12/5 for some value of angle A. T

(ii) cos A is the abbreviation used for the cosecant of angle A. F

(iii) cot A is the product of cot and A. F

(iv) sin θ = 4/3 for some angle. F

Cosecant of angle A = cosecA

Cosine of angle A = cosA

secantθ = secθ

sineθ = sinθ

cosineθ = cosθ

tangentθ = tanθ

cotangentθ = cotθ

cosecantθ = cosecθ

Q. $\dfrac{1}{\frac{1}{2}} = \dfrac{\frac{1}{1}}{\frac{1}{2}} = \dfrac{2}{1} = 2$

Q. $\dfrac{3}{\frac{2}{9}} = \dfrac{\frac{3}{1}}{\frac{2}{9}} = \dfrac{27}{2}$

Q. $\dfrac{\frac{9}{4}}{3} = \dfrac{\frac{9}{4}}{\frac{3}{1}} = \dfrac{9}{12} = \dfrac{3}{4}$

Q. $\dfrac{\frac{16}{9}}{\frac{4}{3}} = \dfrac{\frac{4}{3}}{\frac{1}{1}} = \dfrac{4}{3}$

Reciprocal Identity

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

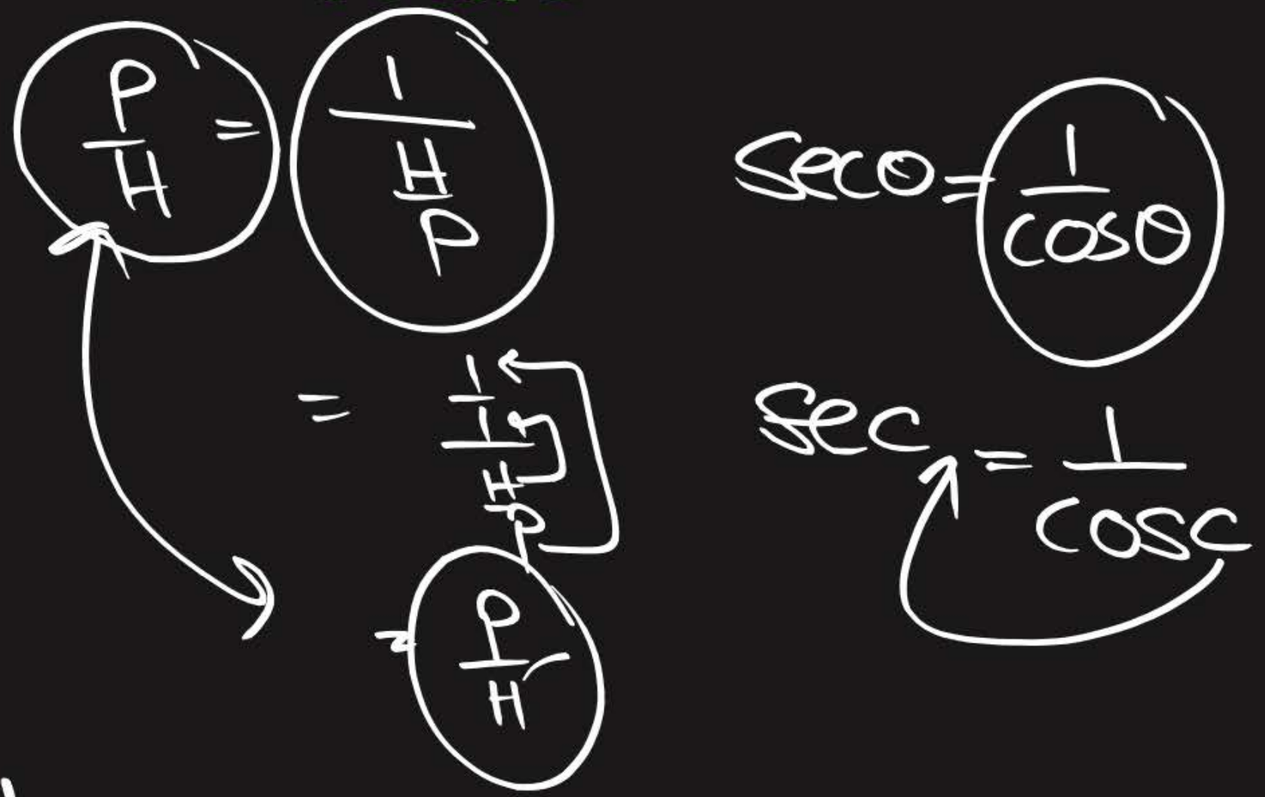
$\cos\theta \longleftrightarrow \sec\theta$ ⇄ B

$\tan\theta \longleftrightarrow \cot\theta$ ⇄ B/P

P ⇄ B ⇄ B

2 sra Matlab

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



1st mattab

Q $\sec\theta = \frac{9}{4}$, $\cos\theta = \frac{4}{9}$

Quotient Identity

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

$$\frac{\frac{P}{H}}{\frac{B}{H}} = \frac{P}{B}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta} = \frac{B/H}{P/H}$$

$$\tan\alpha = \frac{\sin\alpha}{\cos\alpha}$$

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

$\tan 90^\circ = \frac{\sin 90^\circ}{\cos 90^\circ}$

$\frac{1}{0} = n.d$

$\frac{1}{n.d} = 0$

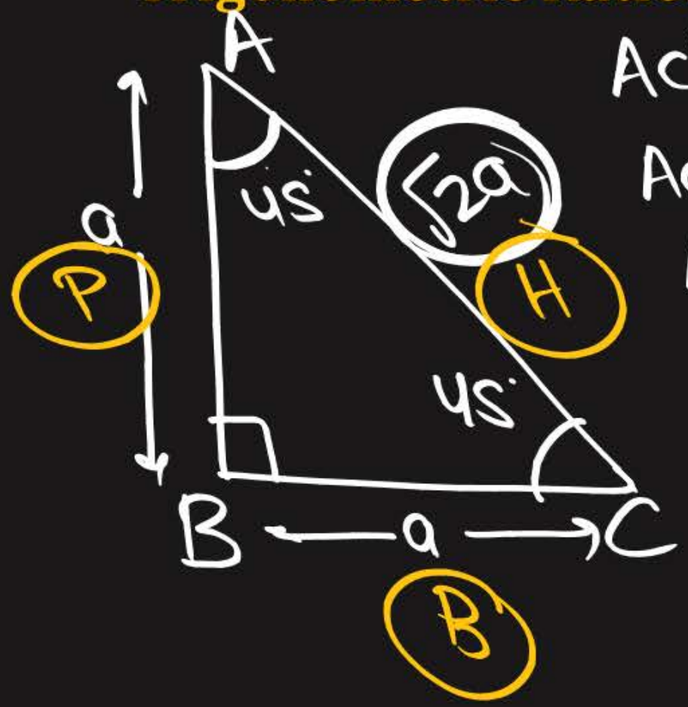
T. Ratios / θ	0°	30°	45°	60°	90°
sin θ	0	1/2	1/√2	√3/2	1
cos θ	1	√3/2	1/√2	1/2	0
tan θ	0	1/√3	1	√3	n.d
cosec θ	n.d	2	√2	2/√3	1
sec θ	1	2/√3	√2	2	n.d
cot θ	n.d	√3	1	1/√3	0

$\frac{\sin\theta}{\cos\theta}$ $\frac{1}{\sin\theta}$ $\frac{1}{\cos\theta}$ $\frac{1}{\tan\theta}$

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

Trigonometric Ratios of Some Specific Angles

Trigonometric Ratios of 45°



$$AC^2 = AB^2 + BC^2$$

$$AC^2 = (a)^2 + (a)^2$$

$$AC^2 = a^2 + a^2$$

$$AC^2 = 2a^2$$

$$AC = \pm\sqrt{2a^2}$$

$$\boxed{AC = \sqrt{2}a}$$

$$\text{Sin}45^\circ = \frac{P}{H} = \frac{a}{\sqrt{2}a} = \boxed{\frac{1}{\sqrt{2}}}$$

$$\text{Cos}45^\circ = \frac{B}{H} = \frac{a}{\sqrt{2}a} = \boxed{\frac{1}{\sqrt{2}}}$$

$$\text{tan}45^\circ = \frac{P}{B} = \frac{a}{a} = \boxed{1}$$

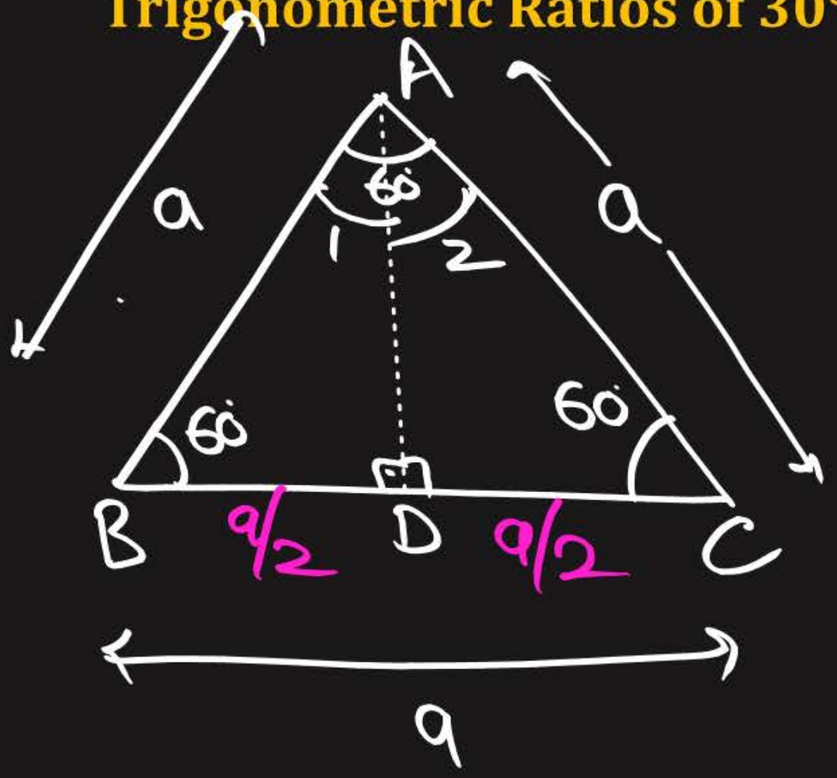
$$\text{Cosec}45^\circ = \frac{\sqrt{2}}{1} = \boxed{\sqrt{2}}$$

$$\text{Sec}45^\circ = \boxed{\sqrt{2}}$$

$$\text{Cot}45^\circ = \boxed{1}$$

Trigonometric Ratios of Some Specific Angles

Trigonometric Ratios of 30° and 60°



$\triangle ABD$ and $\triangle ACD$

$AB = AC$ (a)

$\angle ADB = \angle ADC$ (90°)

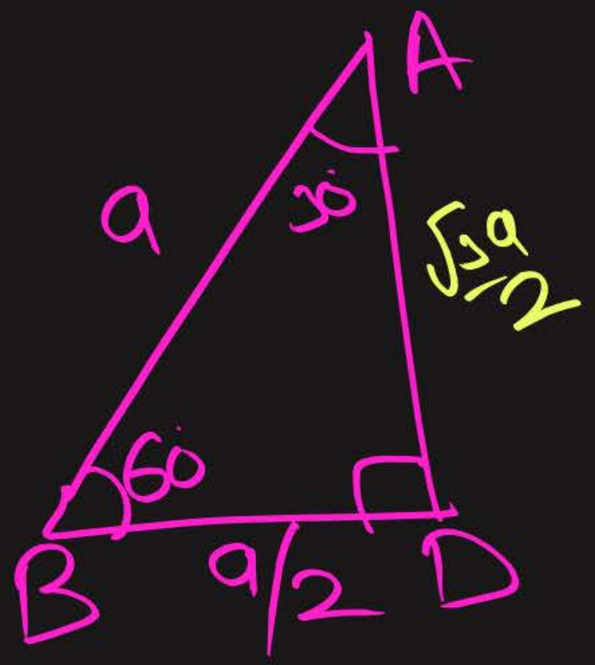
$AD = DA$ (common)

By RHS

$\triangle ABD \cong \triangle ACD$

By CPCT $\angle 1 = \angle 2$

$BD = DC$



$AB^2 = AD^2 + BD^2$

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

$a^2 = AD^2 + \frac{a^2}{4}$

$\frac{a^2}{1} - \frac{a^2}{4} = AD^2$

$\frac{4a^2 - a^2}{4} = AD^2$

$\frac{3a^2}{4} = AD^2$

$\pm\sqrt{\frac{3a^2}{4}} = AD$

$AD = \frac{\sqrt{3}a}{2}$

$\sin 60^\circ = \frac{P}{H} = \frac{\frac{\sqrt{3}a}{2}}{a} = \frac{\sqrt{3}}{2}$

$\sin 30^\circ = \frac{P}{H} = \frac{\frac{a}{2}}{a} = \frac{1}{2}$

$\tan 60^\circ = \frac{P}{B} = \frac{\frac{\sqrt{3}a}{2}}{\frac{a}{2}} = \sqrt{3}$

$\operatorname{Sec} 30^\circ = \frac{H}{B} = \frac{a}{\frac{\sqrt{3}a}{2}} = \frac{2}{\sqrt{3}}$

Trigonometric Ratios of Some Specific Angles

Trigonometric Ratios of 0° and 90°

#Q. Evaluate: $\sin 45° \sin 30° + \cos 45° \cos 30°$.

$\frac{1}{\sqrt{2}} \cdot \frac{1}{2} + \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2}$

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

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

A $\frac{1-\sqrt{3}}{2\sqrt{2}}$

B $\frac{\sqrt{3}+1}{2\sqrt{2}}$

C $\frac{2\sqrt{2}}{\sqrt{3}+1}$

D $\frac{2}{\sqrt{2}}$

#Q. Evaluate: $\cos 60° \cos 45° - \sin 60° \sin 45°$.

$$\frac{1}{2} \cdot \frac{1}{\sqrt{2}} - \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{2}}$$

$$\frac{1}{2\sqrt{2}} - \frac{\sqrt{3}}{2\sqrt{2}}$$

$$\frac{1-\sqrt{3}}{2\sqrt{2}}$$

A $\frac{1-\sqrt{3}}{2\sqrt{2}}$

B $\frac{\sqrt{3}+1}{2\sqrt{2}}$

C $\frac{2\sqrt{2}}{\sqrt{3}+1}$

D $\frac{2}{\sqrt{2}}$

#Q. Evaluate: $4(\sin^4 60° + \cos^4 30°) - 3(\tan^2 60° - \tan^2 45°) + 5\cos^2 45°$.

A. 0

B. 1

C. $\sqrt{2}$

D. NOTA

$$4\left[\left(\frac{\sqrt{3}}{2}\right)^4 + \left(\frac{\sqrt{3}}{2}\right)^4\right] - 3\left[(\sqrt{3})^2 - (1)^2\right] + 5\left(\frac{1}{\sqrt{2}}\right)^2$$

$$4\left[\frac{9}{16} + \frac{9}{16}\right] - 3\left[3 - 1\right] + 5\left(\frac{1}{2}\right)$$

$$4\left(\frac{18}{16}\right) - 3(2) + \frac{5}{2}$$

$$\frac{9}{2} - \frac{6}{1} + \frac{5}{2} = \frac{9 - 12 + 5}{2} = \frac{2}{2} = 1$$

Ans

#Q. Evaluate: $\dfrac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$

A 0

B 3

C 6

D 9

$$= \frac{(\sqrt{3})^2 + 4\left(\frac{1}{\sqrt{2}}\right)^2 + 3\left(\frac{2}{\sqrt{3}}\right)^2 + 5(0)^2}{\frac{2}{1} + \frac{2}{1} - (\sqrt{3})^2}$$

$$= \frac{3 + 4\left(\frac{1}{2}\right) + 3\left(\frac{4}{3}\right)}{2+2-3}$$

$$= \frac{3+2+4}{4-3} = \frac{9}{1} = 9$$

#Q. Evaluate: $\dfrac{5\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$

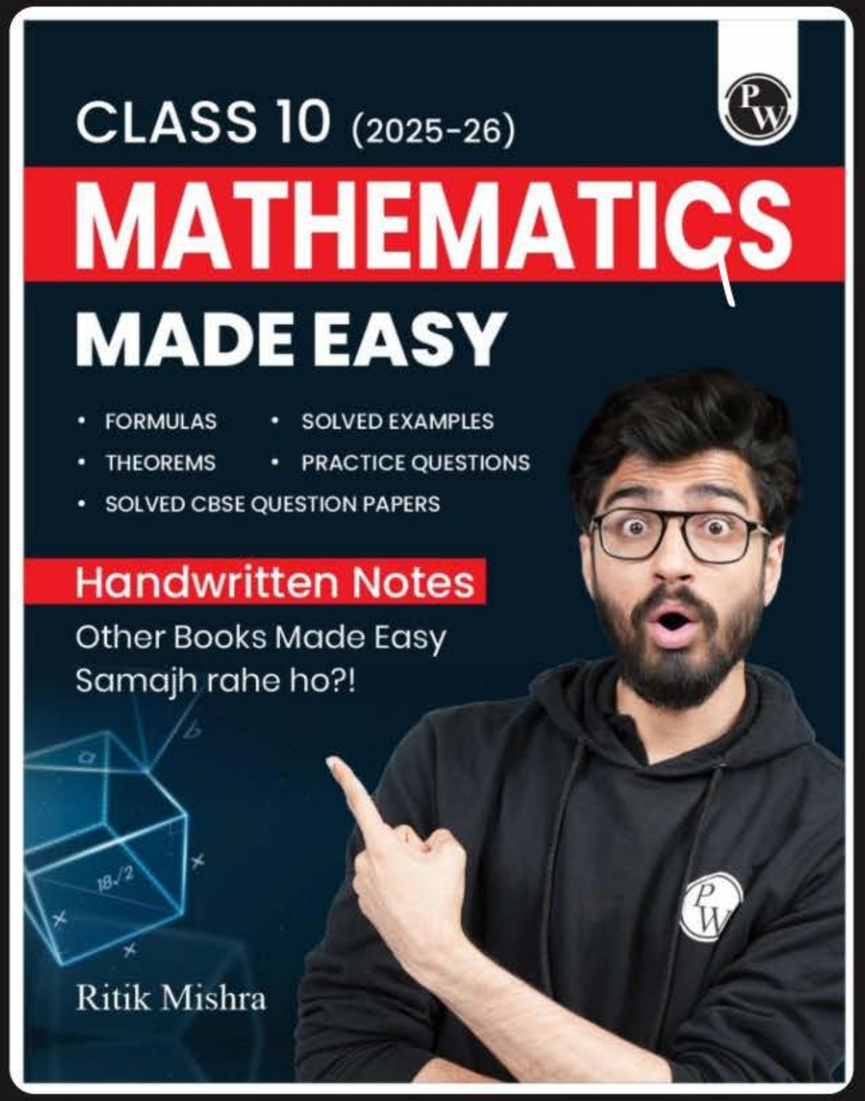
#Gpu

A $\dfrac{12}{72}$

B $\dfrac{16}{70}$

C $\dfrac{67}{27}$

D $\dfrac{67}{12}$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