CDS 1 2025

SSBCrack EXAMS

LIVE

MATHS

TRIGONOMETRY

CLASS 3

NAVJYOTI SIR

TRIGONOMETRIC FORMULAE

$$\sin A + \sin B = 2\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\sin A - \sin B = 2\cos\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right)$$

$$\cos A + \cos B = 2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

$$\cos A - \cos B \begin{cases} = -2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right) \\ = 2\sin\left(\frac{A+B}{2}\right)\sin\left(\frac{B-A}{2}\right) \end{cases}$$

Sum → product

TRIGONOMETRIC FORMULAE

product ⟶ sum

$$2\cos A\cos B = \cos(A+B) + \cos(A-B)$$

$$-2\sin A\sin B = \cos(A+B) - \cos(A-B)$$

$$2\sin A\sin B = \cos(A-B) - \cos(A+B)$$

$$2\sin A\cos B = \sin(A+B) + \sin(A-B)$$

$$2\cos A\sin B = \sin(A+B) - \sin(A-B)$$

EXAMPLE

Q. What is the value of $\dfrac{(\cos 10^\circ + \sin 20^\circ)}{(\cos 20^\circ - \sin 10^\circ)}$?

(a) $\dfrac{1}{\sqrt{3}}$ (b) $-\dfrac{1}{\sqrt{3}}$

(c) $\sqrt{3}$ (d) $-\sqrt{3}$

$$\frac{\sin(90^\circ - 10^\circ) + \sin 20^\circ}{\sin(90^\circ - 20^\circ) - \sin 10^\circ}$$

$$\frac{2\sin\left(\frac{80^\circ + 20^\circ}{2}\right)\cos\left(\frac{80^\circ - 20^\circ}{2}\right)}{2\cos\left(\frac{70^\circ + 10^\circ}{2}\right)\sin\left(\frac{70^\circ - 10^\circ}{2}\right)}$$

$$= \frac{\sin 50^\circ \cos 30^\circ}{\cos 40^\circ \sin 30^\circ} = \cot 30^\circ = \sqrt{3}$$

$\sin\theta = \cos(90^\circ - \theta)$ and $\cos\theta = \sin(90^\circ - \theta)$

CDS 1 2025 LIVE CLASS - MATHS - PART 3

EXAMPLE

Q. What is the value of $\frac{(\cos 10^\circ + \sin 20^\circ)}{(\cos 20^\circ - \sin 10^\circ)}$?

(a) $\frac{1}{\sqrt{3}}$

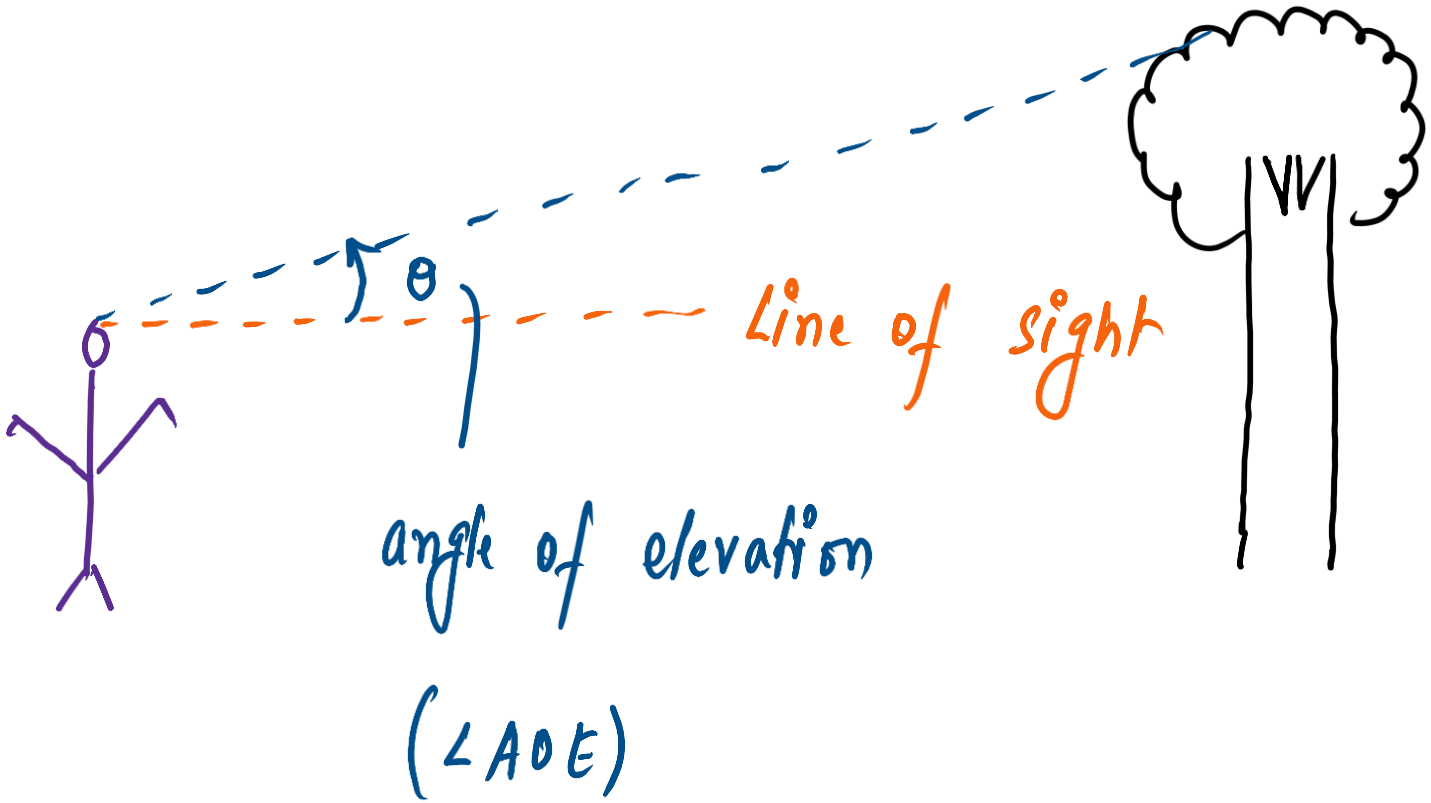
(b) $-\frac{1}{\sqrt{3}}$

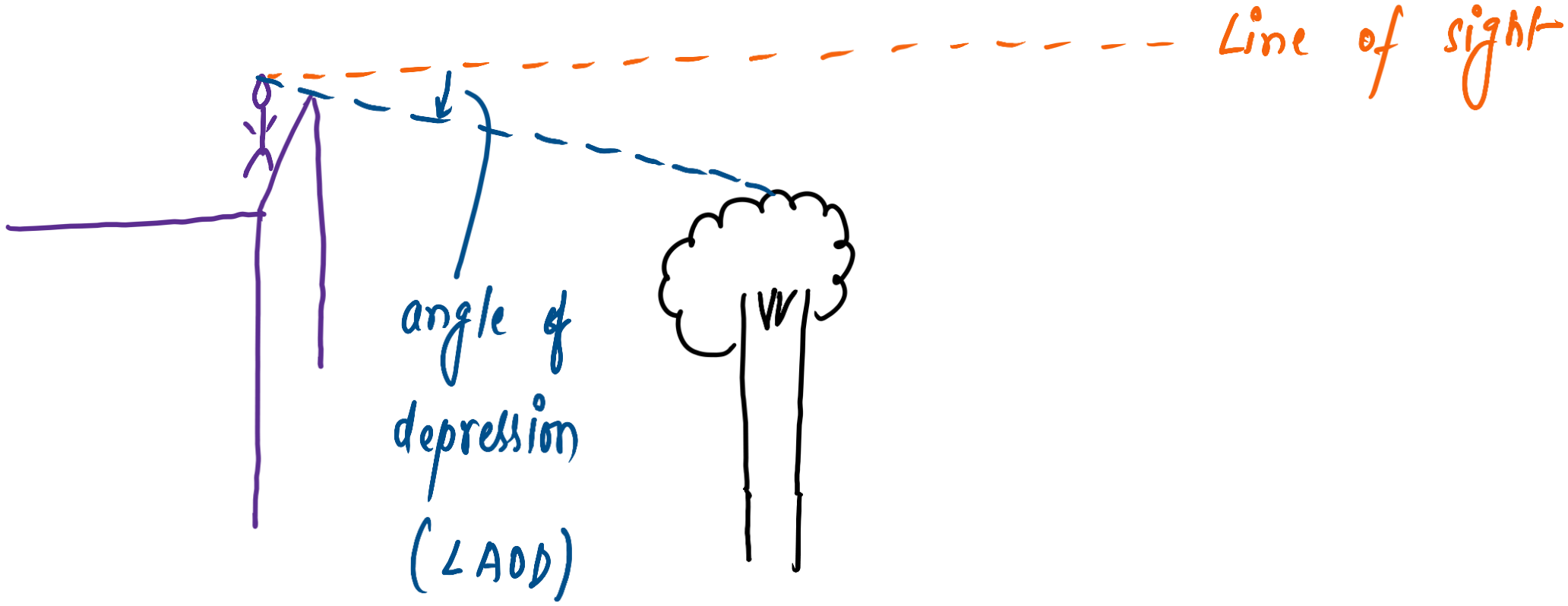
(c) $\sqrt{3}$

(d) $-\sqrt{3}$

Ans: (c)

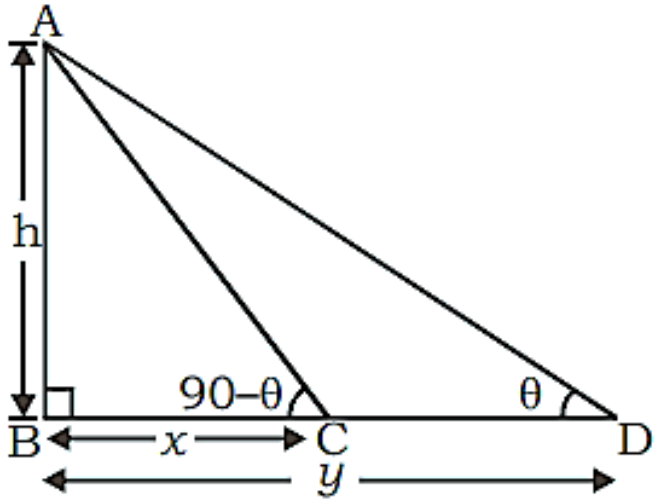
HEIGHT AND DISTANCES





* In most situations, $\angle AOE = \angle AOD$

SOME RESULTS



$h = \sqrt{xy}$

The two angles of elevation are complementary,

In $\triangle ABD$,

$$\tan\theta = \frac{h}{y} \quad -(1)$$

In $\triangle ABC$,

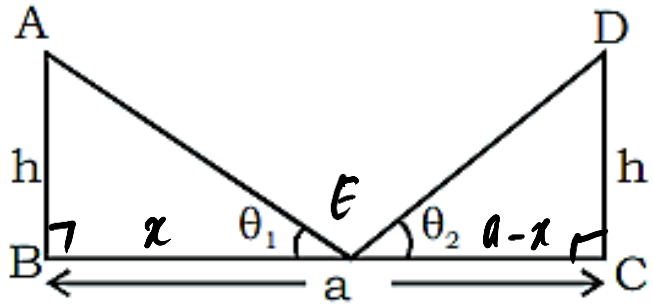
$$\tan(90^\circ - \theta) = \frac{h}{x} \quad -(2)$$

$(1) \times (2)$,

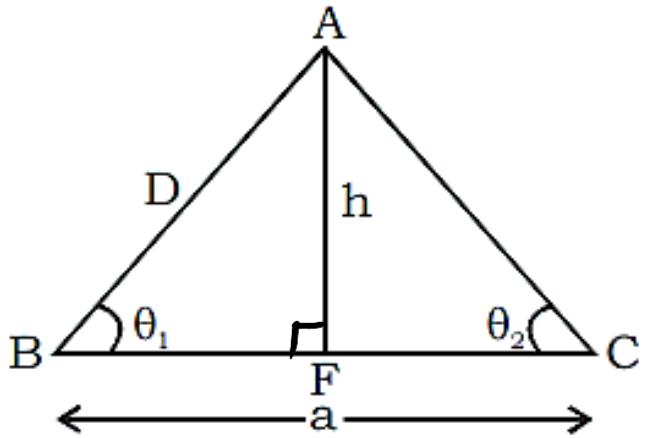
$$\tan\theta \cdot \cot\theta = \frac{h}{y} \times \frac{h}{x}$$

$$h^2 = xy \Rightarrow h = \sqrt{xy} \text{ //}$$

SOME RESULTS



$a = h\,(\cot\theta_1 + \cot\theta_2)$



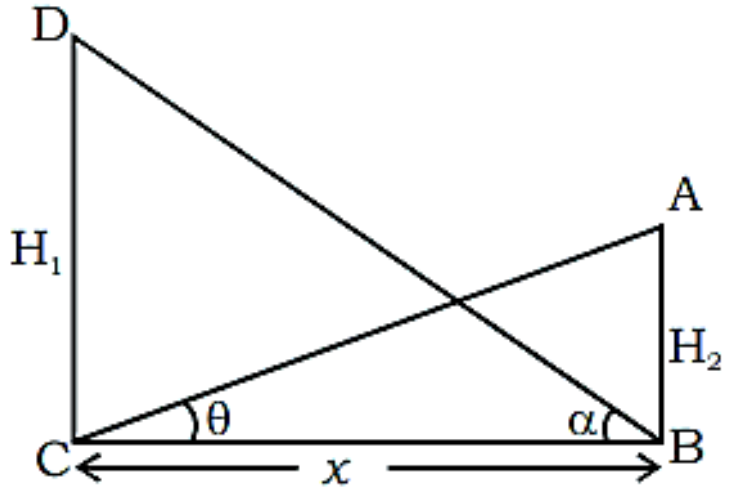
$a = h\,(\cot\theta 1 + \cot\theta 2)$

$\tan\theta_1 = \frac{h}{x}$ $\quad$ $\tan\theta_2 = \frac{h}{a-x}$

$x = h\cot\theta_1$ — (1) $\quad$ $a - x = h\cot\theta_2$ — (2)

(1) + (2), $\quad a = h\,(\cot\theta_1 + \cot\theta_2)$

SOME RESULTS



$\theta + \alpha = 90^\circ$

$x = \sqrt{h_1 h_2}$

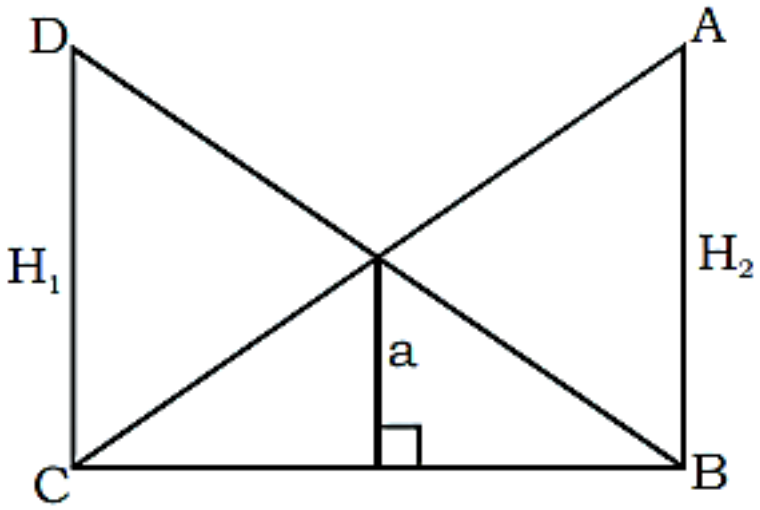
$\tan\alpha = \frac{H_1}{x}$ —— (1)

$\tan(90^\circ - \alpha) = \frac{H_2}{x}$ — (2)

(1) × (2),

$1 = \left(\frac{H_1}{x}\right)\left(\frac{H_2}{x}\right) \Rightarrow x = \sqrt{H_1 H_2}$

SOME RESULTS



$$\frac{1}{a} = \frac{1}{H_1} + \frac{1}{H_2}$$

MAXIMUM AND MINIMUM VALUES

T - ratio	min	max
$\sin\theta, \cos\theta$ (odd power)	-1	$+1$
$\sin^2\theta, \cos^2\theta$ (even power)	0	$+1$
$\tan\theta, \cot\theta$ (odd power)	$-\infty$	$+\infty$
$\tan^2\theta, \cot^2\theta$ (even power)	0	∞
$\sec\theta, \operatorname{cosec}\theta$ (odd power)	$-\infty$	$+\infty$
$\sec^2\theta, \operatorname{cosec}^2\theta$ (even power)	1	∞

$\sin\theta$ $\cos\theta$

max. $\longrightarrow$ $+1$

min $\longrightarrow$ -1

$a\sin\theta + b\cos\theta$

max. $\longrightarrow$ $+\sqrt{a^2+b^2}$

min. $\longrightarrow$ $-\sqrt{a^2+b^2}$

$$-\sqrt{a^2+b^2} \leq a\sin\theta + b\cos\theta \leq +\sqrt{a^2+b^2}$$

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CLASS 4

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