UDAAN

2025

Some Application of Trigonometry

Mathematics | Lecture - 02

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Topics *to be covered*

1. Introduction
2. Some basic terms (horizontal line, line of sight, angle of elevation, angle of depression)
3. Badhiya Questions (Part - 01)


WORK HARD
DREAM BIG
NEVER GIVE UP !!

Topic : Application

#Q. The angle of depression of a car parked on the road from the top of 150 m high tower is 30°. The distance of the car from the tower (in meters) is:

(A) $50\sqrt{3}$

(B) $150\sqrt{3}$

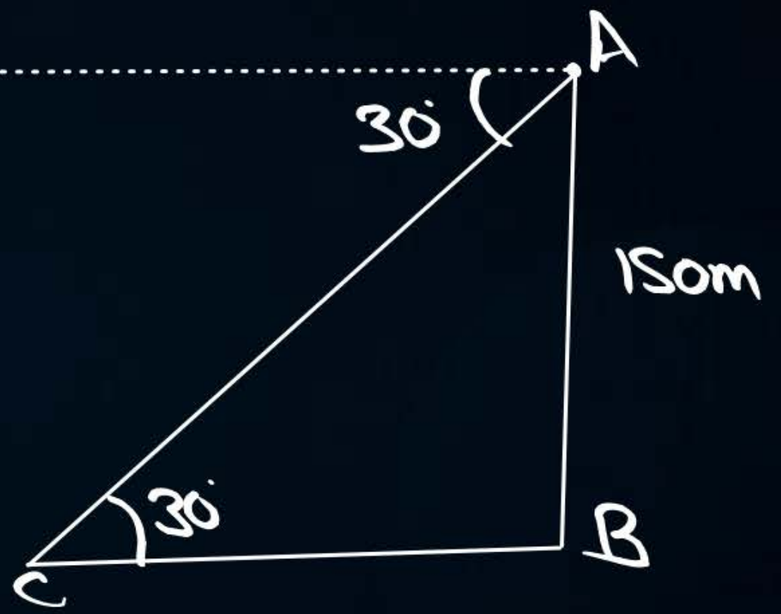
(C) $150\sqrt{3}$

(D) 75

$\tan 30° = \frac{AB}{BC}$

$\frac{1}{\sqrt{3}} = \frac{150}{BC}$

$BC = 150\sqrt{3}$ m

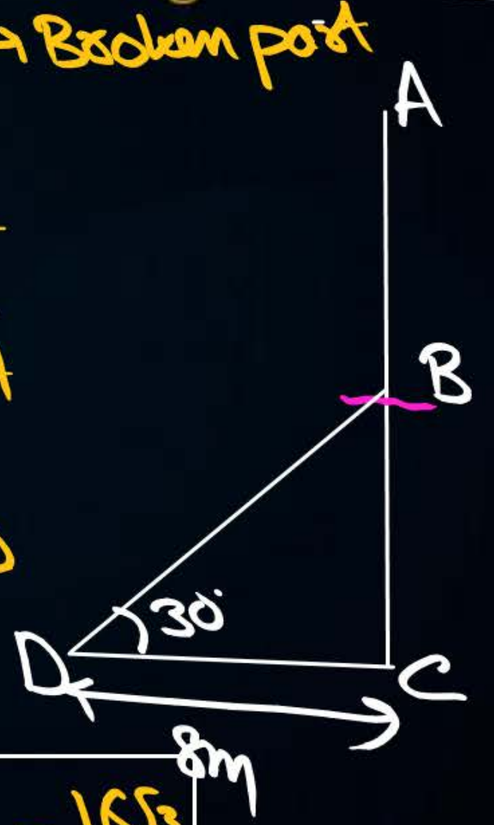


Topic : Application

#Q. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.

AC

AB = BD → Broken part



In ΔBDC

$\cos 30^\circ = \frac{B}{H}$

$\frac{\sqrt{3}}{2} = \frac{DC}{BD}$

$\frac{\sqrt{3}}{2} = \frac{8}{BD}$

$BD = \frac{16}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{16\sqrt{3}}{3}$

ΔCDB

$\tan 30^\circ = \frac{BC}{DC}$

$\frac{1}{\sqrt{3}} = \frac{BC}{8}$

$\frac{8}{\sqrt{3}} = BC$

$\frac{8}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = BC$

$\frac{8\sqrt{3}}{3}\ m = BC$

$$AC = AB + BC$$

$$AC = \frac{16\sqrt{3}}{3} + \frac{8\sqrt{3}}{3}$$

$$AC = \frac{24\sqrt{3}}{3}$$

$$AC = 8\sqrt{3}\,m$$

Topic : Application

#Q. A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal.

ΔBCD

$\tan 45° = \frac{BC}{DC}$

$1 = \frac{BC}{DC}$

$DC = BC$

ΔACD

$\tan 60° = \frac{AC}{DC}$

$\sqrt{3} = \frac{AB+BC}{DC}$

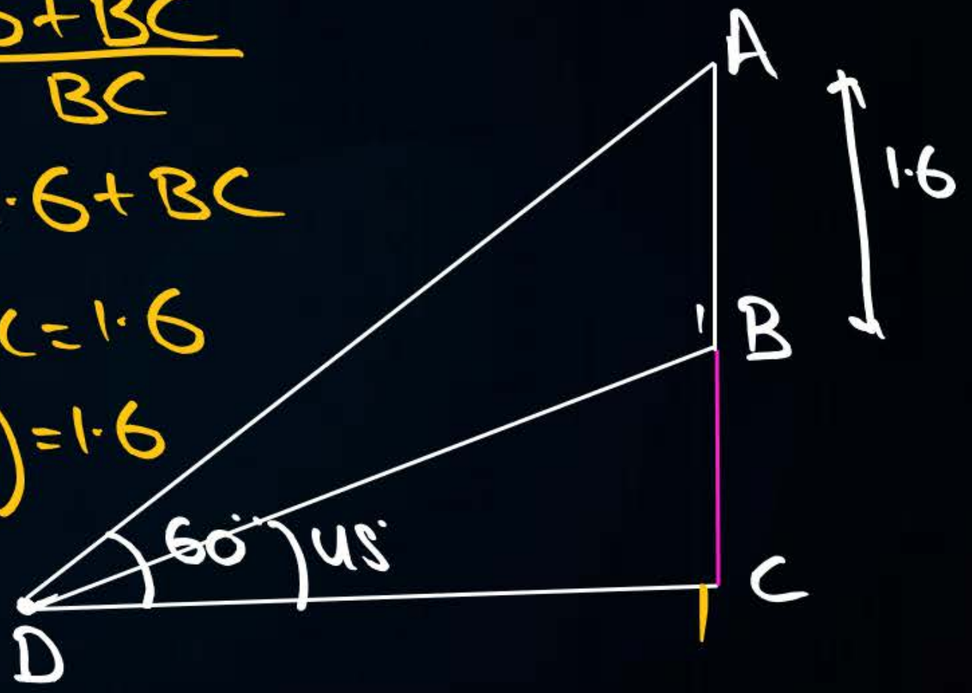
$\sqrt{3} = \frac{1.6+BC}{DC}$

$\sqrt{3} = \frac{1.6+BC}{BC}$

$BC\sqrt{3} = 1.6 + BC$

$BC\sqrt{3} - BC = 1.6$

$BC(\sqrt{3}-1) = 1.6$



$$BC(\sqrt{3}-1) = 1.6$$

$$BC = \frac{1.6}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$(a-b)\quad(a+b) = a^2-b^2$

$$= \frac{1.6(\sqrt{3}+1)}{(\sqrt{3})^2-(1)^2}$$

$$= \frac{1.6(\sqrt{3}+1)}{2}$$

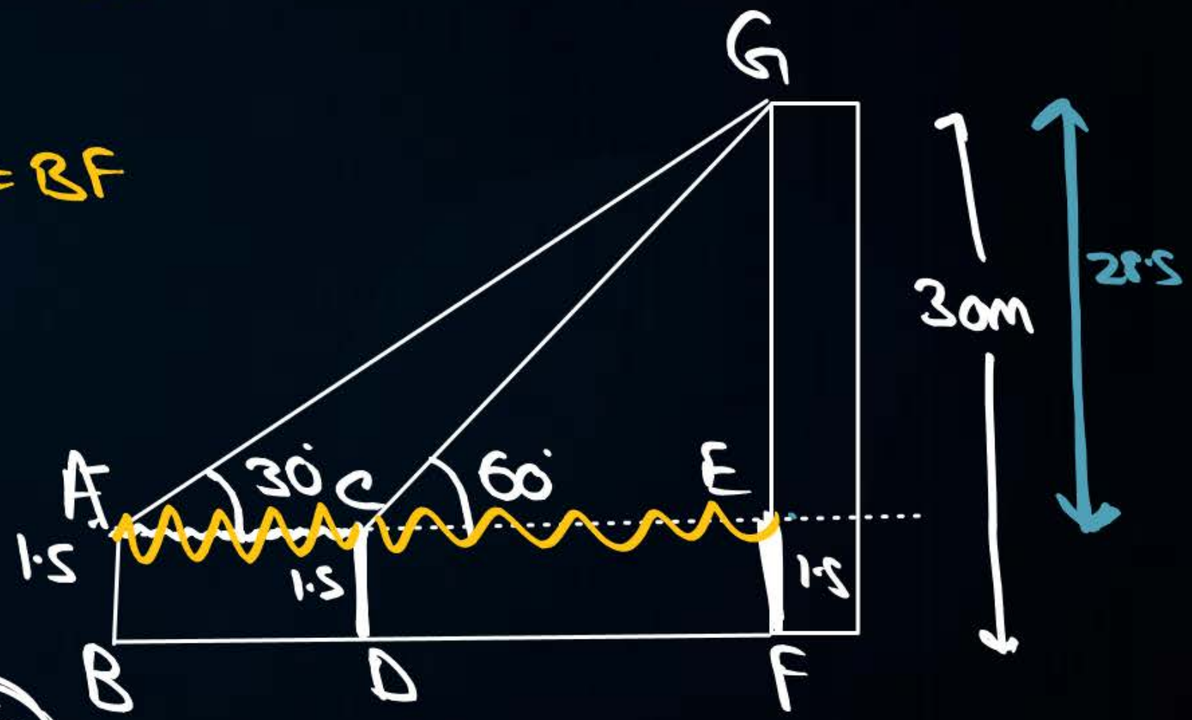
$$= 0.8(\sqrt{3}+1)\,m$$

Topic : Application

#Q. A 1.5 m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the building increases from 30° to 60° as he walks towards the building. Find the distance he walked towards the building.

By Construction: $AB = CD = EF$

$AC = BD$, $CE = DF$, $AE = BF$



ΔGCE

$\tan 60^\circ = \frac{GE}{CE}$

$\sqrt{3} = \frac{28.5}{CE}$

$CE = \frac{28.5}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{28.5\sqrt{3}}{3} = \frac{95}{10} \times \sqrt{3} = 9.5\sqrt{3}$

ΔGAE

$\tan 30^\circ = \frac{GE}{AE}$

$\frac{1}{\sqrt{3}} = \frac{28.5}{AC+CE}$

$AC+CE = 28.5\sqrt{3}$

$AC + 9.5\sqrt{3} = 28.5\sqrt{3}$

$= 28.5\sqrt{3} - 9.5\sqrt{3}$

$AC = 19\sqrt{3}m$

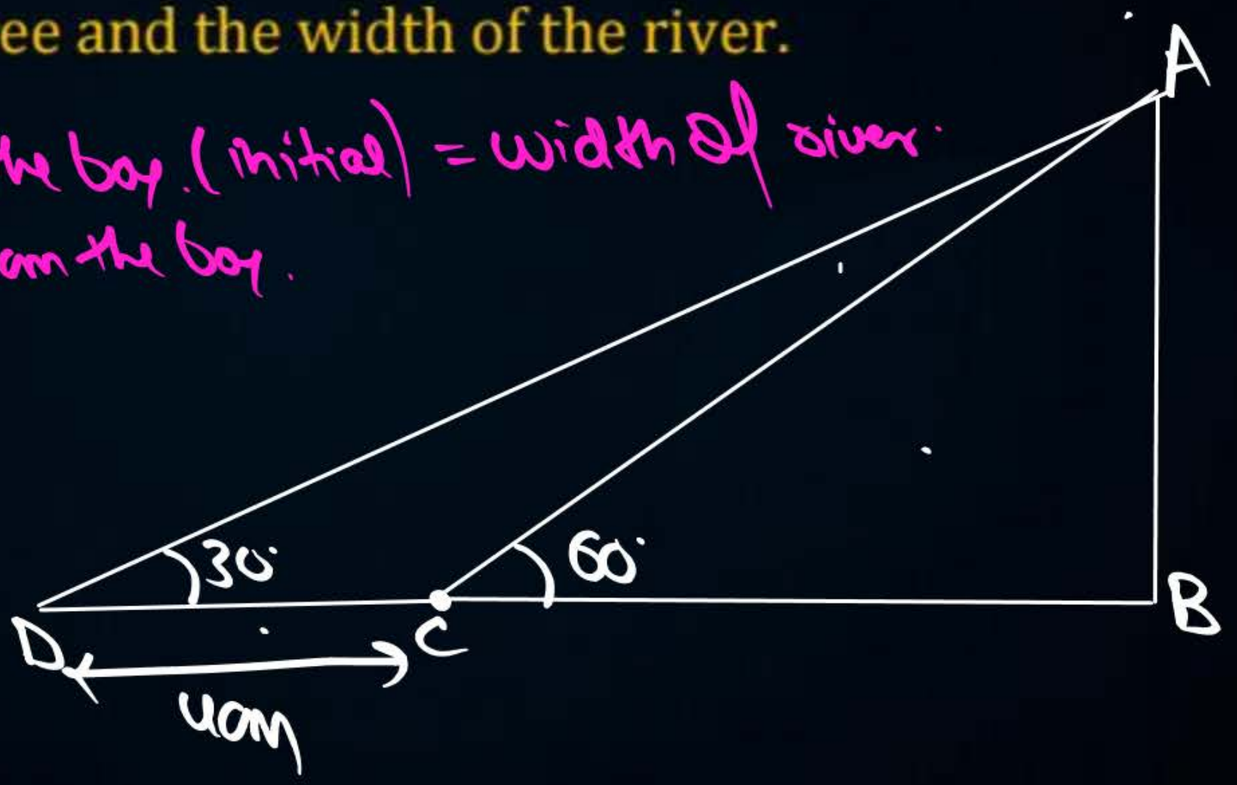
$\Rightarrow$ $BD = 19\sqrt{3}m$

Topic : Application

#Q. A person standing on the bank of a river observes that the angle of elevation of the top of a tree standing on the opposite bank is 60°. When he moves 40 metres away from the bank, he finds the angle of elevation to be 30°. Find the height of the tree and the width of the river.

Gt: AB = height of tree
BC = distance of tree from the bay (initial) = width of river.
DB = Final distance of tree from the bay.

To find: BC, AB



ΔABC

$\tan 60 = \frac{AB}{BC}$

$\sqrt{3} = \frac{AB}{BC}$

ΔABD

$\tan 30 = \frac{AB}{DB}$

$\frac{1}{\sqrt{3}} = \frac{AB}{40+BC}$

$\frac{AB}{BC} = \sqrt{3}$

$AB = BC\sqrt{3}$

$\frac{AB}{40+CB} = \frac{1}{\sqrt{3}}$

$\frac{BC\sqrt{3}}{40+BC} = \frac{1}{\sqrt{3}}$

$(BC\sqrt{3})\sqrt{3} = (40+BC)1$

$3BC = 40+BC$

$3BC - BC = 40$

$2BC = 40$

$BC = 20m$

$AB = 20\sqrt{3}m$

∴ width of river $BC = 20m$.

& height of tree $AB = 20\sqrt{3}m$

Topic : Application

#Q. A pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then the Sun's elevation is:

A. 60°

B. 45°

C. 30°

D. 90°

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

$\tan\theta = \frac{6}{2\sqrt{3}}^{3}$

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

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

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

$\theta = 60$

Topic : Application

#Q. If the height of a vertical pole is $\sqrt{3}$ times the length of its shadow on the ground, then the angle of elevation of the Sun at that time is:

A 30°

B 60°

C 45°

D 75°

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

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

$\tan\theta = \tan 60^\circ$

$\theta = 60^\circ$

Topic : Application

#Q. If the length of the ladder placed against a wall is twice the distance between the foot of the ladder and the wall. Find the angle made by the ladder with the horizontal. [PYQ]

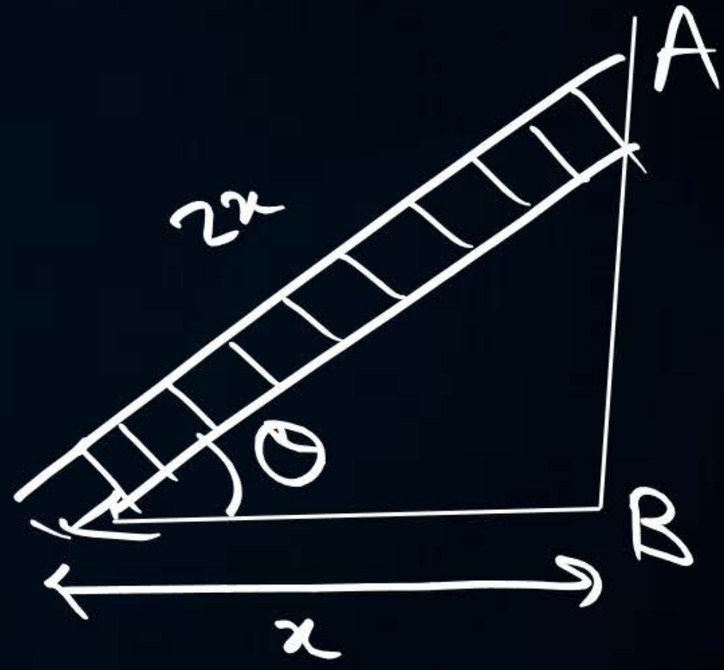
$$\cos\theta = \frac{B}{H}$$

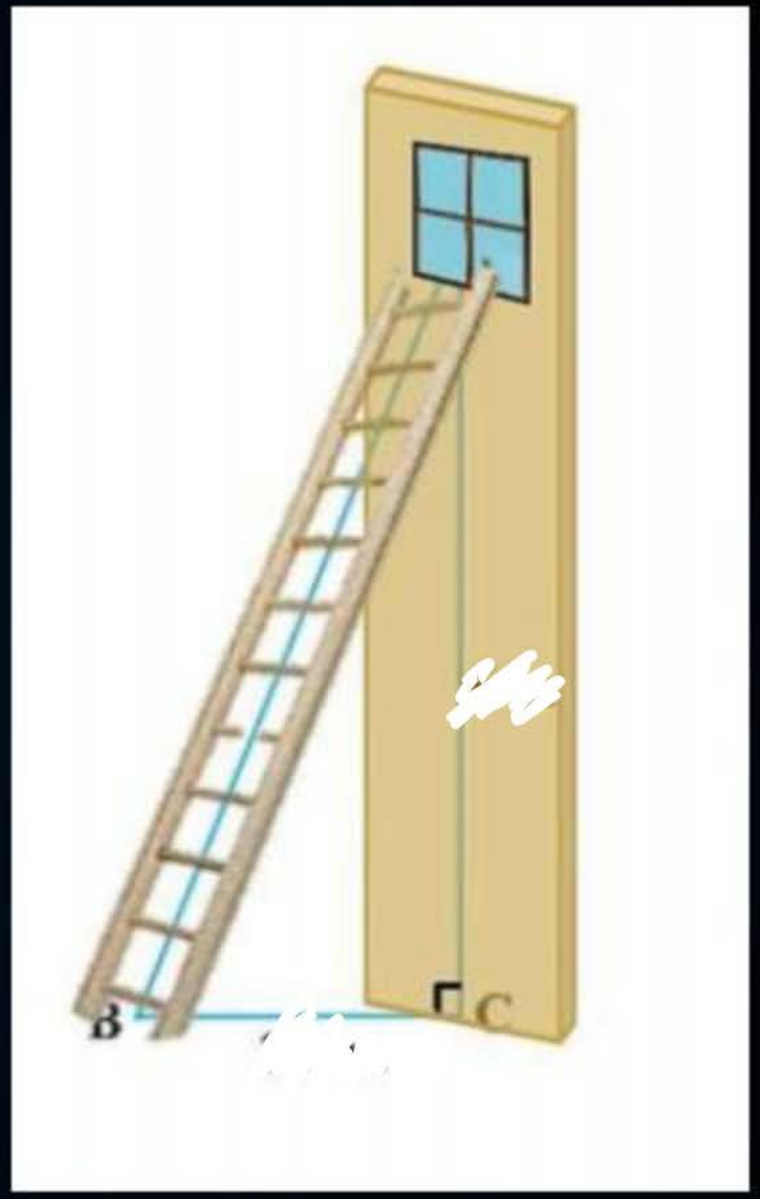
$$\cos\theta = \frac{x}{2x}$$

$$\cos\theta = \frac{1}{2}$$

$$\cos\theta = \cos 60^\circ$$

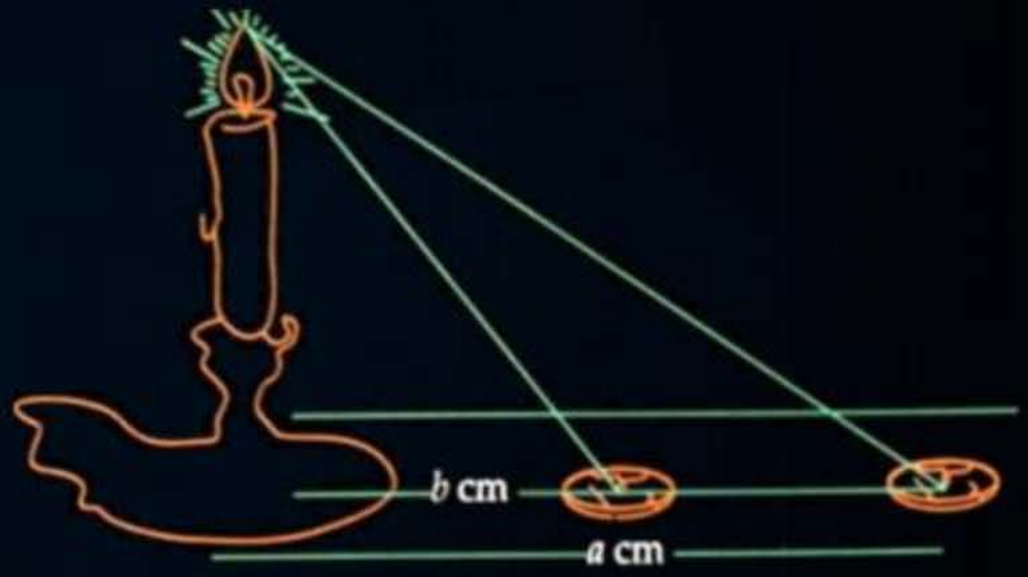
$$\theta = 60^\circ$$




В
Г
С

Topic : Application

#Q. If the angles of elevation of the top of the candle from two coins distant 'a' cm and 'b' cm (a > b) from its base and in the same straight line from it are 30° and 60°, then find the height of the candle. **[PYQ]**



Topic : Application

#Q. A 7 m long flagstaff is fixed on the top of a tower standing on the horizontal plane. From point on the ground, the angles of elevation of the top and bottom of the flagstaff are 60° and 45° respectively. Find the height of the tower correct upto one place of decimal. (Use $\sqrt{3} = 1.73$)

ΔBCD

$\tan 45^\circ = \frac{BC}{CD}$

$1 = \frac{BC}{CD}$

$CD = BC$

ΔACD

$\tan 60^\circ = \frac{AC}{DC}$

$\sqrt{3} = \frac{AB+BC}{DC}$

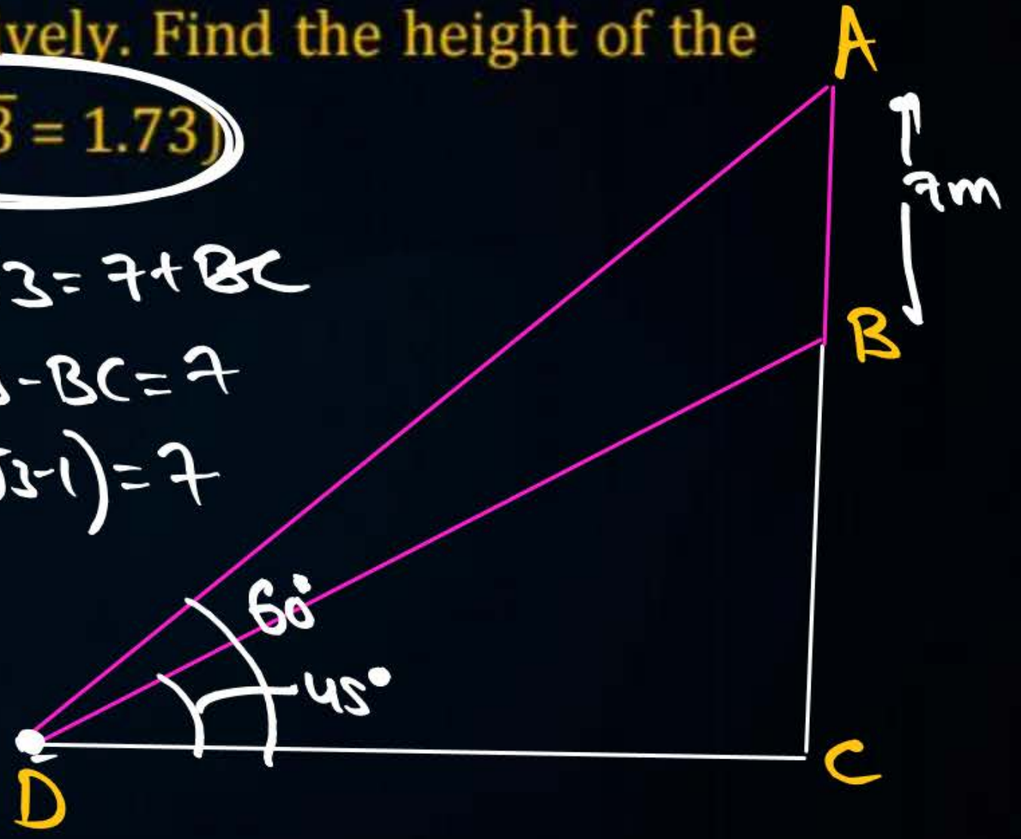
$\sqrt{3} = \frac{7+BC}{DC}$

$\sqrt{3} = \frac{7+BC}{BC}$

$BC\sqrt{3} = 7+BC$

$BC\sqrt{3} - BC = 7$

$BC(\sqrt{3}-1) = 7$



$$BC = \frac{7}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$BC = \frac{7(\sqrt{3}+1)}{2}\ m$$

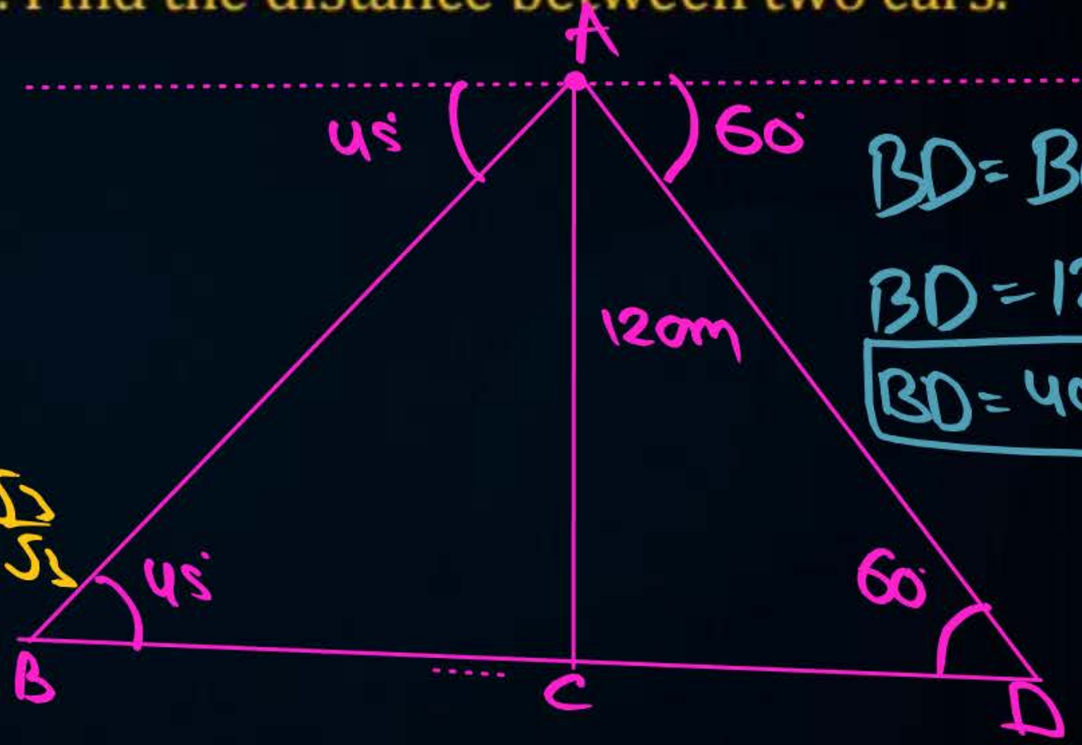
$$BC = \frac{7(1.73+1)}{2}$$

$$BC = 3.5 \times 2.73$$

$$BC = 9.5\ m$$

Topic : Application

#Q. From the top of a 120 m high tower, a man observes two cars on the opposite sides of the tower and in straight line with the base of tower with angles of depression as 60° and 45°. Find the distance between two cars.



ΔACB

$\tan 45° = \frac{AC}{BC}$

$1 = \frac{120}{BC}$

$BC = 120m$

ΔACD

$\tan 60° = \frac{AC}{CD}$

$\sqrt{3} = \frac{120}{CD}$

$CD = \frac{120}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$CD = \frac{120\sqrt{3}}{3}$

$CD = 40\sqrt{3}m$

$BD = BC + CD$

$BD = 120 + 40\sqrt{3}$

$BD = 40(3+\sqrt{3})m$

Ans//

Homework

DPP-02

THANK YOU