UDAAN

2026

Some Applications Of Trigonometry

MATHS LECTURE-3

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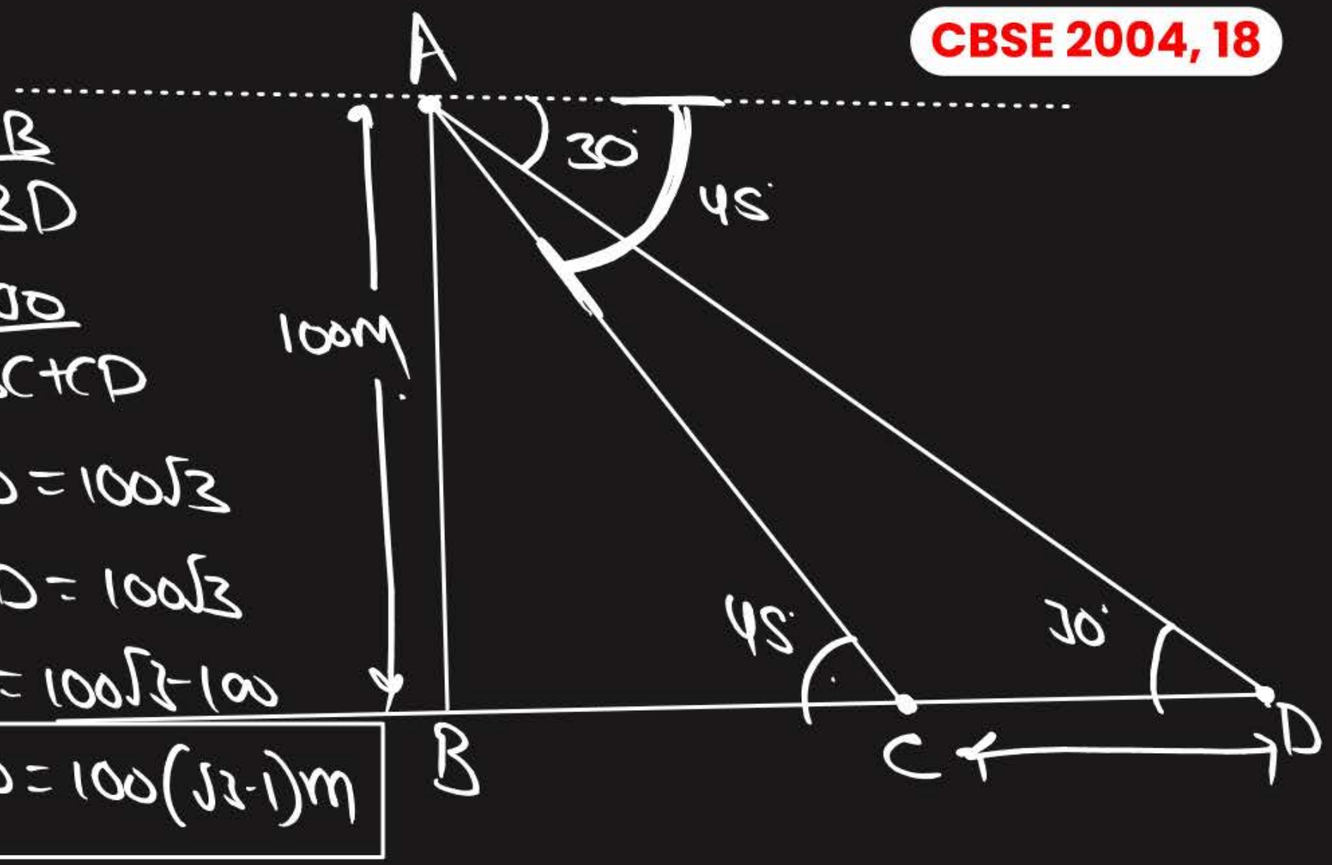
Topics *to be covered*

A Questions (part 3)

#Q. As observed from the top of a light house, 100 m above sea level, the angle of depression of a ship, sailing directly towards it, changes from 30 to 45. Determine the distance travelled by the ship during the period of observation.

CBSE 2004, 18



To find: CD

ΔABC

$\tan 45 = \frac{P}{B} = \frac{AB}{BC}$

$1 = \frac{100}{BC}$

$BC = 100$

ΔADB

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

$\frac{1}{\sqrt{3}} = \frac{100}{BC+CD}$

$BC+CD = 100\sqrt{3}$

$100+CD = 100\sqrt{3}$

$CD = 100\sqrt{3}-100$

$CD = 100(\sqrt{3}-1)\,m$

#Q. From a window 15 metres high above the ground in a street, the angles of elevation and depression of the top and the foot of another house on the opposite side of the street are 30 and 45 respectively show that the height of the opposite house is 23.66 metres (Take $\sqrt{3} = 1.732$)

CBSE 2006

To show: AC = 23.66m.

ΔODC

$\tan 45° = \frac{OD}{DC}$

$1 = \frac{15}{DC}$

$DC = 15$

$OB = 15$

ΔAOB

$\tan 30° = \frac{AB}{OB}$

$\frac{1}{\sqrt{3}} = \frac{AB}{15}$

$\frac{15}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = AB$

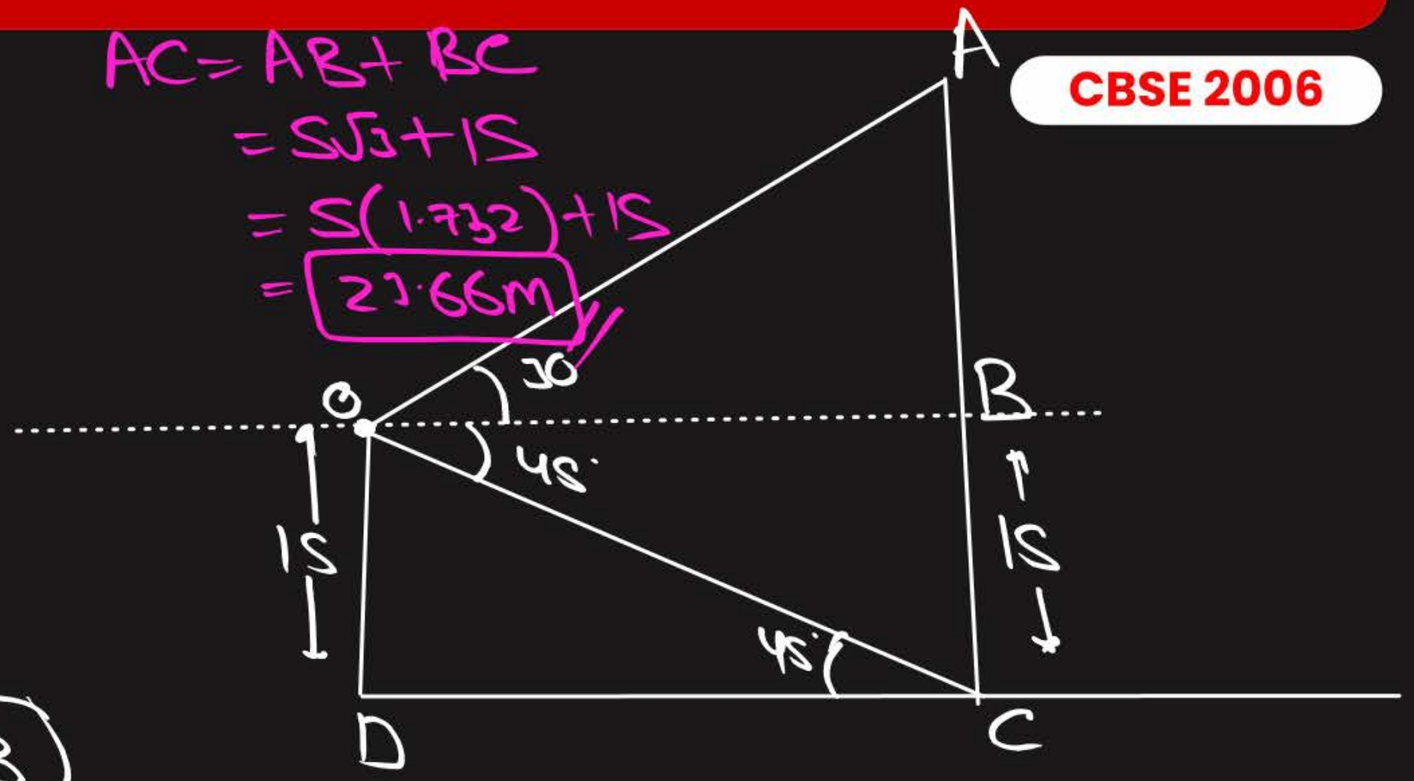
$5\sqrt{3} = AB$

$AC = AB + BC$

$= 5\sqrt{3} + 15$

$= 5(1.732) + 15$

$= 23.66m$



topsey.

#Q. From the top of a building 60 m high the angles of depression of the top and the bottom of a tower are observed to be 30 and 60. Find the height of the tower.

CBSE 2005, 16

ΔABE

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

$\frac{1}{\sqrt{3}} = \frac{AB}{BE}$

$\frac{1}{\sqrt{3}} = \frac{AB}{CD}$

$\frac{1}{\sqrt{3}} = \frac{AB}{20\sqrt{3}}$

$20 = AB$

ΔACD

$\tan 60 = \frac{AC}{CD}$

$\sqrt{3} = \frac{60}{CD}$

$CD = \frac{60}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$CD = \frac{60\sqrt{3}}{3}$

$CD = 20\sqrt{3}$

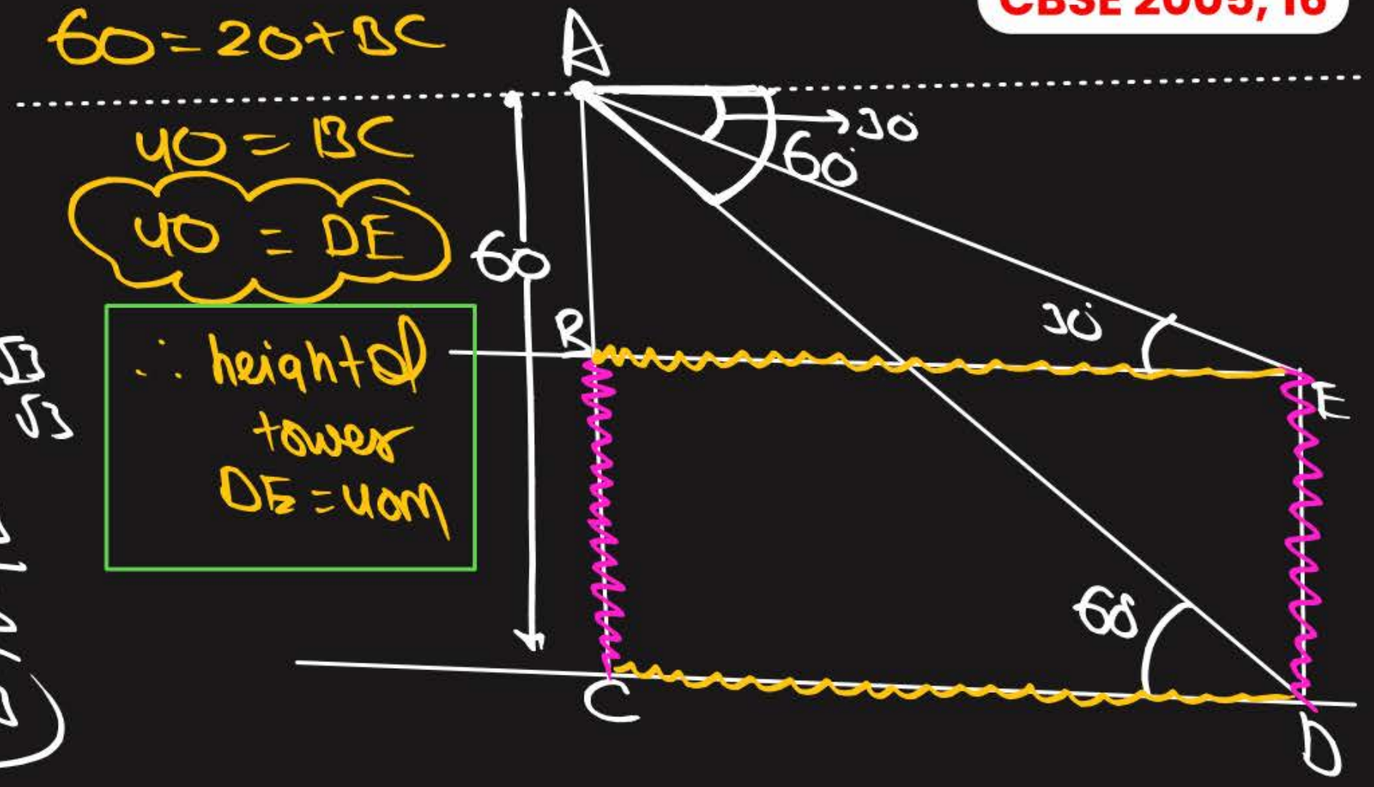
$AC = AB + BC$

$60 = 20 + BC$

$40 = BC$

$40 = DE$

$\therefore$ height of tower $DE = 40$ m



#Q. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.

#Gpk

CBSE 2014, 17, 23

#Q. A man standing on the deck of a ship, which is 10 m above water level. He observes the angle of elevation of the top of a hill as 60 and the angle of depression of the base of the hill as 30. Calculate the distance of the hill from the ship and the height of the hill.

CBSE 2004, 05, 10

To find: DC, AC.

ED = BC

EB = DC

AC = height of hill.

DC = distance of ship from hill.

ΔEDC

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

$\frac{1}{\sqrt{3}} = \frac{10}{DC}$

$DC = 10\sqrt{3}$

$\Rightarrow EB = 10\sqrt{3}$

ΔAEB

$\tan 60^\circ = \frac{AB}{EB}$

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

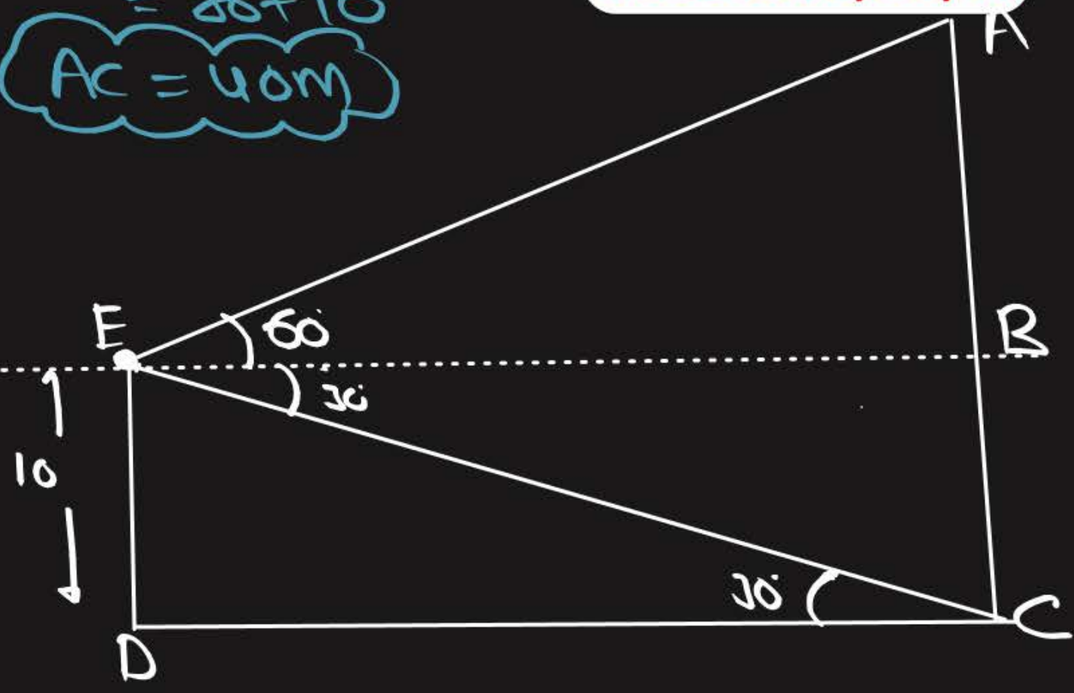
$\sqrt{3} = \frac{AB}{10\sqrt{3}}$

$30 = AB$

$\therefore AC = AB + BC$

$= 30 + 10$

$AC = 40\text{m}$



Hence, height of hill $(AC = 40m.)$

& Distance of hill from ship $= 10\sqrt{3}m$

#Q. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60. After some time, the angle of elevation reduces to 30. Find the distance travelled by the balloon during the interval.

To find: AB

ΔAGH

$\tan 60 = \frac{AH}{GH}$

$\sqrt{3} = \frac{87}{GH}$

$GH = \frac{87}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$GH = \frac{87\sqrt{3}}{3}$

$GH = 29\sqrt{3}$

ΔGBC

$\tan 30 = \frac{BC}{GC}$

$\frac{1}{\sqrt{3}} = \frac{87}{GH+HC}$

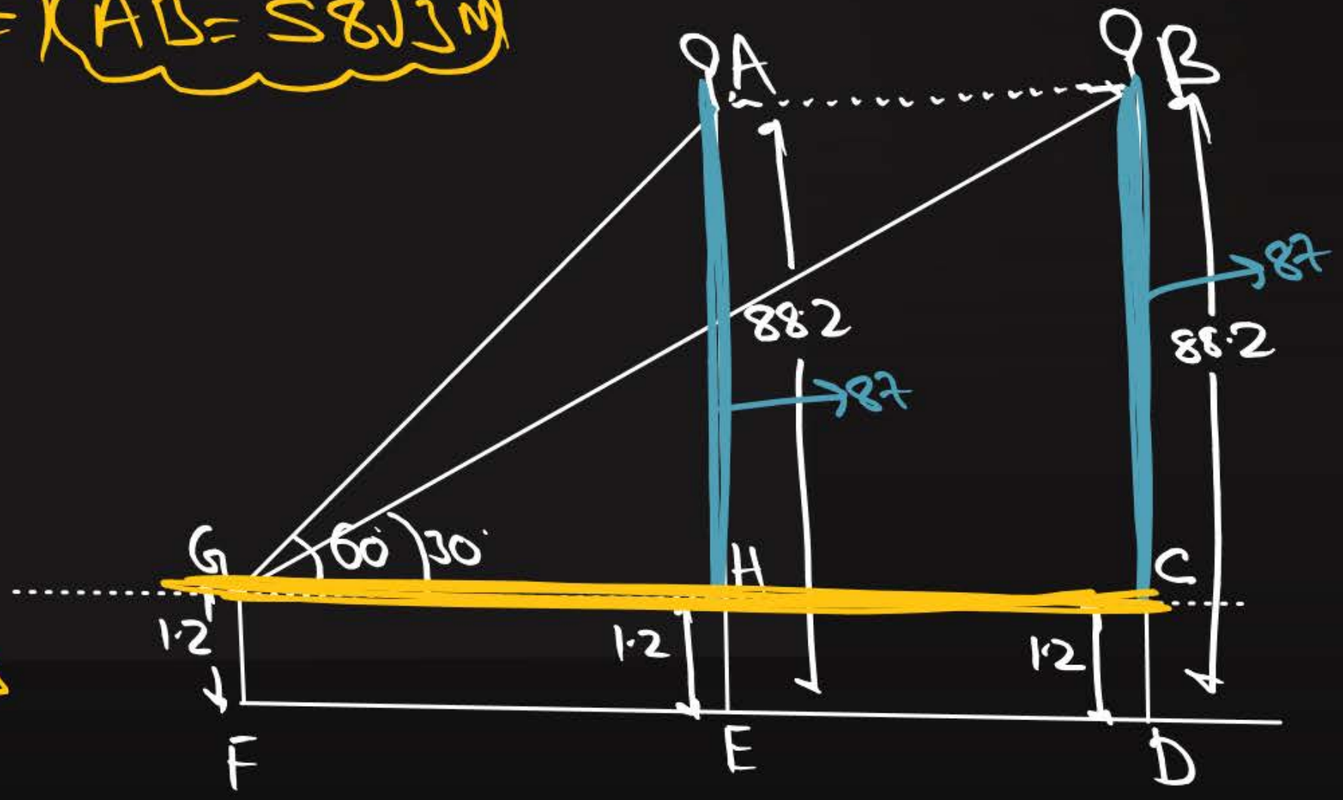
$GH+HC = 87\sqrt{3}$

$29\sqrt{3}+HC = 87\sqrt{3}$

$HC = 87\sqrt{3}-29\sqrt{3}$

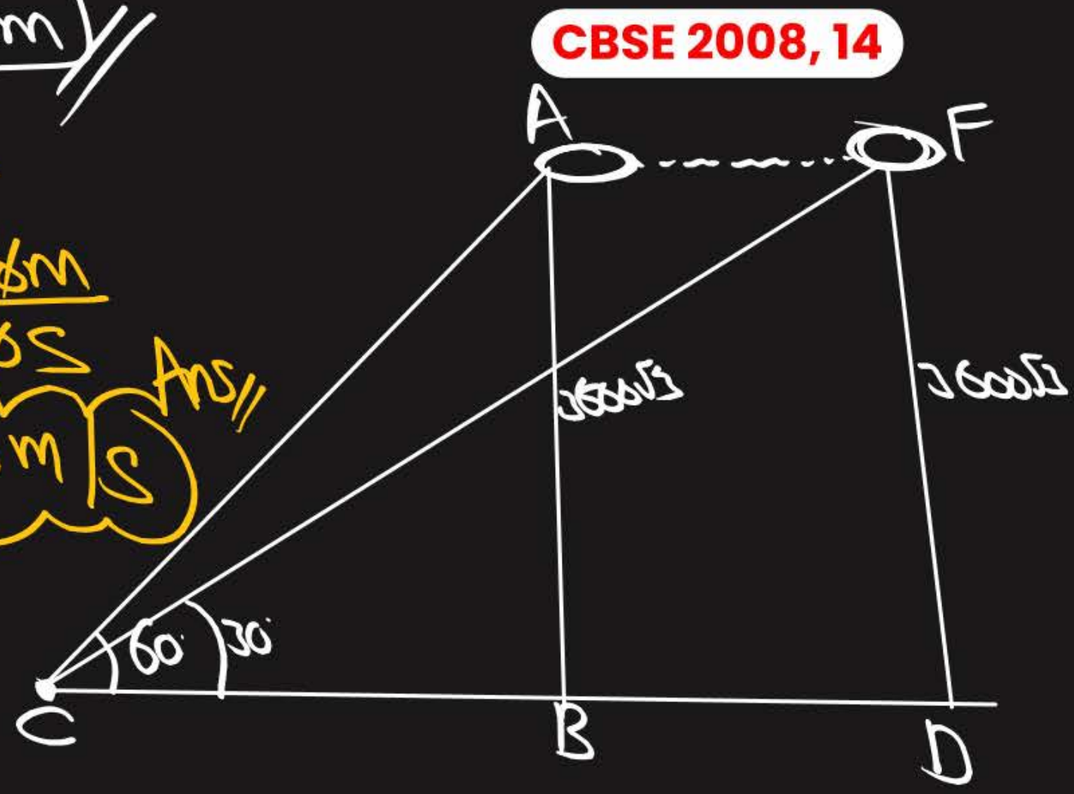
$HC = 58\sqrt{3}$

$= AB = 58\sqrt{3}\,m$



#Q. The angle of elevation of a jet plane from a point A on the ground is 60. After a flight of 30 seconds, the angle of elevation changes to 30. If the jet plane is flying at a constant height of $3600\sqrt{3}$ m, find the speed of the jet plane.

CBSE 2008, 14



Time of AE = 30 seconds.

To find : Speed of jet plane.

ΔACB

$\tan 60° = \frac{AB}{BC}$

$\sqrt{3} = \frac{3600\sqrt{3}}{BC}$

$BC = 3600$

ΔFCD

$\tan 30° = \frac{FD}{CD}$

$\frac{1}{\sqrt{3}} = \frac{3600\sqrt{3}}{CB+BD}$

$CB + BD = 10800$

$3600 + BD = 10800$

$BD = 7200$

$\Rightarrow AF = 7200m$

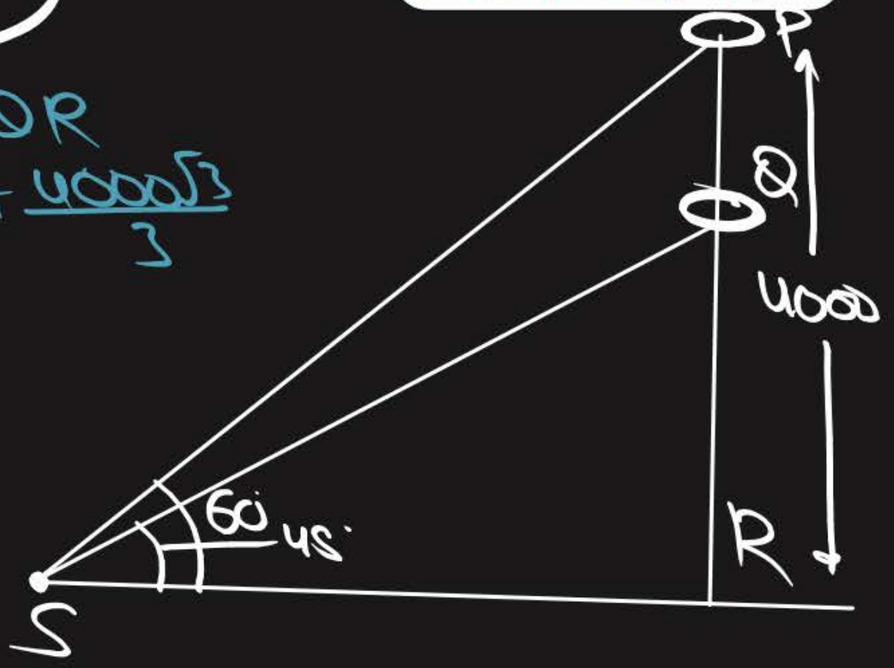
$S = D/T$

$S = \frac{7200m}{30s}$

$S = 240 m/s$ Ans//

#Q. An aeroplane when flying at a height of 4000 m from the ground passes vertically above another aeroplane at an instant when the angles of the elevation of the two planes from the same point on the ground are 60 and 45 respectively. Find the vertical distance between the aeroplanes at that instant.

CBSE 2008, 09, 16



To find : PQ

ΔORS

$\tan 45° = \frac{OR}{RS}$

$1 = \frac{OR}{RS}$

$RS = OR$ //

ΔPRS

$\tan 60° = \frac{PR}{RS}$

$\sqrt{3} = \frac{4000}{RS}$

$RS = \frac{4000}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$RS = \frac{4000\sqrt{3}}{3}$

$QR = \frac{4000\sqrt{3}}{3}$

$PR = PQ + QR$

$4000 = PQ + \frac{4000\sqrt{3}}{3}$

$$4000 - \frac{4000\sqrt{3}}{3} = PQ$$

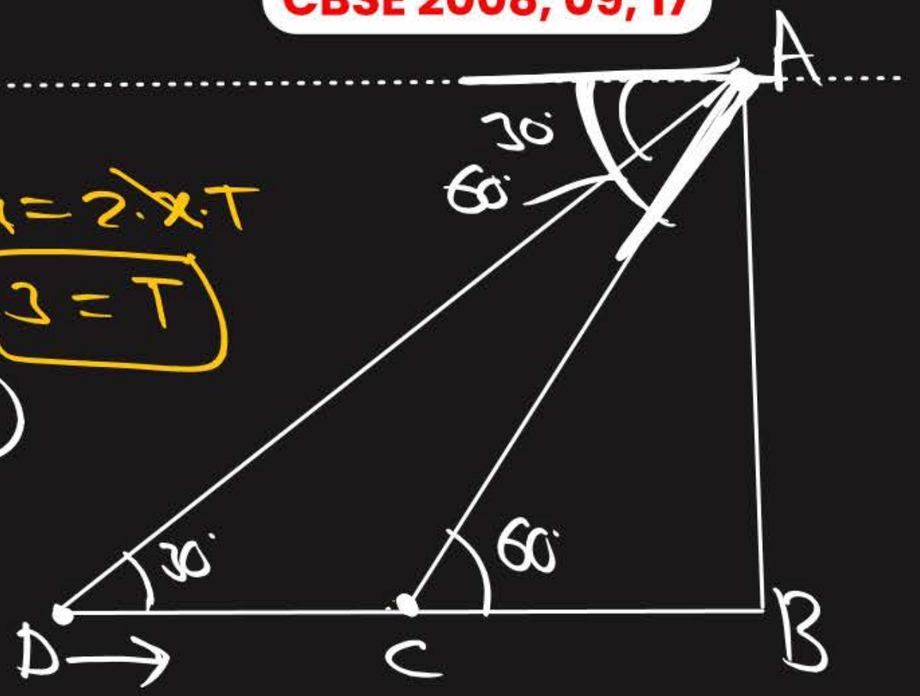
$$\frac{12000 - 4000\sqrt{3}}{3} = PQ$$

$$\frac{4000\left[3 - \sqrt{3}\right]}{3}\ m = PQ$$

#QT

#Q. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at angle of depression of 30, which is approaching to the foot of the tower with a uniform speed. Six seconds later, the angle of depression of the car is found to be 60. Find the further time taken by the car to reach the foot of the tower.

CBSE 2008, 09, 17



To find: Time from C to B.

ΔACB

$\tan 60° = \frac{AB}{BC}$

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

$BC\sqrt{3} = AB$

ΔADB

$\tan 30° = \frac{AB}{BD}$

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

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

$DC + BC = 3BC$

$DC = 2BC$

$D = S \times T$

Let the speed $= x$.

$DC = x \times 6$

$DC = 6x$

$BC = x \times T$

$6x = 2 \cdot x \cdot T$

$3 = T$

#last

→ sidekey ubaa.

#Q. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff of height h. At a point on the plane, the angles of elevation of the bottom and the top of the flag-staff are α and β respectively. Prove that the height of the tower is $\frac{h \tan\alpha}{\tan\beta - \tan\alpha}$.

Top: $BC = \frac{h\tan\alpha}{\tan\beta - \tan\alpha}$

ΔBCD

$\tan\alpha = \frac{BC}{DC}$

$DC = \frac{BC}{\tan\alpha}$

ΔACD

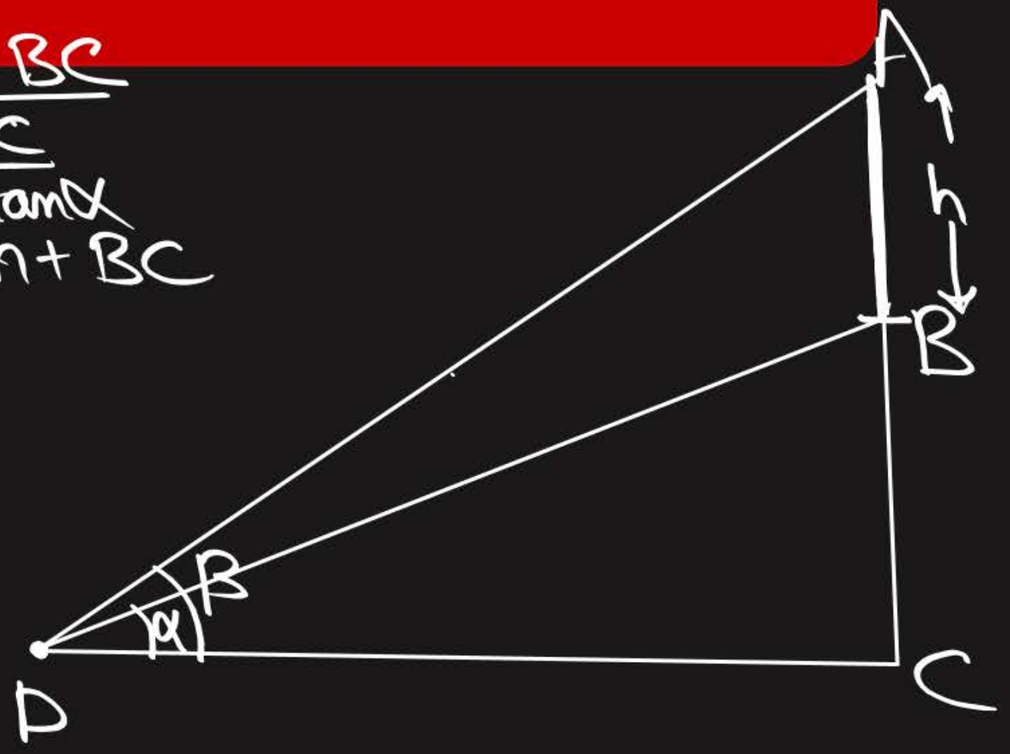
$\tan\beta = \frac{AC}{DC}$

$\tan\beta = \frac{AB+BC}{DC}$

$\tan\beta = \frac{h+BC}{DC}$

$\tan\beta = \frac{h+BC}{\frac{BC}{\tan\alpha}}$

$\frac{BC}{\tan\alpha}\tan\beta = h + BC$



$$\frac{BC\tan\beta}{\tan\alpha} - BC = h$$

$$BC\left[\frac{\tan\beta}{\tan\alpha} - 1\right] = h$$

$$BC\left[\frac{\tan\beta - \tan\alpha}{\tan\alpha}\right] = h$$

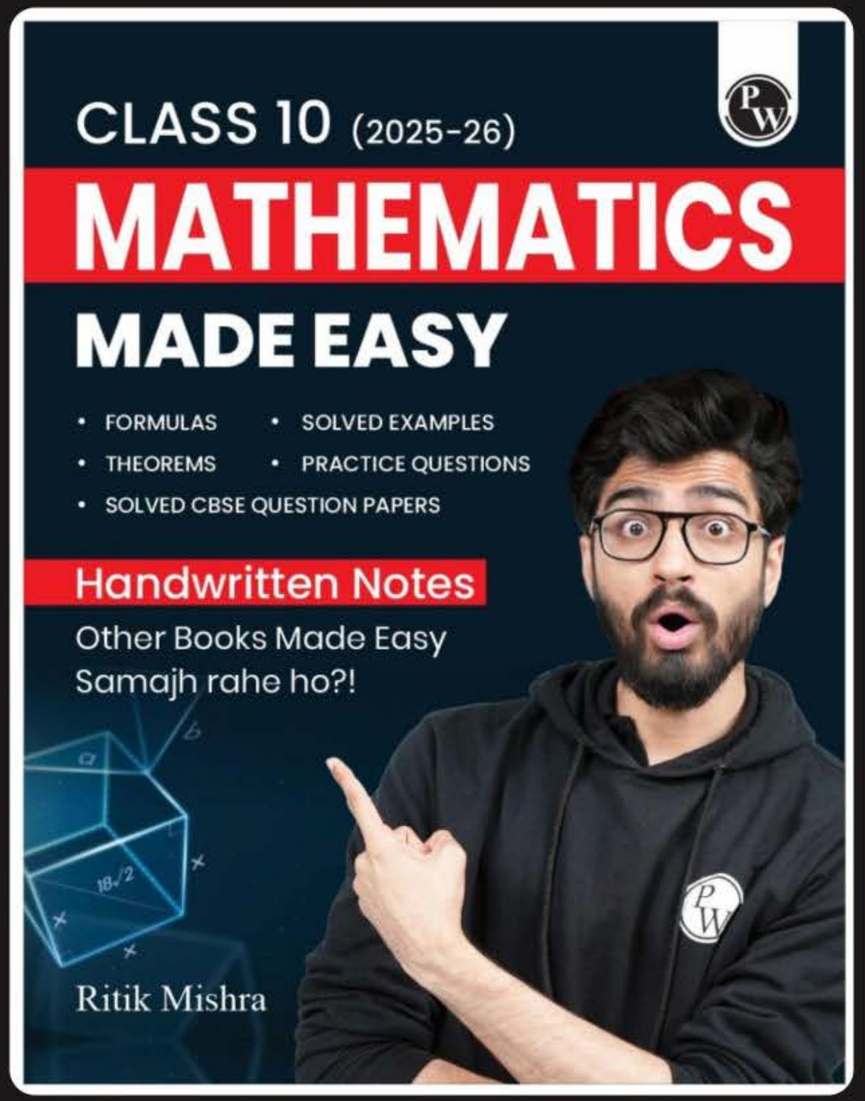
$$\boxed{BC = \frac{h\tan\alpha}{\tan\beta - \tan\alpha}}$$

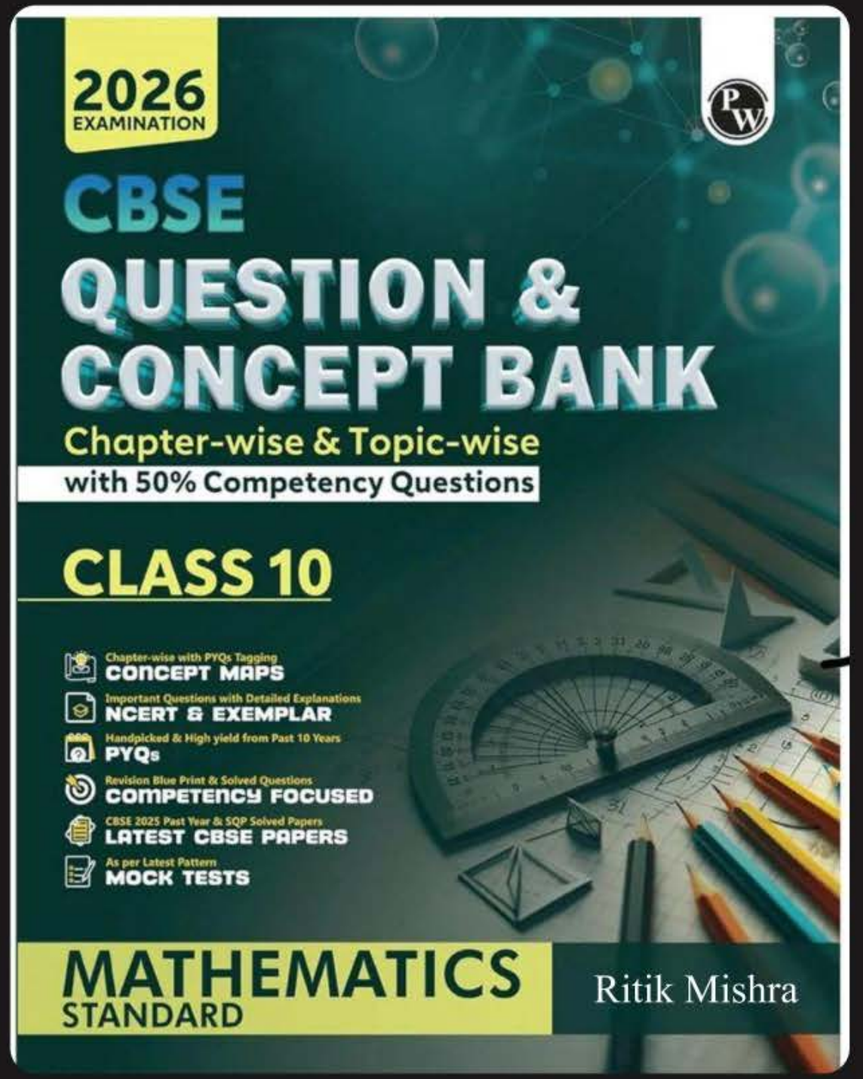
H.P

#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 the cars.
(Take $\sqrt{3} = 1.732$)

#6PY

CBSE 2017





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