YAKEEN NEET 2.0

2026

30 chapters
↳ 12 Topic (Avg)
360 Topic

Basic Maths and Calculus (Mathematical Tools)

Physics | Lecture - 03

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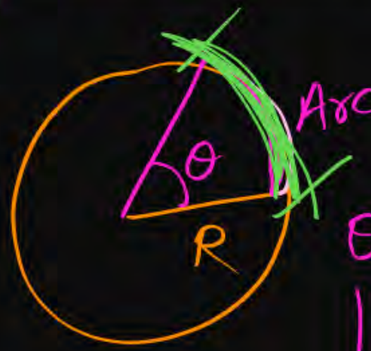
Topics to be covered

1. PhD on Trigonometry
2.
3.
4.

Recap of previous lecture

1. 

$Arc = R\theta$

$\theta = \frac{Arc}{Radu}$

↳ unit Radian / degree / mint / sec.
SI

2. $\pi rad = 180°$

3. $1° = 60 mint = 60'$

4. 

$\sin\theta = \frac{P}{H} = \frac{1}{\text{cosec}\,\theta}$

$\cos\theta = \frac{B}{H} = \frac{1}{\sec\theta}$

$\tan\theta = P/B \quad \cot\theta = B/P$

$Arc = R\theta$ — Have unit, does not have dimn.

metre = metre × radian.

$L^1 = L^1 M^0 L^0 T^0$ ← dimension

Sangrah Assignm.

↳ electric charge & field

5% chapter

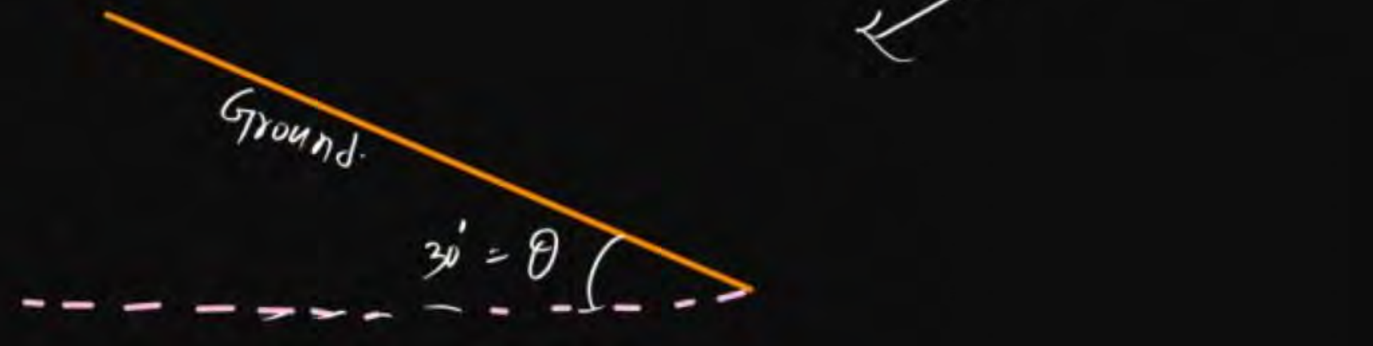
Question

H/W → *** PhD. on. H/W से करना है।

A vertical pole of height $h = 10$ m stands on ground that slopes upwards at a constant angle $\alpha = 30°$ with the horizontal. If the sun's angle of elevation above the horizontal is $\theta = 60°$, what is the length of the shadow cast by the pole on the sloping ground?

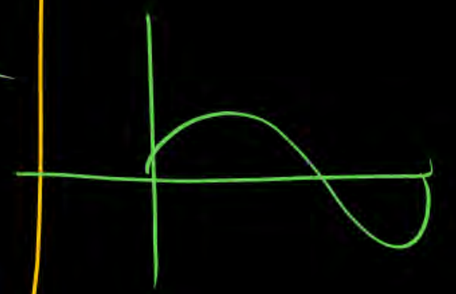
↳ Inclined Plane

1. 5 m
2. 10 m
3. $10\sqrt{3}$ m
4. $\frac{10}{\sqrt{3}-1}$ m



30° Socho

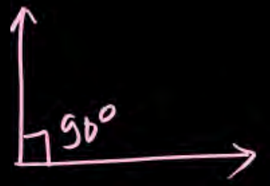
	0°	30°	45°	60°	90°	120°	135°	150°	180°
sinθ	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
cosθ	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{\sqrt{3}}{2}$	−1
tanθ									




@MRPHYSICSS

Parallel line

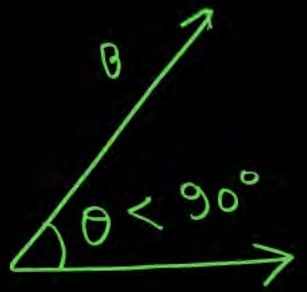
$\theta = 0°$



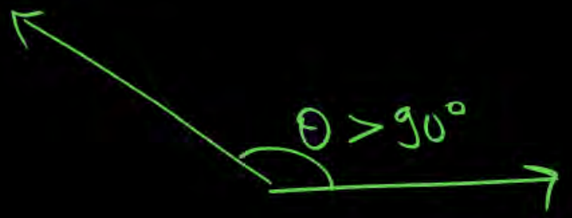
orthogonal line (Perpendicular)

$\theta = 180°$

Antiparallel lin

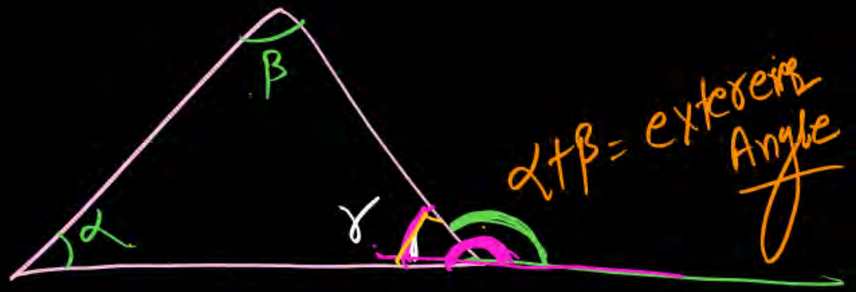


Acute Angle



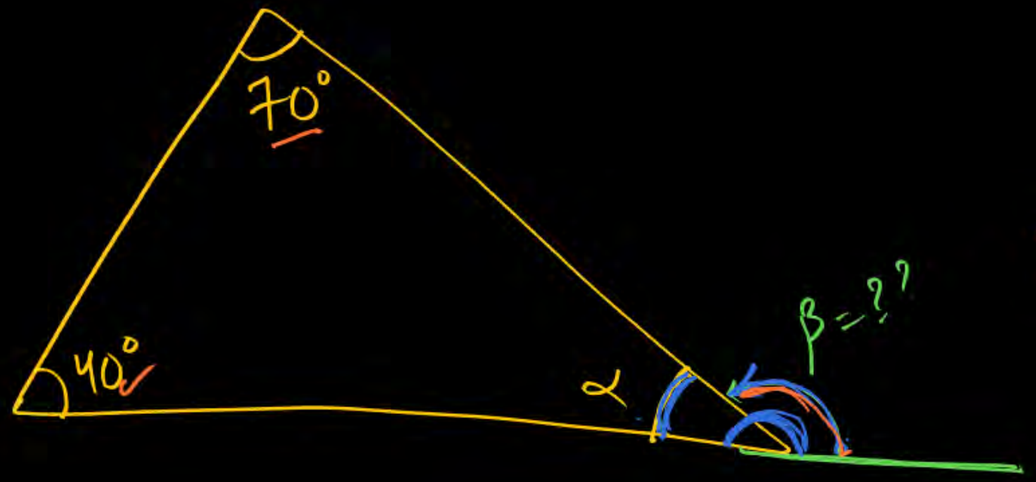
Obtuse angle

Alternate Angle



$\alpha + \beta + \gamma = 180$

$\gamma = 180 - (\alpha + \beta)$



find α Angle & β angle

$40 + 70 + \alpha = 180$

$\alpha = 180 - 110$

$\alpha = 70^\circ$ Ans

we know that

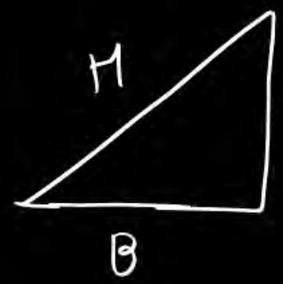
$\alpha + \beta = 180^\circ$

$\beta = 180 - \alpha$

$= 180 - 70$

$\beta = 110$

(#) Some important Pythagoras relation



$H = \sqrt{P^2 + B^2}$ ✓

$\Rightarrow$ P = 1, B = 2 H = $\sqrt{5}$ (1, 2, $\sqrt{5}$)

$\Rightarrow$ P = 4, B = 3 H = 5 (3, 4, 5)

$\Rightarrow$ P = 12 B = 5 H = ??13 (12, 5, 13)

$\Rightarrow$ P = 7 B = 24 H = 25 (7, 24, 25)

$\Rightarrow$ P = 6 B = 8 H = 10 (6, 8, 10)

$\Rightarrow$ #

#

$H = \sqrt{P^2 + B^2}$
$= \sqrt{144 + 25} = \sqrt{169}$
$= 13$

24
24
96
48
576 ✓

$25^2 = 625$ ✓

$P^2 + B^2 = H^2$

divided by H^2 Both side.

$$\frac{P^2}{H^2} + \frac{B^2}{H^2} = \frac{H^2}{H^2} \quad 1$$

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

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

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

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

divide by P^2 both side

$$\frac{P^2}{P^2} + \frac{B^2}{P^2} = \frac{H^2}{P^2}$$

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

divided by B^2 both side

$$\frac{P^2}{B^2} + \frac{B^2}{B^2} = \frac{H^2}{B^2}$$

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

(#) $\sin(A+B) = \sin A \cdot \cos B + \sin B \cdot \cos A$

$\sin(A-B) = \sin A \cdot \cos B - \sin B \cos A$

$\cos(A+B) = \cos A \cdot \cos B - \sin A \cdot \sin B$

$\cos(A-B) = \cos A \cdot \cos B + \sin A \cdot \sin B$

$\tan(A+B) = \dfrac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$

$\tan(A-B) = \dfrac{\tan A - \tan B}{1 + \tan A \cdot \tan B}$

If $A = B = \theta$

$\sin(2\theta) = \sin\theta \cdot \cos\theta + \sin\theta \cdot \cos\theta$

(#) $\boxed{\sin(2\theta) = 2\sin\theta \cdot \cos\theta}$

$\cos(A+B) = \cos A \cdot \cos B - \sin A \cdot \sin B$

$\boxed{\cos(2\theta) = \cos^2\theta - \sin^2\theta}$ #

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

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

$\sin(2\theta) = 2\sin\theta \cdot \cos\theta$

If $2\theta = \alpha$

$\theta = \alpha/2$

$$\sin\alpha = 2\sin\alpha/2 \cdot \cos(\alpha/2)$$

Half Angle formula

$\cos(2\theta) = \cos^2\theta - \sin^2\theta$

$$\cos\alpha = \cos^2\alpha/2 - \sin^2\alpha/2$$

Half Angle formula

A + B

(#) $\sin(105^\circ) = \sin(60+45^\circ) = \sin 60 \cdot \cos 45^\circ + \sin 45^\circ \cdot \cos 60$

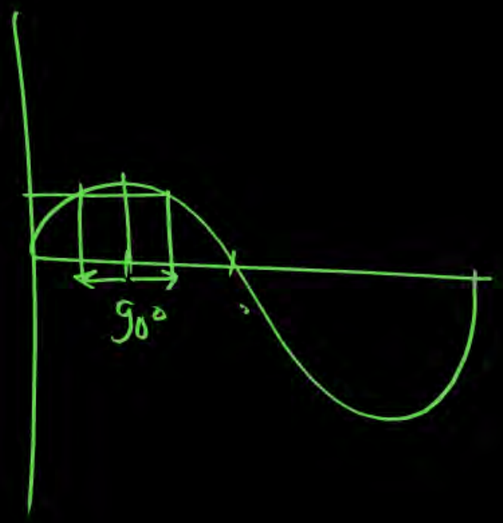
$= \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

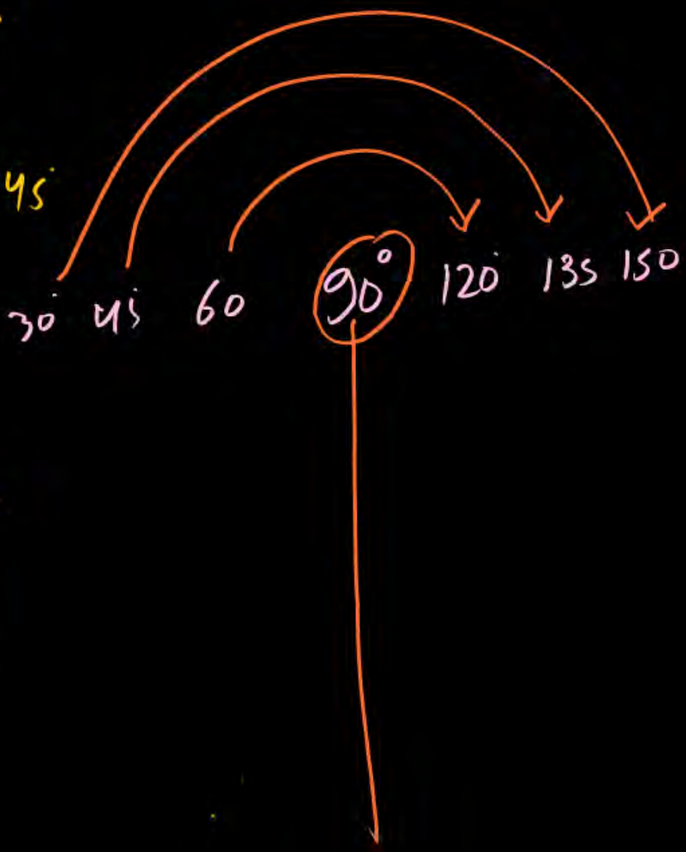
$= \frac{\sqrt{3}+1}{2\sqrt{2}}$

(#) $\sin(75^\circ) = \sin(45^\circ+30^\circ) = \sin 45^\circ \cdot \cos 30^\circ + \sin 30 \cos 45$

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

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





$$\#\quad \cos(15^\circ) = \cos(45^\circ - 30^\circ) = \cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ$$

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

$$\#\quad \tan(105^\circ) = \tan(60 + 45^\circ) = \frac{\tan 60^\circ + \tan 45^\circ}{1 - \tan 60^\circ \tan 45^\circ} = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$\sin 2\theta = 2\sin\theta \cdot \cos\theta$$

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

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

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

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

No need to solve

find value of $\sin 22.5^\circ$

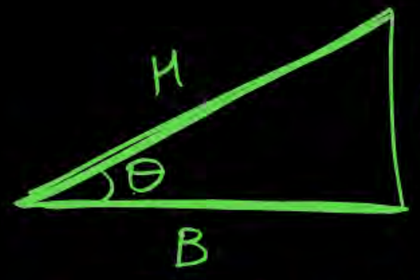
$$\sin 22.5^\circ = \sqrt{\frac{1-\cos(2\times 22.5)}{2}}$$

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

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

Not for us.

Small Angle approximation



$$\cos\theta = \frac{B}{H}$$

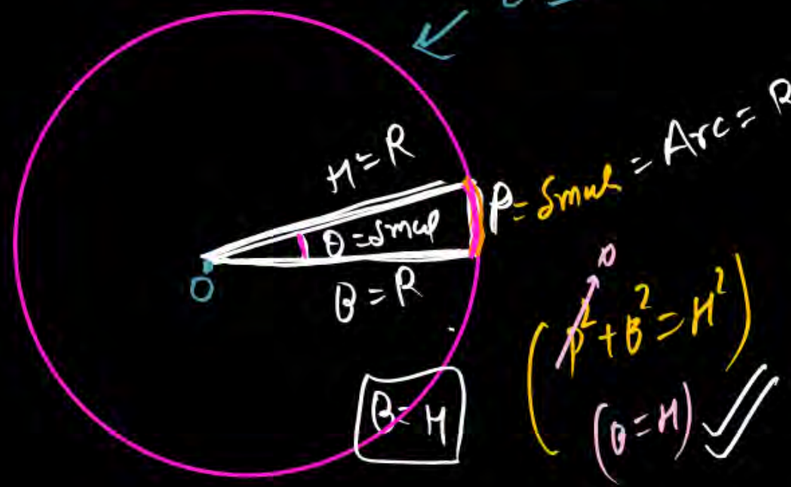
$\theta \longrightarrow$ small

$$\cos\theta = \frac{B}{B} = 1$$

$$\boxed{\cos\theta = 1}$$

small

circle



$(P^2 + B^2 = H^2)$

$(\theta = H)$

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

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

$$\tan\theta = \frac{P}{B} = \frac{R\theta}{R} = \theta$$

for small angle $\theta \leq 5^\circ$

$$\cos\theta = 1$$

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

For Small angle

$\cos 3^\circ = 1$

$\cos 4^\circ = 1$

$\cos 2^\circ = 1$

$\cos 1^\circ = 1$

$\sin\theta = \theta$

$\sin 2^\circ = 2^\circ$ wrong.

$\sin 2^\circ = 2^\circ = 2 \times \frac{\pi \text{ rad}}{180}$

$\sin 2^\circ = \frac{\pi}{90}$ rad

90°

$180^\circ = \pi$ rad

$\sin 3^\circ = 3^\circ = 3 \times \frac{\pi \text{ rad}}{180 \times 60} = \frac{\pi}{60}$ rad.

$\tan 4^\circ = 4^\circ = 4 \times \frac{\pi \text{ rad}}{180}$ R.

Question

Which of the following option is correct for the value of tan (2°) $= 2^\circ = 2 \times \frac{\pi \text{ rad}}{180^\circ} = \frac{\pi}{90} \text{ rad}$

1. 2° ✗
2. $\pi/90$ ✓ 93%
3. $\pi/30$ ✗
4. 2 rad ✗

$\tan 2^\circ = 2\theta$

7% >>>>>>>> 93%

ASTC Rule

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

$\sin(-30^\circ) = -\frac{1}{2}$

$\tan(60) = -\sqrt{3}$

$\cos(-30^\circ) = +\frac{\sqrt{3}}{2}$

2nd [$\sin(150^\circ) = +$

3rd [$\sin(240^\circ) = -$

4th [$\sin(300^\circ) = -$

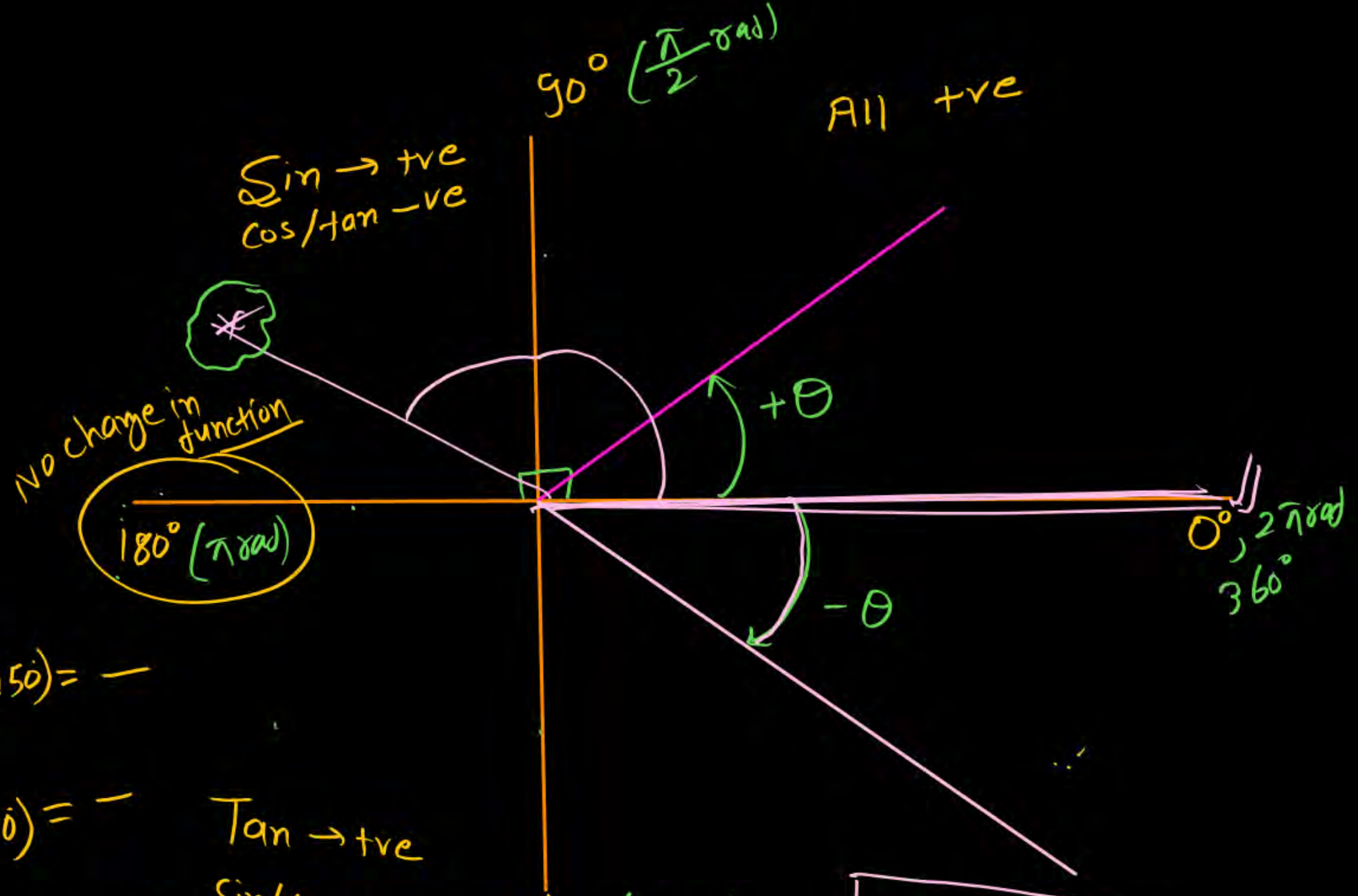
$\sin(-60) = -$

2nd [$\cos(150) = -$

3rd [$\cos(240) = -$

4th [$\cos(330) = +ve$

$\cos(-30) = +ve$



Tan → +ve

Sin/Cos → -ve

Cosθ → +ve

Sinθ/tanθ = -ve

$$\sin(180-\theta) = \sin 180^\circ \cos\theta - \sin\theta \cos 180^\circ$$

$$= 0 - \sin\theta(-1)$$

$$\boxed{\sin(180-\theta) = \sin\theta}$$

$$\sin(180+\theta) = -\sin\theta$$

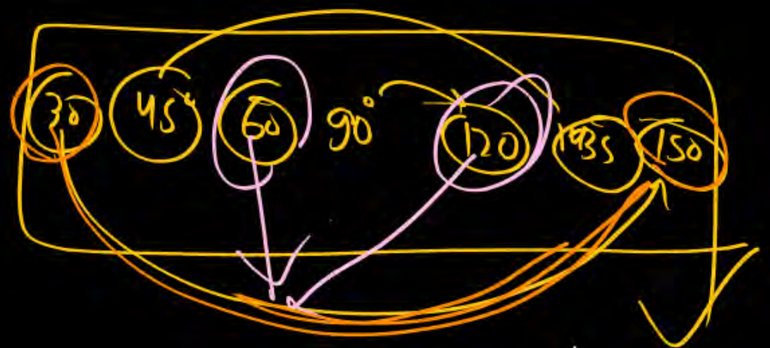
$$\boxed{\begin{aligned}\cos(180-\theta) &= -\cos\theta \\ \cos(180+\theta) &= -\cos\theta\end{aligned}}$$

IMP Concept

Ex $\boxed{\sin(120^\circ) = \sin(180-60) = \sin 60 = \frac{\sqrt{3}}{2}}$

$\sin(150^\circ) = \sin(180-30) = \sin 30^\circ = \frac{1}{2}$

$\sin(240^\circ) = \sin(180+60) = -\sin 60 = -\frac{\sqrt{3}}{2}$



Pho

$\sin(180-\theta) = \sin\theta$

$\sin(180+\theta) = -\sin\theta$

$\cos(180-\theta) = -\cos\theta$

$\cos(180+\theta) = -\cos\theta$

1st

$\sin(360+\theta) = \sin\theta$

$\cos(360+\theta) = \cos\theta$

4th

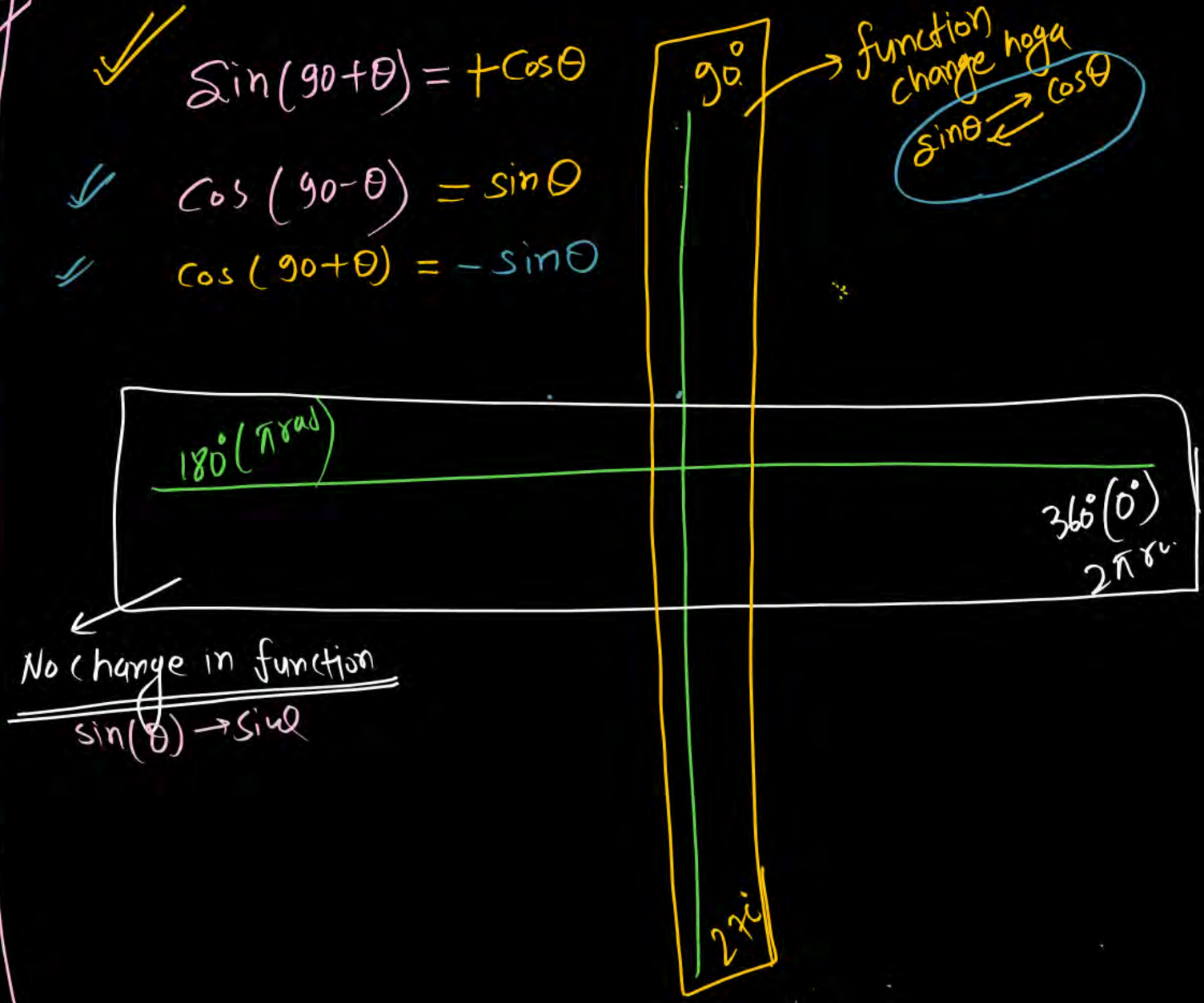
$\sin(360-\theta) = -\sin\theta$

$\cos(360-\theta) = +\cos\theta$

$\sin(90+\theta) = +\cos\theta$

$\cos(90-\theta) = \sin\theta$

$\cos(90+\theta) = -\sin\theta$



$\sin(90+\theta) = \sin 90^\circ \cos\theta + \sin\theta \cos 90^\circ$

(1 and 0 above $\sin 90^\circ$ and $\cos 90^\circ$)

$\boxed{\sin(90+\theta) = \cos\theta}$

Iska sign dekna hai 2nd Quadrant me

$\boxed{\sin(90-\theta) = \cos\theta}$

Question

If $y = \frac{\sin\theta}{\theta}$ then find value of y if $\theta = 30°$.

$$y = \frac{\sin\theta}{\theta}$$

$$y_{\theta=30°} = \frac{\sin 30°}{\pi/6} = \frac{1/2}{\pi/6} = \frac{6 \times 1}{2 \times \pi} = \frac{3}{\pi}$$ Ans #

$$y_{\theta=30°} = \frac{\sin 30°}{30°}$$ X

$30° = \frac{\pi}{6}$ rad

Question challenger Question (H/W)

Suggest suitable match between function given in the first column and its description given in the second column.

Column-I	Column-II
(A) sin (390°)	(P) Positive
(B) sin (–30°)	(Q) Negative
(C) cos 120°	(R) Zero
(D) tan (–120°)	(S) Modulus is greater than one
	(T) Modulus is less than one

1. A→PT, B →QT, C→QT, D→PS
2. A→PT, B →QS, C→QT, D→PS
3. A→QT, B →QS, C→PT, D→PS
4. A→QS, B →PT, C→QT, D→PS

Question

Find value:

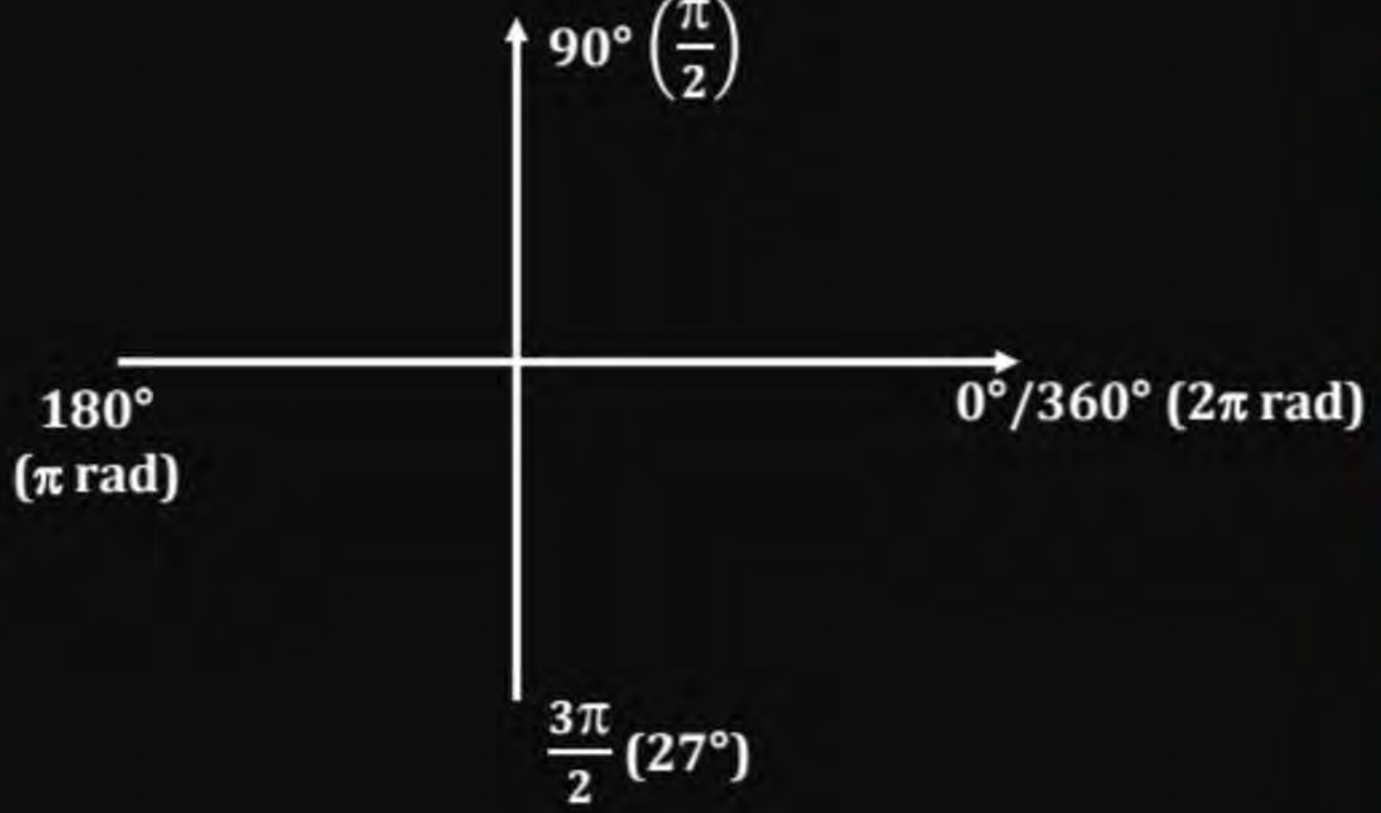
(i) $\sin 2°$

(ii) $\tan 3°$

(iii) $\cos 3°$

(iv) $\sin (88.5°)$

TRIGONOMETRY FUNCTION CHARGE



$\sin(90° - \theta) =$

$\cos(90° - \theta) =$

$\sin(90° + \theta) =$

$\cos(90° + \theta) =$

$\sin(180° - \theta) =$

$\cos(180° - \theta) =$

Question

11/10

Find value of

(i) $\sin(-30°)$

(ii) $\cos(-60°)$

(iii) $\sin(120°)$

(iv) $\sin(390°)$

H/W

$\sin(360°) =$

✓ $\sin(450°) =$ $\sin(360+90) = \sin 90° = 1$

$\sin(-90°) =$

$\sin(120°) =$

$\sin(-150°) =$

H/W

$\cos(300°) =$

$\cos(330°) =$

$\tan(240°) =$

$\cos(-30°) =$

$\tan(-60°) =$

$\cot(-45°) =$

Question

$y = 4 \sin(2\theta)$

Find maximum value of y and also find angle at which y will be maximum?

$$|\cos(7\theta)|_{max} = 1$$

$$\sin\theta_{max} = 1$$

$$\sin(2\theta)_{max} = 1$$

$$\sin\left(\frac{3\theta}{2}\right)_{max} = 1$$

$$y = 4\sin 2\theta$$

mokeka mila ki nahi mila

$$y_{max} = 4\,|\sin(2\theta)|_{max}$$

$$y_{max} = 4$$

$$\sin(2\theta)_{max} = 1$$

at $2\theta = 90$

$\theta = 45^\circ$ ✓ feel

$$R = \frac{u^2 \sin 2\theta}{g}$$

$$R_{max} = \frac{u^2}{g}\,|\sin 2\theta|_{max}$$

$$R_{ma} = \frac{u^2}{g}$$

$\sin 2\theta = 1$

$2\theta = 90$

at $\theta = 45$

R_{max}

⑧ at which angle $\sin(3\theta)$ will have max^{m} val

$$\sin(3\theta)_{Max} = 1$$

$$3\theta = 90^\circ$$

$$\theta = \frac{90}{3} = 30^\circ$$

Question

11/10

If $y = 3\cos(3\theta)$, then find angle at which y will be zero.

ϕ = intial phase

$Y = A \sin(\omega t + kx + \phi)$

3

1

2

Kisko Phase Kahte hai ??

SHM wave vese wave oph EM wave

(a) 1 50%

(b) 2

(c) 3 32%

(d) Hamko nahi aw

Ohaichu on top

THANK YOU