

YAKEEN NEET 2.0

2026

Basic Maths and Calculus (Mathematical Tools)

Physics

Lecture – 02

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Topics to be covered

1

Trigonometry

2

3

4

What is infinity ??

→ infinity is relative term ✓

1m length is infinitely large
in compare to Radius of
atom ($10^{-10} \text{ m} = 1 \text{ \AA}$).

$$1 \text{ m} \gg \gg \gg \gg 10^{-10} \text{ m}$$

1m length is infinitely small
is compare to radius of earth.

$$2^2 = 4$$

$$2^3 = 8$$

$$2^4 = 16$$

$$2^\infty = \text{infinity}$$

$$2^{-\infty} = \frac{1}{2^\infty} = \frac{1}{\infty} = 0$$

$$\frac{1}{2} = 0.5$$

$$\frac{1}{4} = \frac{1}{2} \times \frac{1}{2} = \frac{0.5}{2} = 0.25$$

$$e^\infty = (2.71)^\infty = \text{infinity}$$

$$e^{-\infty} = \frac{1}{e^\infty} = \frac{1}{\infty} = 0$$

$$e^0 = 1$$

$$e^1 = e$$

H/W



$$2^0$$

$$2^\alpha$$

$$2^{-\alpha}$$

$$e^1$$

$$e^0$$

$$e^\alpha$$

$$e^{-\alpha}$$

$$\frac{1}{(0.4)^\alpha} = ?$$

$$12\frac{1}{2} = 6 \text{ wrong}$$

$$\overset{6}{\cancel{12}} \times \frac{1}{\cancel{2}} = 6 \quad \checkmark$$

$$12\frac{1}{2} = 12 + \frac{1}{2} = \frac{25}{2} = 12.5$$

$$\# \checkmark \quad \frac{4}{3\frac{1}{2}} = \frac{4}{7/2} = \frac{8}{7} \quad \checkmark$$

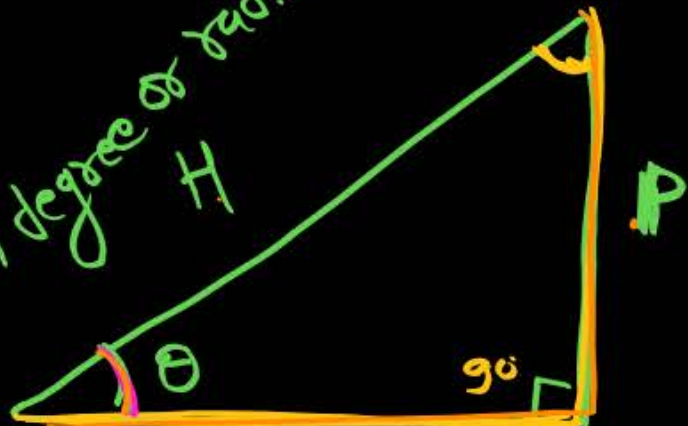
$$\# \checkmark \quad \frac{4}{3 \times \frac{1}{2}} = \frac{8}{3}$$



Trigonometry

Trigonometry

Isko ham degree or radian dono me value rakh sakte hai



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

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

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

$$\operatorname{cosec} \theta = \frac{H}{P}$$

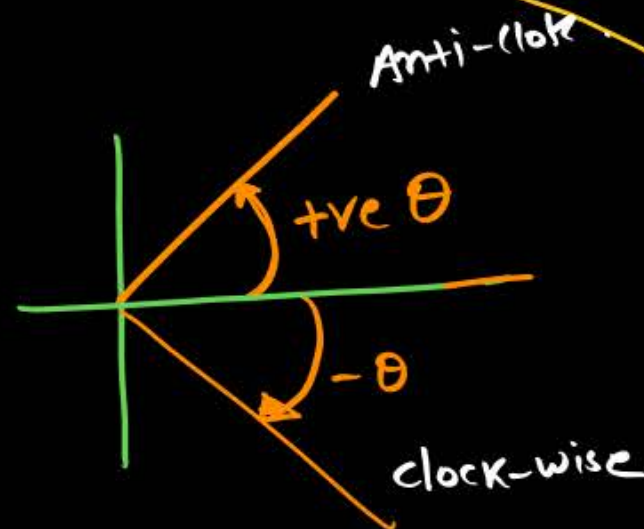
$$\sec \theta = \frac{H}{B}$$

$$\cot \theta = \frac{B}{P}$$

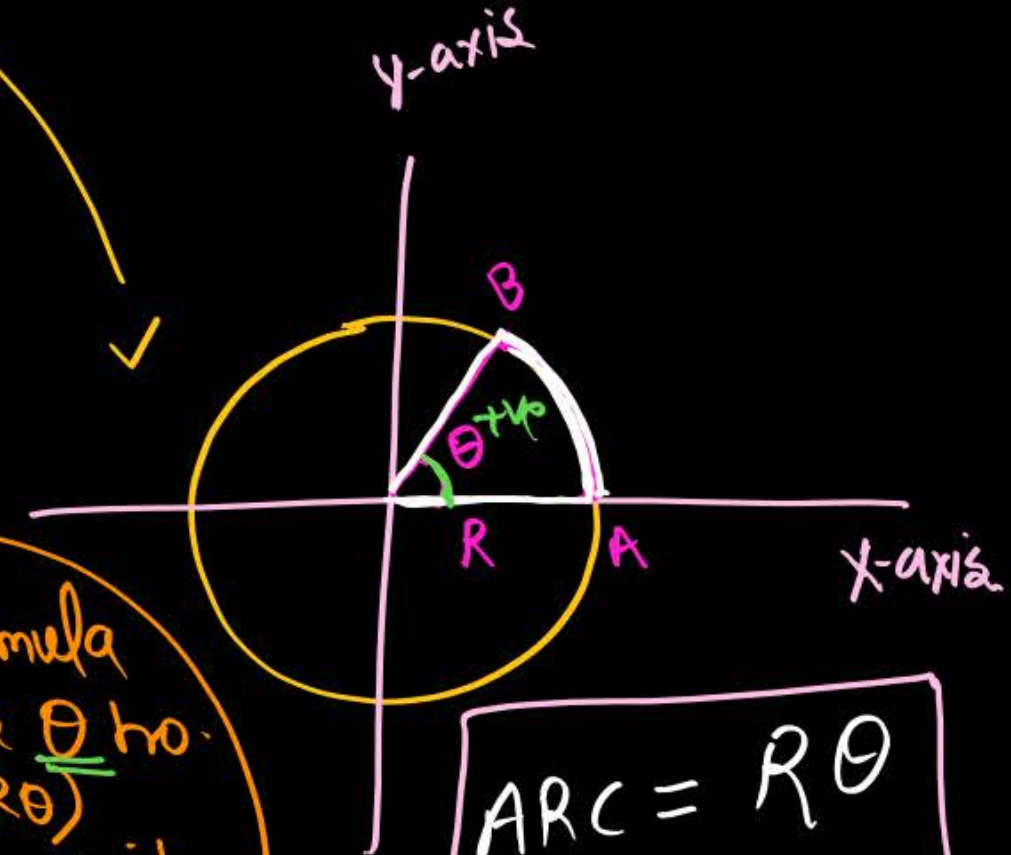
$$\sin \theta \times \operatorname{cosec} \theta = 1$$

$$\cos \theta \times \sec \theta = 1$$

$$\tan \theta \times \cot \theta = 1$$




Jab formula me akela θ ho.
($\text{Arc} = R\theta$)
to θ ka unit radian hi hoga.



$$\text{ARC} = R\theta$$

$\theta \rightarrow$ S.I unit radian
 \rightarrow dimensionless
 \rightarrow Practical unit degree / min / sec



Trigonometric function	0°	30°	45°	60°	90°	120°	135°	150°	180°
$\sin \theta$	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
$\cos \theta$	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
$\tan \theta = \frac{\sin \theta}{\cos \theta}$	0	$\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined	$-\sqrt{3}$	-1	$-\frac{1}{\sqrt{3}}$	0

∴ as θ increases from $[0^\circ \text{ to } 90^\circ]$

$\sin \theta \rightarrow$ Inc rate.

$\cos \theta \rightarrow$ decrease.

$\tan \theta \rightarrow$ Inc rate.

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

$$\cos 60^\circ = \frac{1}{2}$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$\cos 90^\circ = 0$$

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

$$\cos 45^\circ = \frac{1}{\sqrt{2}}$$

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

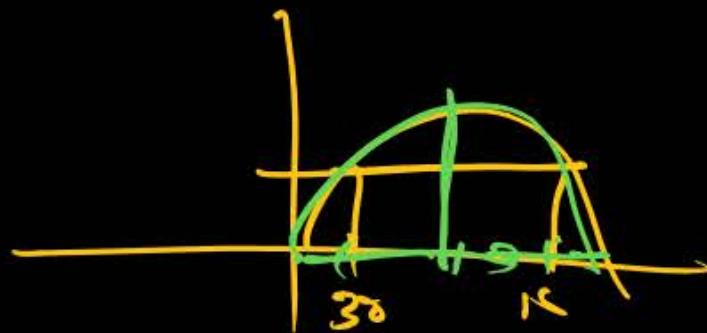
$$\cos(120^\circ) = -\frac{1}{2}$$

$$\tan(135^\circ) = -1$$

$$\cos(150^\circ) = -\frac{\sqrt{3}}{2}$$

$$\sin(120^\circ) = \frac{\sqrt{3}}{2}$$

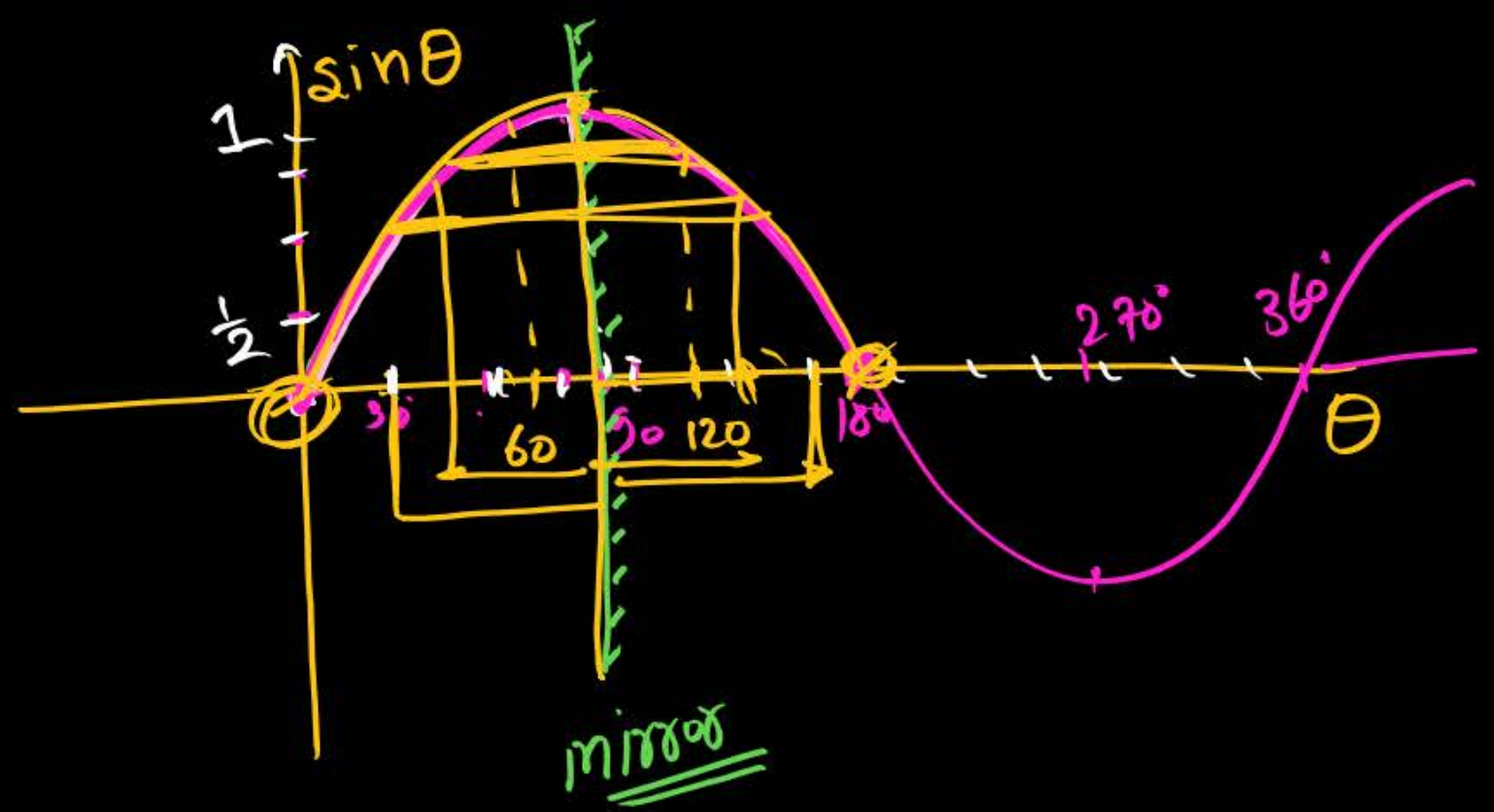
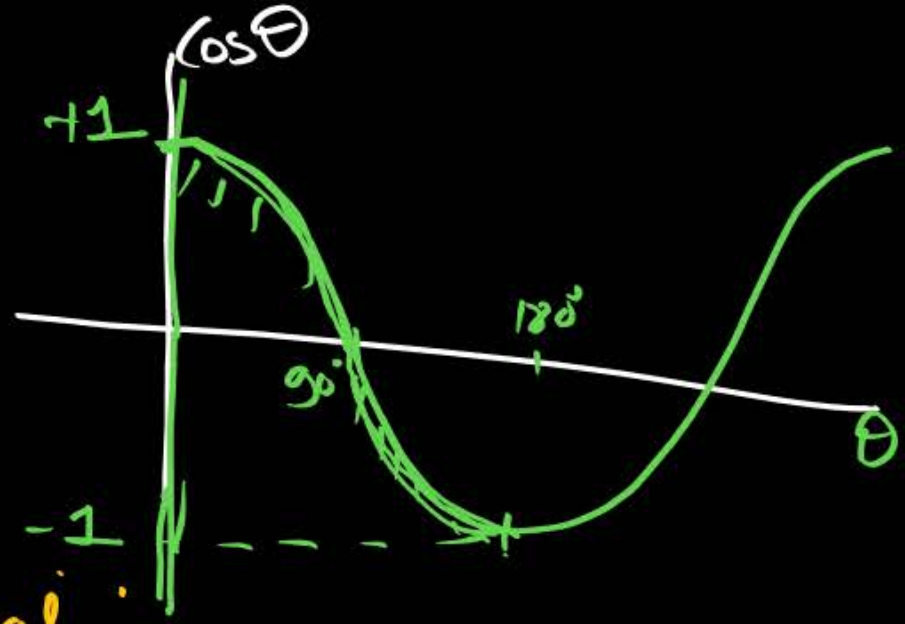
$$\cos(135^\circ) = -\frac{1}{\sqrt{2}}$$



60/120

45/135

30/150



MR* kya hai.

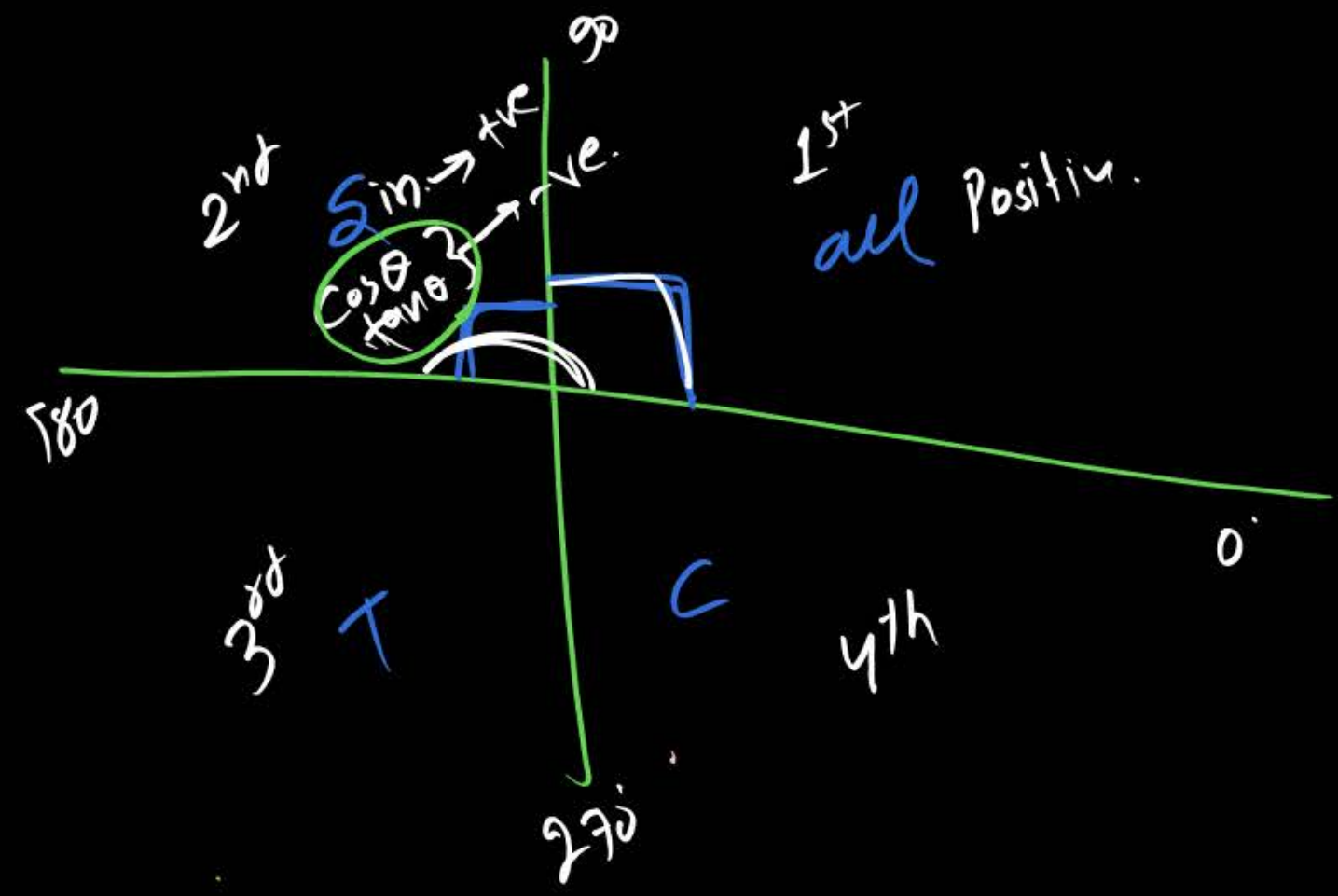
(a) Jante hai 54% ✓

(b) Janna chahte hai.
44%.

MR* → Soch hai (concept ka)

pt Blood group
MOR

Matlauri se duri MR* hai. Jany



Question



If angle increases from 0° to 90° , then value $\sin \theta$ and $\cos \theta$

1 ✓ Increases, decreases (Ans)

2 decreases, Increases

3 both decrease

No need to write

4 both Increase

Question



Find value of $\sin(180^\circ) \cos(135^\circ) \tan(120^\circ)$

\swarrow
 $\sin(0) = 0$

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

\searrow
 $-\sqrt{3}$

Likhna hai

$$\begin{aligned} \sin \theta_{\max} &= +1 \quad \text{at } \theta = 90^\circ \\ \sin \theta_{\min} &= -1 \quad \text{at } \theta = 270^\circ \end{aligned} \quad \left[-1 \leq \sin \theta \leq +1 \right]$$

$$\begin{aligned} \cos \theta_{\max} &= 1 \quad (\text{at } 0^\circ) \\ \cos \theta_{\min} &= -1 \quad (\text{at } 180^\circ) \end{aligned} \quad \left[-1 \leq \cos \theta \leq +1 \right]$$

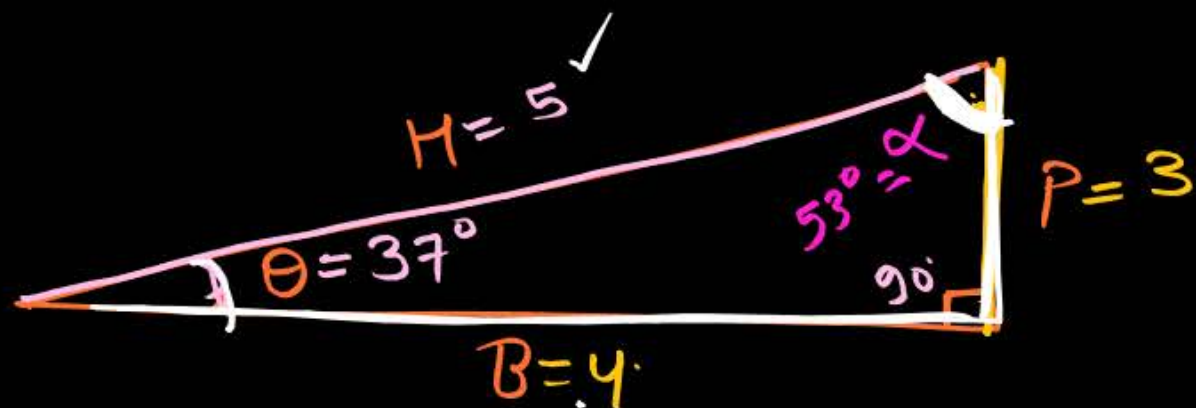
$$\begin{aligned} \tan \theta_{\max} &= +\infty \quad \text{at } 90^\circ \\ \tan \theta_{\min} &= -\infty \quad \text{at } 270^\circ \end{aligned}$$

pythagoras. theorem

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

$$H > P$$

$$H > B$$



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

$$H = \sqrt{9 + 16}$$

$$H = \sqrt{25} = 5$$

$$H > P > B \quad \text{wrong}$$

$$\sin 37^\circ = \frac{3}{5}$$

$$\cos 37^\circ = \frac{4}{5}$$

$$\tan 37^\circ = \frac{3}{4}$$

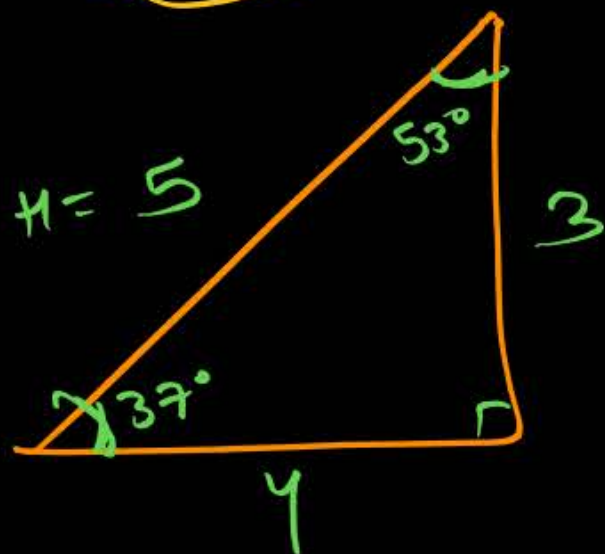
(*)

$$\sin 53^\circ = \frac{4}{5}$$

$$\cos 53^\circ = \frac{3}{5}$$

$$\tan 53^\circ = \frac{4}{3}$$

MR*



$$\tan 37^\circ < \tan 53^\circ$$

$$\tan 37^\circ = \frac{3}{4}$$

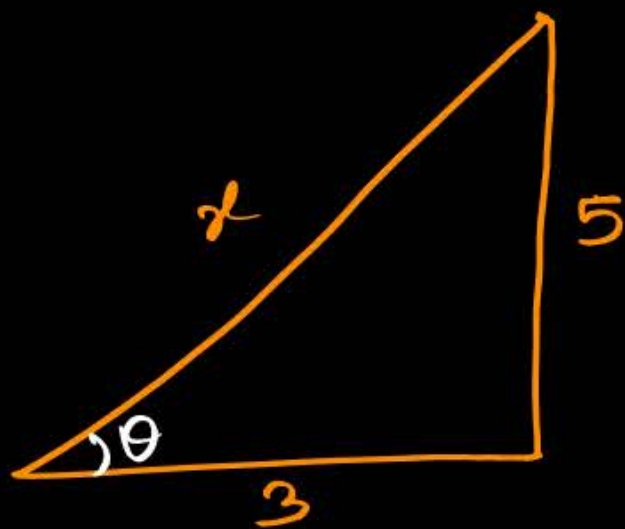
$$\sin 37^\circ = \frac{3}{5}$$

$$\cos 37^\circ = \frac{4}{5}$$

$$\tan 53^\circ = \frac{4}{3}$$

$$\sin 53^\circ = \frac{4}{5}$$

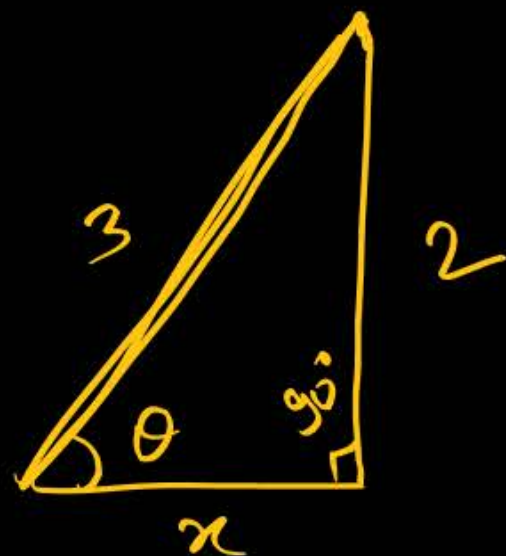
$$\cos 53^\circ = \frac{3}{5}$$



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

$$= \sqrt{9 + 25}$$

$$H = \sqrt{34}$$



$$x^2 + 2^2 = 3^2$$

$$x^2 = 9 - 4$$

$$x = \sqrt{5}$$

(Q) If $\tan \theta = 2$; then find $\cos \theta$ & $\sin \theta$.

Solⁿ

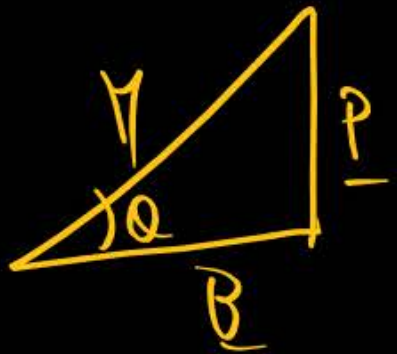
$$\tan \theta = \frac{P}{B} = \frac{2}{1}$$

$$\begin{matrix} P=2 \\ B=1 \end{matrix} \quad (\text{let})$$

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

$$= \sqrt{2^2 + 1^2}$$

$$H = \sqrt{4+1} = \sqrt{5}$$



$$\left. \begin{aligned} \sin \theta &= \frac{P}{H} = \frac{2}{\sqrt{5}} \\ \cos \theta &= \frac{B}{H} = \frac{1}{\sqrt{5}} \end{aligned} \right\}$$

(Q) If $\sin \theta = 2$ then find value of $\cos \theta$ & $\tan \theta$

\rightarrow Solⁿ \rightarrow Not Possible

$$\sin \theta = 2 \quad \times$$

$$\sin \theta = \frac{3}{2} \quad (\text{wrong})$$

(Q) If $\sin \theta = \frac{2}{3}$ then find value of $\cos \theta$ & $\tan \theta$

$$\sin \theta = \frac{2}{3} = \frac{P}{H}$$

$$\begin{aligned} \text{If } P &= 2 \\ H &= 3 \end{aligned}$$

$$\begin{aligned} B &= \sqrt{H^2 - P^2} \\ &= \sqrt{9 - 4} = \sqrt{5} \end{aligned}$$

$$\cos \theta = \frac{B}{H} = \frac{\sqrt{5}}{3}$$

$$\tan \theta = \frac{P}{B} = \frac{2}{\sqrt{5}}$$

Question

Not the $\frac{8}{3}$ likhna hai.



Find x and y :

1 \times $x = \frac{4}{3}, y = \frac{3}{2}$

2 \times $x = \frac{8}{3}, y = \frac{6}{2}$

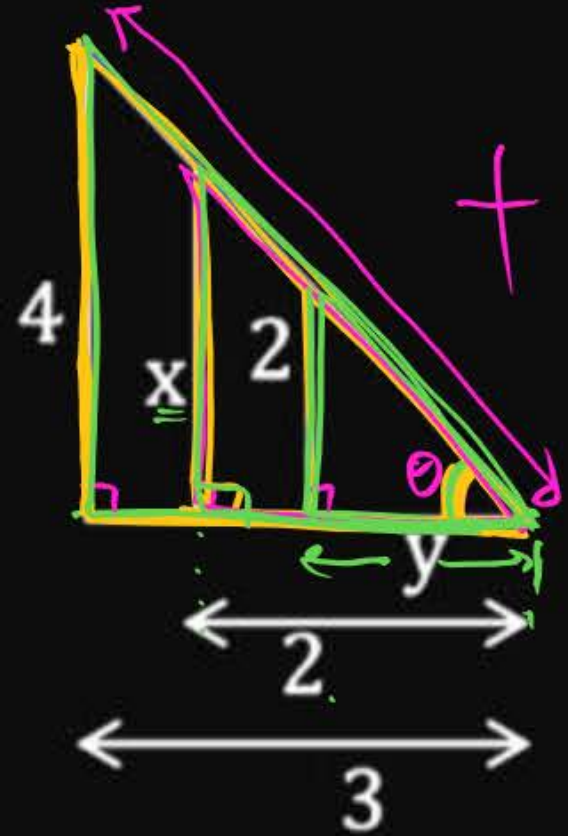
3 \checkmark $x = \frac{8}{3}, y = \frac{3}{2}$
72%

4 $x = \frac{3}{2}, y = \frac{8}{3}$

$$\tan \theta = \frac{4}{3} = \frac{x}{2}$$

$$\frac{4 \times 2}{3} = x$$

$$x = \frac{8}{3}$$



Question

H/W (rough)



If $\sin \theta = 3/5$ then find $\cos \theta$, $\tan \theta$.

If $\sin \theta = 4/3$ then find $\cos \theta$ and $\tan \theta$?

Question



If ~~$\cot \theta = 3$~~ then find $\sin \theta$ and $\cos \theta$.
 $\cot \theta = 3$

Question

From a point on level ground between two vertical towers that are d meters apart, the angles of elevation to the tops of the nearer and farther towers are θ and ϕ , respectively. Assuming the observer is x meters from the nearer tower, what is the difference in heights of the towers?

1 $d \cdot (\tan \theta - \tan \phi)$ ✗

2 $x \cdot \tan \theta - (d - x) \cdot \tan \phi$ ✓

3 $\tan \theta - \tan \phi \cdot d$ ✗

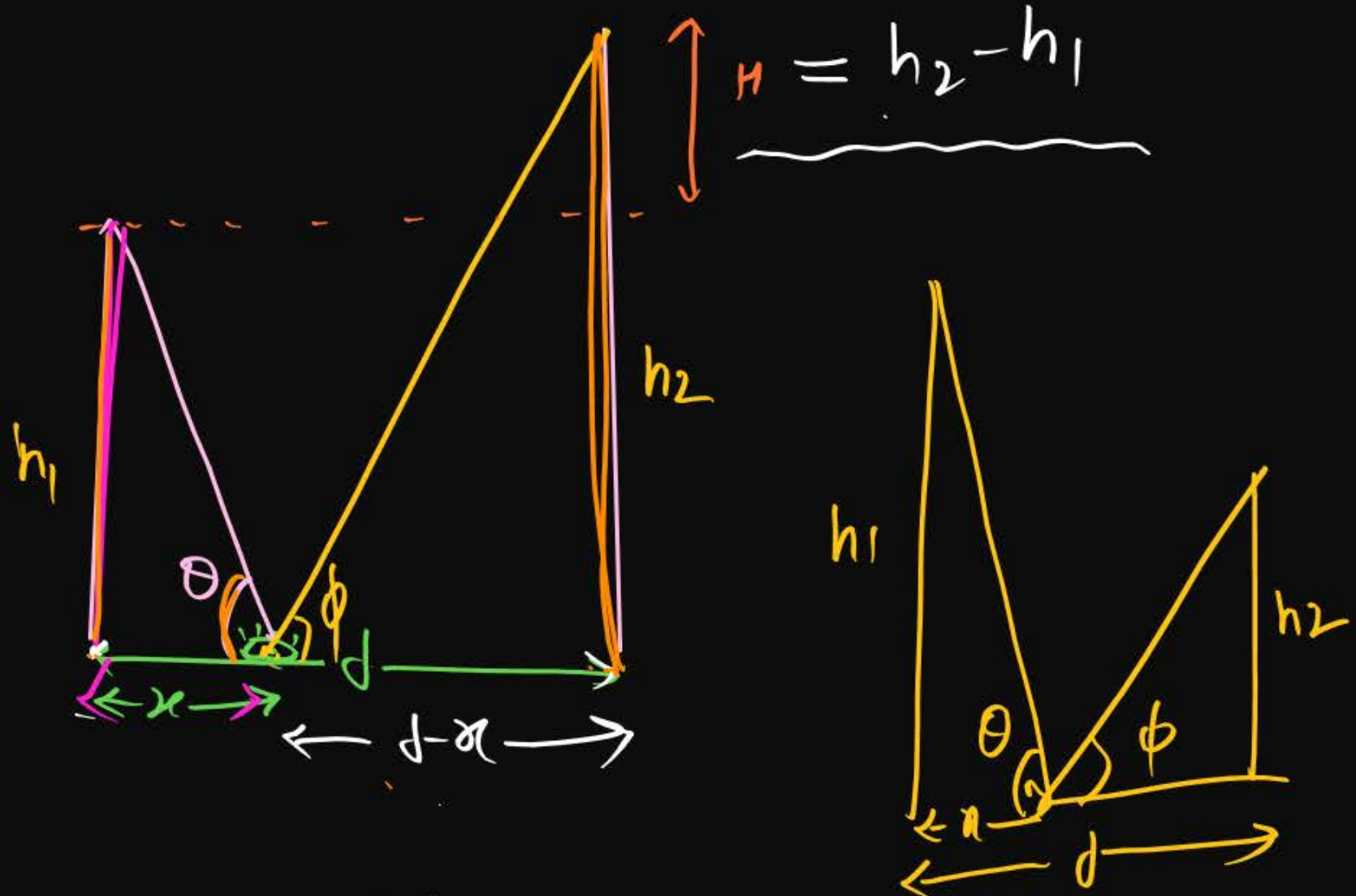
4 $\frac{\tan \theta - \tan \phi}{d}$ ✗

$$\tan \theta = \frac{h_1}{x}$$

$$\tan \phi = \frac{h_2}{d-x}$$

$$h_1 = x \tan \theta \quad \text{--- (1)}$$

$$h_2 = (d-x) \tan \phi \quad \text{--- (2)}$$



Unit of Angle

→ S.I Unit of Angle radian.

→ Practical unit degrees / mint / sec.

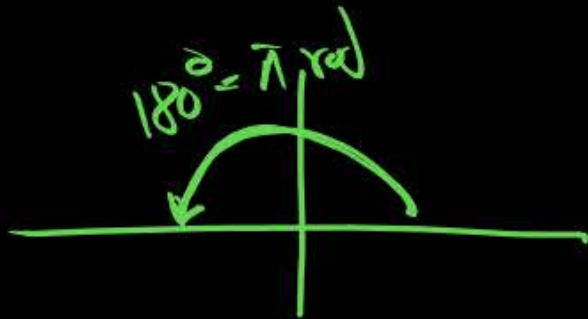
$$180^\circ = \pi \text{ rad}$$

$$1^\circ = 60 \text{ mint}$$

$$1 \text{ mint} = \frac{1^\circ}{60}$$

$$1^\circ = \frac{\pi}{180} \text{ rad}$$

$$1 \text{ rad} = \frac{180^\circ}{\pi}$$



$$1 \text{ m} = 100 \text{ cm}$$

$$1 \text{ fm} = 10^{-15} \text{ m}$$

$$1 \text{ Pf} = 10^{-12} \text{ f}$$

$$1 \text{ nm} = 10^{-9} \text{ m}$$

$$1 \mu\text{m} = 10^{-6} \text{ m}$$

$$1 \text{ mm} = 10^{-3} \text{ m}$$

$$1 \text{ cm} = 10^{-2} \text{ m}$$

$$1 \text{ Km} = 10^3 \text{ m}$$

$$1 \text{ KJ} = 10^3 \text{ J}$$

$$1 \text{ Mm} = 10^6 \text{ m}$$

~~$$\frac{\pi}{2} \text{ rad} = \frac{\pi}{2} (1 \text{ rad})$$

$$= \frac{\pi}{2} \times \frac{180}{\pi} = 90^\circ$$~~

$$180^\circ = \pi \text{ rad}$$

Convert radian into degree

MR⁺

MR⁺

$$180^\circ = \pi \text{ rad} \quad \checkmark$$

$$\frac{\pi}{2} \text{ rad} = \frac{180}{2} = 90^\circ$$

$$\frac{\pi}{6} \text{ rad} = \frac{180}{6} = 30^\circ$$

$$\frac{5\pi}{6} \text{ rad} = \frac{5}{6} \times 180 = 150^\circ \quad \checkmark$$

Convert following radian into degree?

(i) $\frac{\pi}{2}$ rad

(ii) $\frac{\pi}{4}$ rad

(iii) $\frac{\pi}{3}$ rad

(iv) $\frac{5\pi}{6}$ rad

(v) $\frac{2\pi}{3}$ rad

(vi) $\frac{4\pi}{3}$ rad

(vii) $\frac{3\pi}{5}$ rad

(viii) 5π rad

(ix) $\frac{2\pi}{5}$ rad

(x) $\frac{7\pi}{12}$ rad

(xi) $\frac{5}{2}\pi$ rad

(xii) $3(\pi \text{ rad})$

(xiii) $\frac{\pi}{6}$ rad

$\frac{7}{12} \times \frac{180}{\pi}$
 $= 105^\circ$

Convert degree to radian.

$$45^\circ \xrightarrow{\frac{\pi \text{ rad}}{180}} 45 \times \frac{\pi \text{ rad}}{\cancel{180}_9} = \frac{\pi}{4} \text{ rad.}$$

$$60^\circ \xrightarrow{\cancel{\frac{\pi \text{ rad}}{180}}} \frac{60 \times \pi \text{ rad}}{\cancel{180}_3} = \frac{\pi}{3} \text{ rad.}$$

$$135^\circ \longrightarrow \cancel{135}_3 \times \frac{\pi \text{ rad}}{\cancel{180}_9} = \left(\frac{3\pi}{4} \right)$$

$$\boxed{180^\circ = \pi \text{ rad}}$$
$$1^\circ = \frac{\pi \text{ rad}}{180}$$

Convert following into radian

(i) 45°

(ii) 60°

(iii) 120°

(iv) 30°

(v) 150°

(vi) 90°

(vii) π

(viii) 270°

(ix) 135°

(x) 720°

(xi) 36°

(xii) 450°

(xiii) 240°

(xiv) 330°

(xv) 57°

(xvi) 360°

Question



Convert 1 radian into minute?

$$1 \text{ rad} = \frac{180^\circ}{\pi} = \frac{180}{\pi} 1^\circ$$
$$= \frac{180}{\pi} \times 60 \text{ min}$$

We know that

$$\pi \text{ rad} = 180^\circ$$

$$1^\circ = 60 \text{ min}$$

$$1 \text{ rad} = \frac{10800}{\pi} \text{ min}$$

Ans

Convert 2° in minute?

$$1^\circ = 60 \text{ min}$$

$$2^\circ = 120 \text{ min}$$

Convert 4 sec into degree ??

Soln

$$1^\circ = 60 \text{ min}$$

$$1 \text{ min} = \frac{1^\circ}{60}$$

$$60 \text{ sec} = \frac{1^\circ}{60}$$

$$1 \text{ sec} = \frac{1^\circ}{60 \times 60}$$

$$4 \text{ sec} = \frac{4^\circ}{60 \times 60}$$

$$4 \text{ sec} = \frac{1^\circ}{15}$$

Question

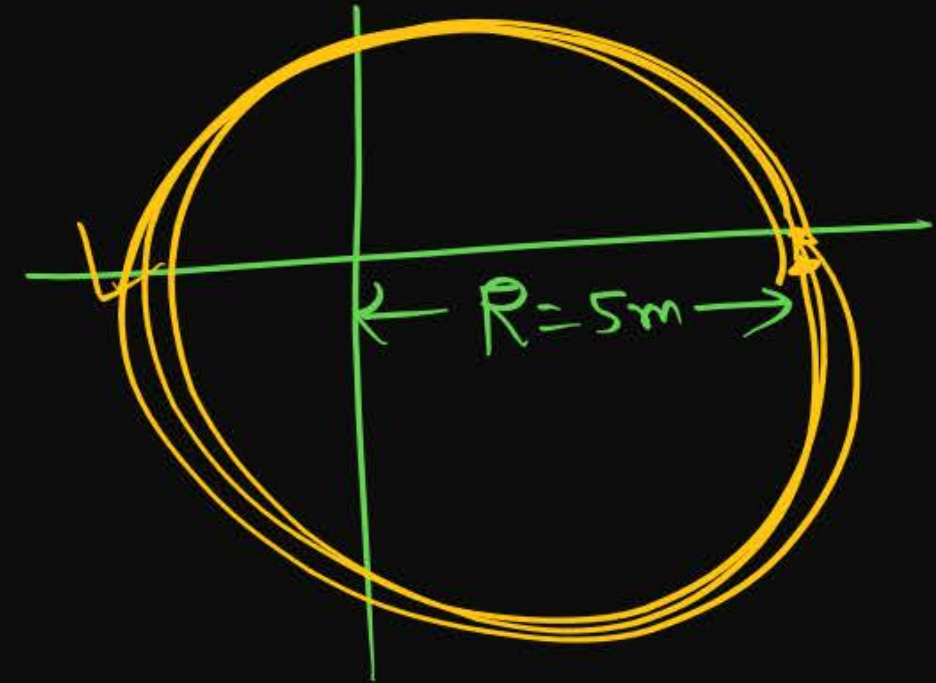
2°

H/w

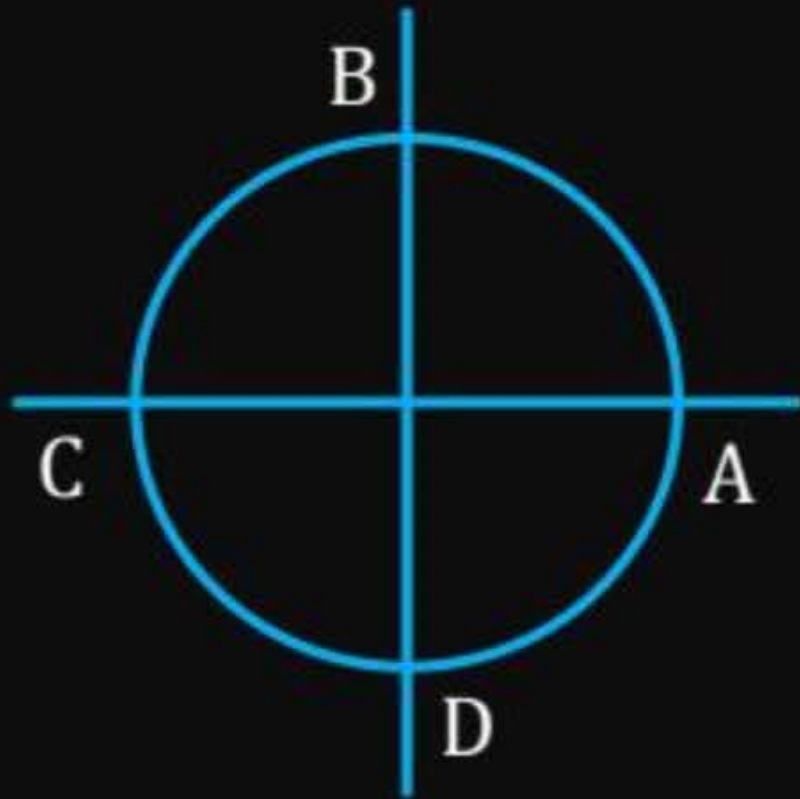


Total distance moved by object on the circle of radius 5m in 3 and half rotation

[IIT] [NEET]



When object moves from point A to C on the circle the find total distance moved by object.



Question

M/W



When a clock shows 4 O'clock, how much angle do its minute and hour hand make.

Question

H/W

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

(If divided by P^2 both side)

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

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

divide by B^2 both side

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

Divide by H^2 both side

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

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

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



Question

H/W



If $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} = \frac{11}{5}$ then find value of $\tan \theta$

Question

n/w



Find value of $\sin^2(40^\circ) + \cos^2(40^\circ)$

A vertical pole of height h casts a shadow of length l when the Sun is at an angle θ above the horizon.

Which of the following expresses the shadow length l in terms of h and θ ?

1 $l = h \cdot \tan \theta$

2 $l = \frac{h}{\tan \theta}$

3 $l = h \cdot \sin \theta$

4 $l = \frac{h}{\sin \theta}$

Question

n/w challenge
Solution



Two towers are separated by a horizontal distance D . From the top of the first tower (height h_1), the angle of depression to the top of the second tower (height h_2) is θ .

Which relation correctly gives the horizontal separation D in terms of h_1 , h_2 , θ ?

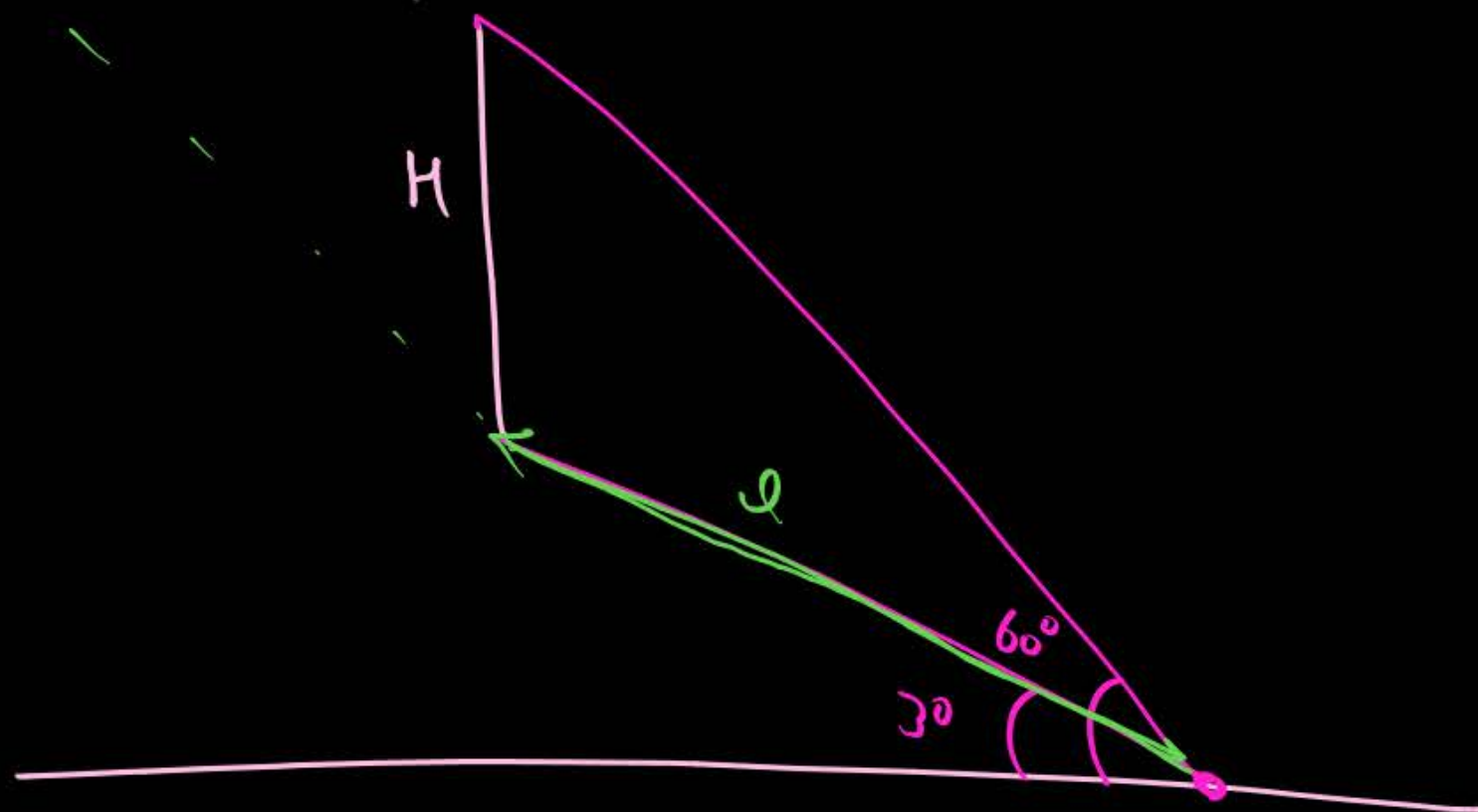
1 $D = \frac{h_1 + h_2}{\tan \theta}$

2 $D = \frac{h_1 - h_2}{\tan \theta}$

3 $D = \frac{h_2 - h_1}{\tan \theta}$

4 $D = \tan \theta \cdot (h_1 + h_2)$

Sum



find $l = ?$

THANK
YOU