YAKEEN NEET 2.0

2026

Basic Maths and Calculus (Mathematical Tools)

PHYSICS | Lecture - 02

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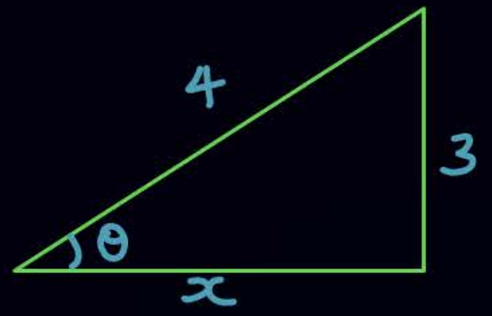
Topics to be covered

Basic trigonometry approximation & identity

Q

$\sin\theta = \frac{3}{4}$



$3^2 + x^2 = 4^2$

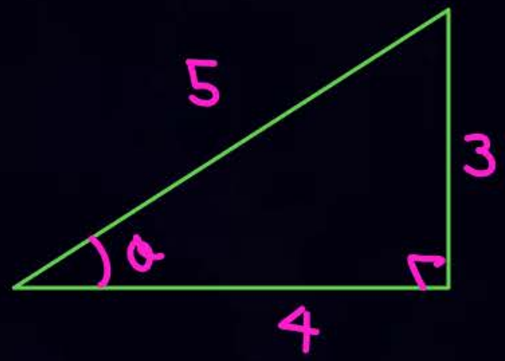
$9 + x^2 = 16$

$x^2 = 7$

$x = +\sqrt{7}$

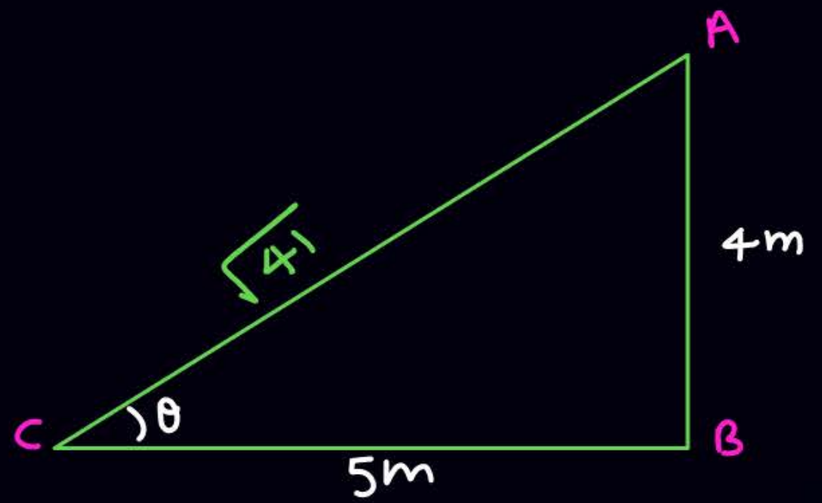
$\tan\theta = \frac{3}{\sqrt{7}}$

$\cos\theta = \frac{\sqrt{7}}{4}$



$3^2 + 4^2 = 9 + 16 = 25 = 5^2$

Q



$AC = \sqrt{4^2+5^2} = \sqrt{16+25}$

$= \sqrt{41}$

$\sin\theta = \frac{4}{\sqrt{41}}$

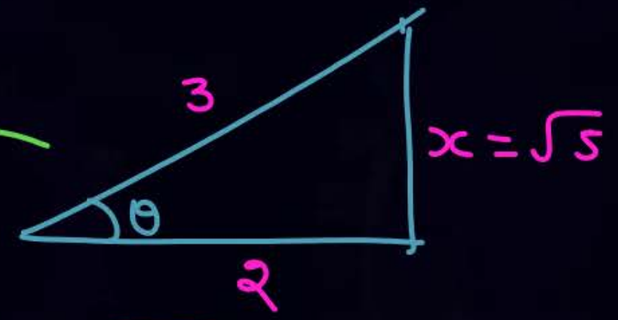
$\cos\theta = \frac{5}{\sqrt{41}}$

$\tan\theta = \frac{4}{5}$

Q $\cos\theta = \frac{2}{3}$

$\sin\theta = \frac{\sqrt{5}}{3}$

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



$x = \sqrt{3^2-2^2} = \sqrt{5}$

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

$4 + x^2 = 9$

$x = \sqrt{5}$

-03489

Small angle approximation

* $\sin\theta \simeq \theta$ (if θ is very small, $\theta < 5^\circ$, $\theta < 10^\circ$)
  ↓ rad.

* $\tan\theta \simeq \theta$ (if θ is very small, $\theta < 10^\circ$)
  ↓ rad.

* If θ is very small ($\theta < 10^\circ$)

$$\sin\theta \simeq \tan\theta \simeq \theta$$

① $\sin 2^\circ = \sin 2 \cdot \frac{\pi}{180} \simeq \frac{2\pi}{180} = \frac{\pi}{90}$

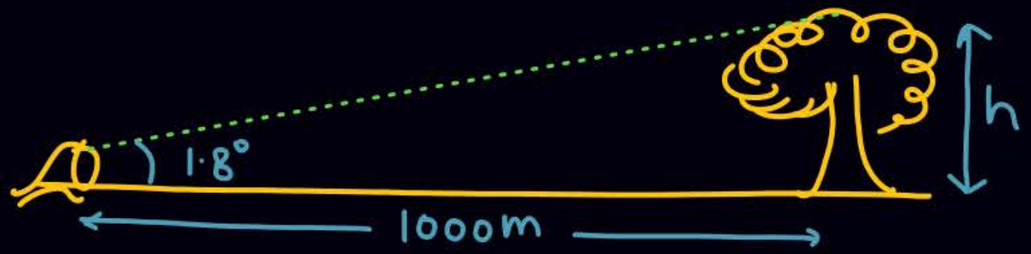
② $\tan 2^\circ = \tan \frac{2\pi}{180} \simeq \frac{2\pi}{180} \simeq \frac{\pi}{90}$

③ $\tan 6^\circ \simeq \frac{6\pi}{180}$

④ $\sin 8^\circ \simeq 8 \times \pi/180$

⑤ $\tan 0^\circ = 0$

Q find height of tree



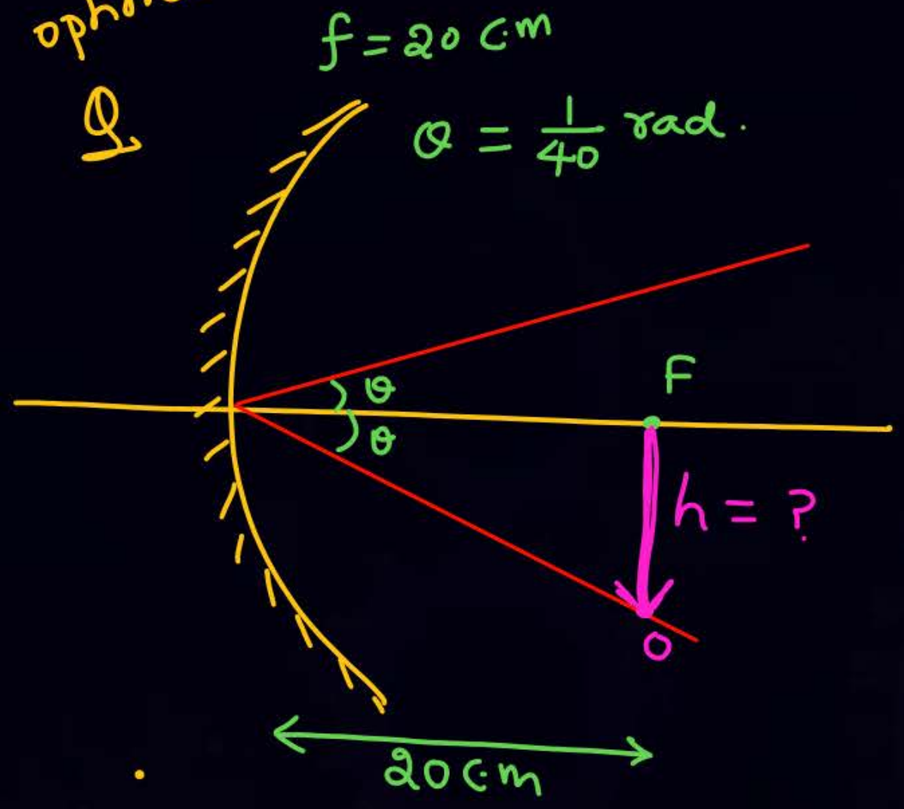
$$\tan 1.8^\circ = \frac{h}{1000}$$

$$1.8 \times \frac{\pi}{180} = \frac{h}{1000}$$

$$h = \frac{1.8 \times 3.14 \times 1000}{180} = 31.4\text{m}$$

optional

Q



$$\tan\theta = \frac{h}{20}$$

$$\tan\frac{1}{40} = \frac{h}{20}$$

$$\frac{1}{40} = \frac{h}{20}$$

$$h = \frac{1}{2}\text{cm}$$

Few important trignometry identt. (8 days)

* $\sin^2\theta + \cos^2\theta = 1$
* $\sin(A+B) = \sin A \cos B + \cos A \sin B$
* $\sin(A-B) = \sin A \cos B - \cos A \sin B$
* $\cos(A+B) = \cos A \cos B - \sin A \sin B$
* $\cos(A-B) = \cos A \cos B + \sin A \sin B$
* $\tan(A+B) = \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$
* $\tan(A-B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

* $1 + \tan^2\theta = \sec^2\theta$
* $1 + \cot^2\theta = \operatorname{cosec}^2\theta$ (rarely)

* $\sin 2\theta = 2\sin\theta\cos\theta$

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

* If θ is very small $(\theta < 10^\circ)$

$\Rightarrow\Rightarrow\Rightarrow \sin\theta \simeq \tan\theta \simeq \theta$

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

$\cos\theta \approx \sqrt{1-\theta^2}$

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

your choice (CKL)

If θ is very small

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

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

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

If θ is very small $\sin\theta = \theta$

$\sin^2\theta = \sin\theta \times \sin\theta \simeq \theta \times \theta = \theta^2$

Least positive

* $\sin 75^\circ = \sin(45^\circ + 30^\circ) = \sin 45 \cos 30 + \cos 45 \sin 30 = \frac{1}{\sqrt{2}}\frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

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

* $\sin 15^\circ = \sin(45-30) = \sin 45 \cos 30 - \cos 45 \sin 30 = \frac{1}{\sqrt{2}}\frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$

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

(H/w ज़ो last slide पर)

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

$\cos(A+B)$ . . . .

① $\sin 105^\circ = \sin(60+45^\circ) = \sin 60 \cos 45 + \cos 60 . \sin 45^\circ = \frac{\sqrt{3}}{2}\frac{1}{\sqrt{2}} + \frac{1}{2}\cdot\frac{1}{\sqrt{2}}$

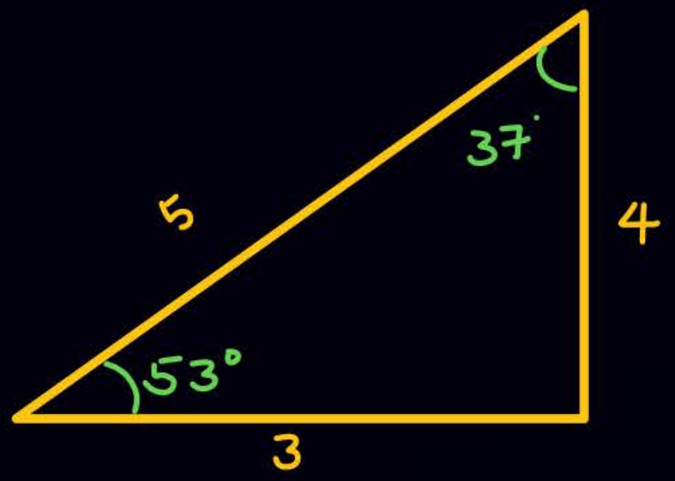
$= \frac{\sqrt{3}+1}{2\sqrt{2}}$

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

③ $\cos 105^\circ = \cos(60+45^\circ) = \cos 60 . \cos 45 - \sin 60 \sin 45^\circ$

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

B



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

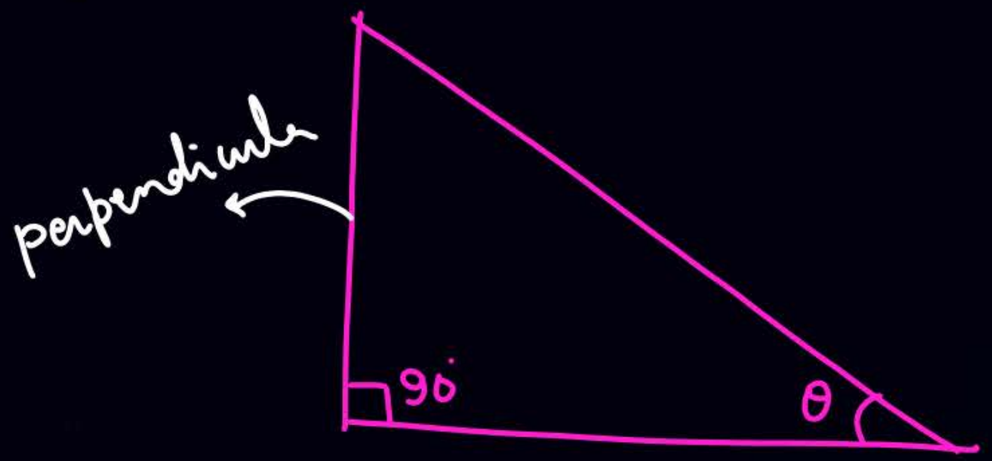
$\cos 53^\circ = \frac{3}{5}$

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

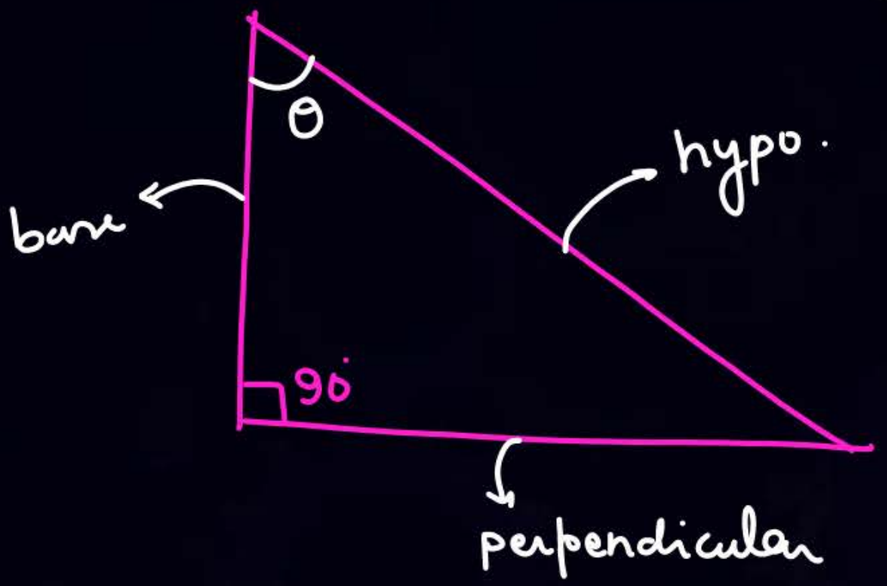
$\cos 37^\circ = \frac{4}{5}$

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

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



θ के सामने वाली side perpendicular है

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Home Work

- Revise all formula
- KPP-01 (will be uploaded at evening)
- DPP-01

THANK YOU