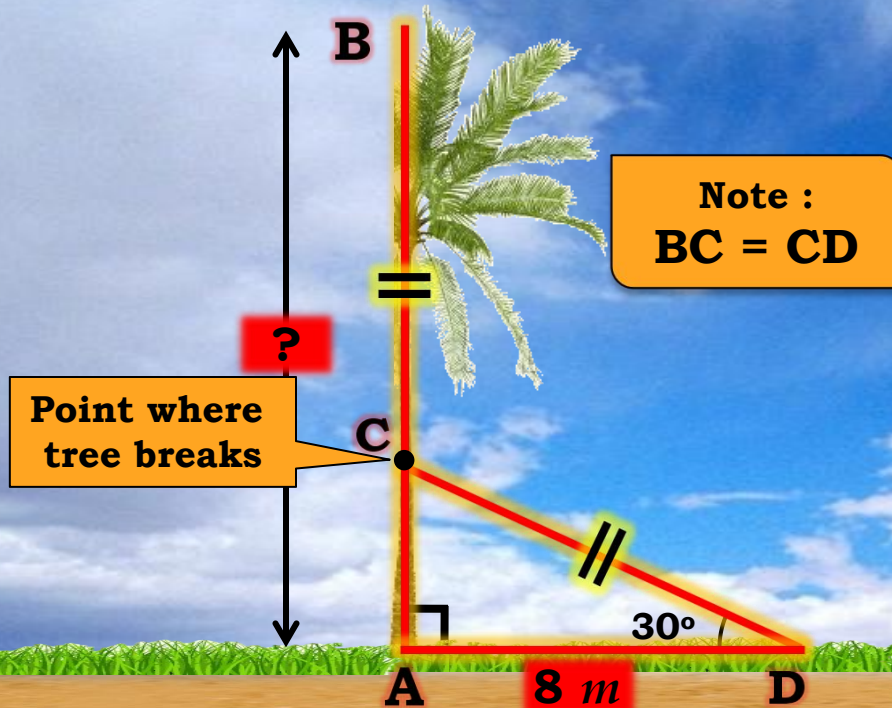


TOPIC

New sum to be added.
Question is in R+ book

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.



Q. A tree breaks at point C. The broken part BC touches the ground at point D making an angle of 30° with the ground. The distance between the foot of the tree A and the point D where the top touches the ground is 8 m. Find the height of the tree.

Sol. AB represents the height of the tree which breaks at point C.

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

$$\tan 30^\circ = \frac{AC}{AD}$$

$$\therefore \frac{1}{\sqrt{3}} = \frac{AC}{8}$$

$$\therefore AC = \frac{8}{\sqrt{3}}$$

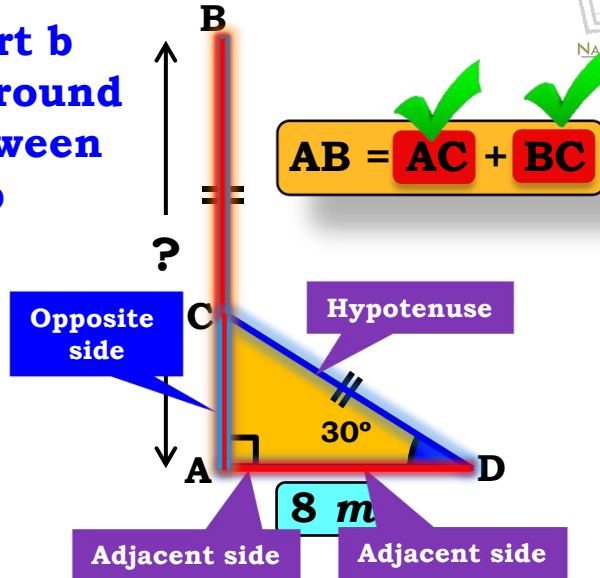
$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 30^\circ = \frac{AD}{CD}$$

$$\therefore \frac{\sqrt{3}}{2} = \frac{8}{BC}$$

$$\therefore \sqrt{3} BC = 16$$

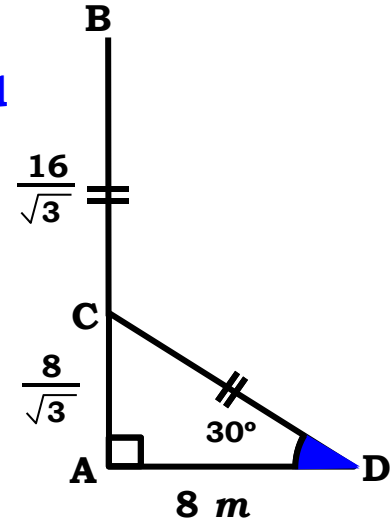
$$\therefore BC = \frac{16}{\sqrt{3}}$$



$$CD = BC$$

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 of 30° with the ground. The distance between the foot of the tree and the point where the top touches the ground is 8 m. Find the height of the tree.

Now, let us rationalise the denominator



Sol.

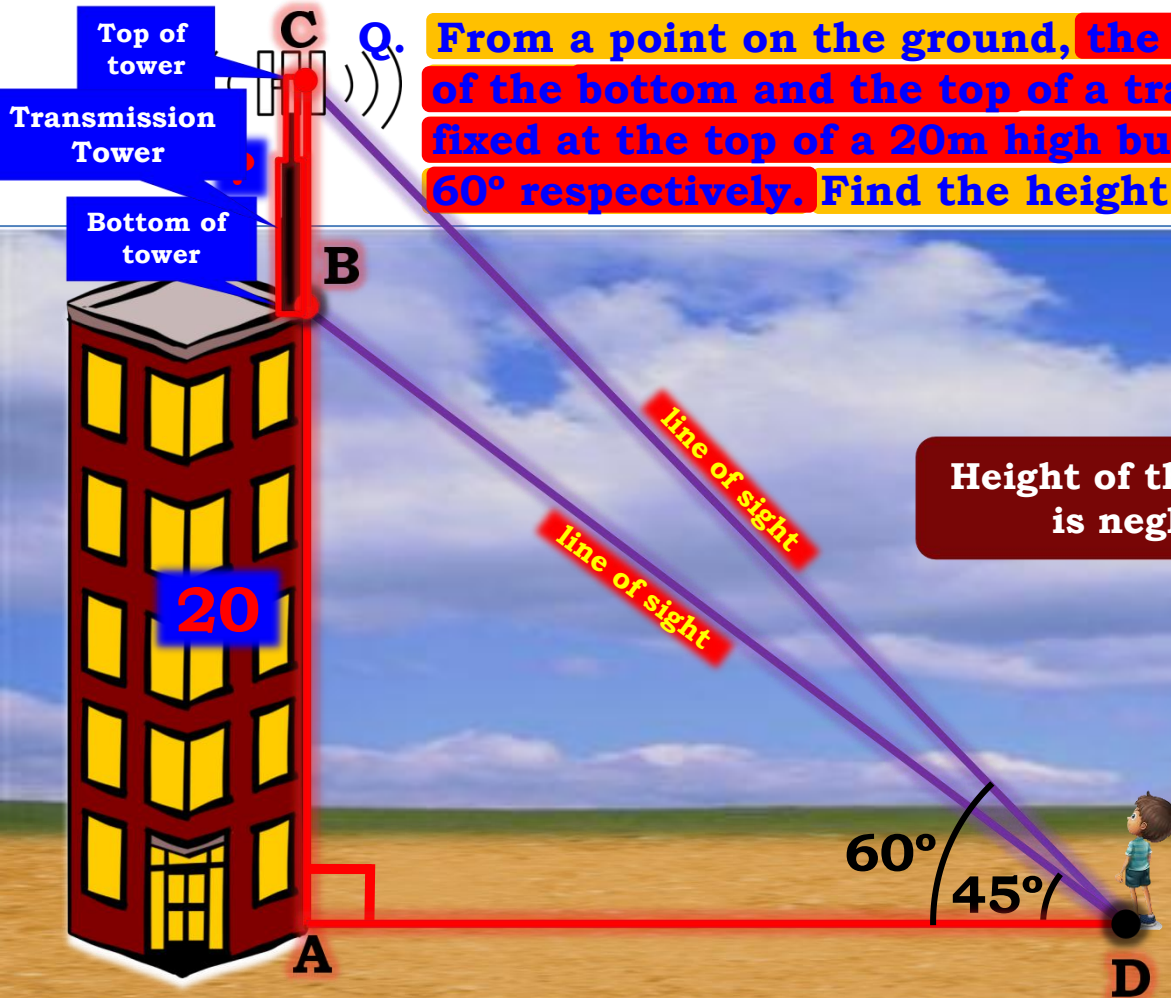
$$\begin{aligned}
 \text{Height of tree} &= AC + BC \\
 &= \frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}} \\
 &= \frac{8 + 16}{\sqrt{3}} \\
 &= \frac{24}{\sqrt{3}} \\
 \therefore \text{Height of tree} &= \frac{24}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{8\sqrt{3}}{\sqrt{3}\sqrt{3}} + \frac{16\sqrt{3}}{\sqrt{3}\sqrt{3}} \\
 &= \frac{8\sqrt{3}}{3} + \frac{16\sqrt{3}}{3} \\
 &= \frac{8\sqrt{3} + 16\sqrt{3}}{3} \\
 &= \frac{24\sqrt{3}}{3} \\
 &= 8\sqrt{3} \\
 &= 8(1.73) \\
 &= 13.84 \text{ m}
 \end{aligned}$$

$\sqrt{3} = 1.73$

Height of the tree is 13.84 m

From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20m high building are 45° and 60° respectively. Find the height of tower.



Height of the observer is neglected

Q. From a point on the ground, the angles of elevation of the top of a transmission tower and the top of a 20m high building are 60° and 45° respectively. Find the height of tower.

Now, Consider
Let us find AC

Sol. AB represents the height of the building

$$AB = 20m$$

BC represents the height of the transmission tower.

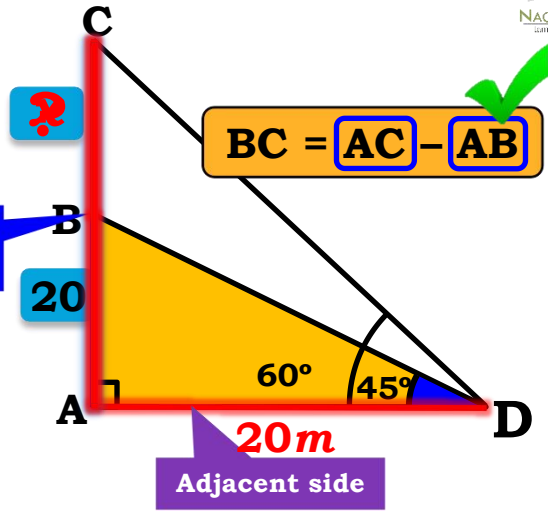
Let $BC = x$
In $\triangle ABD$,

$$\tan 45^\circ = \frac{AB}{AD}$$

$$\therefore 1 = \frac{20}{AD}$$

$$\therefore AD = 20 m$$

Opposite side



$$AC = AB + BC$$

$$\therefore AC = 20 + x$$

$$\therefore AC = (20 + x) m$$

Q. From a point on the ground, the angle of elevation of the top of a transmission tower is 60° . From a point 20 m vertically below the top of a tower, the angle of elevation of the top of the tower is 45° . Find the height of the tower.

Ratio of opposite side and Adjacent side reminds us of \tan .

$$\tan 60^\circ = \sqrt{3}$$

Sol. In right angled $\triangle CAD$,

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

$$AC = (20 + x) \text{ m}$$

$$\therefore \sqrt{3} = \frac{20 + x}{20}$$

$$\therefore 20\sqrt{3} = 20 + x$$

$$\sqrt{3} = 1.73$$

$$\therefore x = 20\sqrt{3} - 20$$

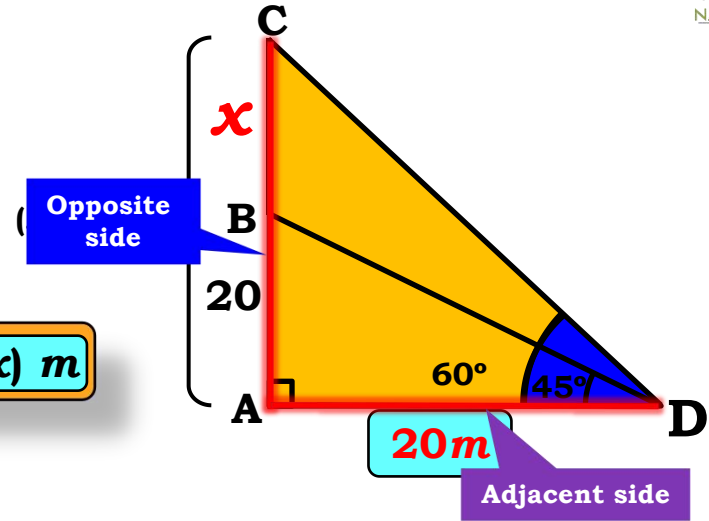
$$\therefore x = 20(\sqrt{3} - 1)$$

$$\therefore x = 20(1.73 - 1)$$

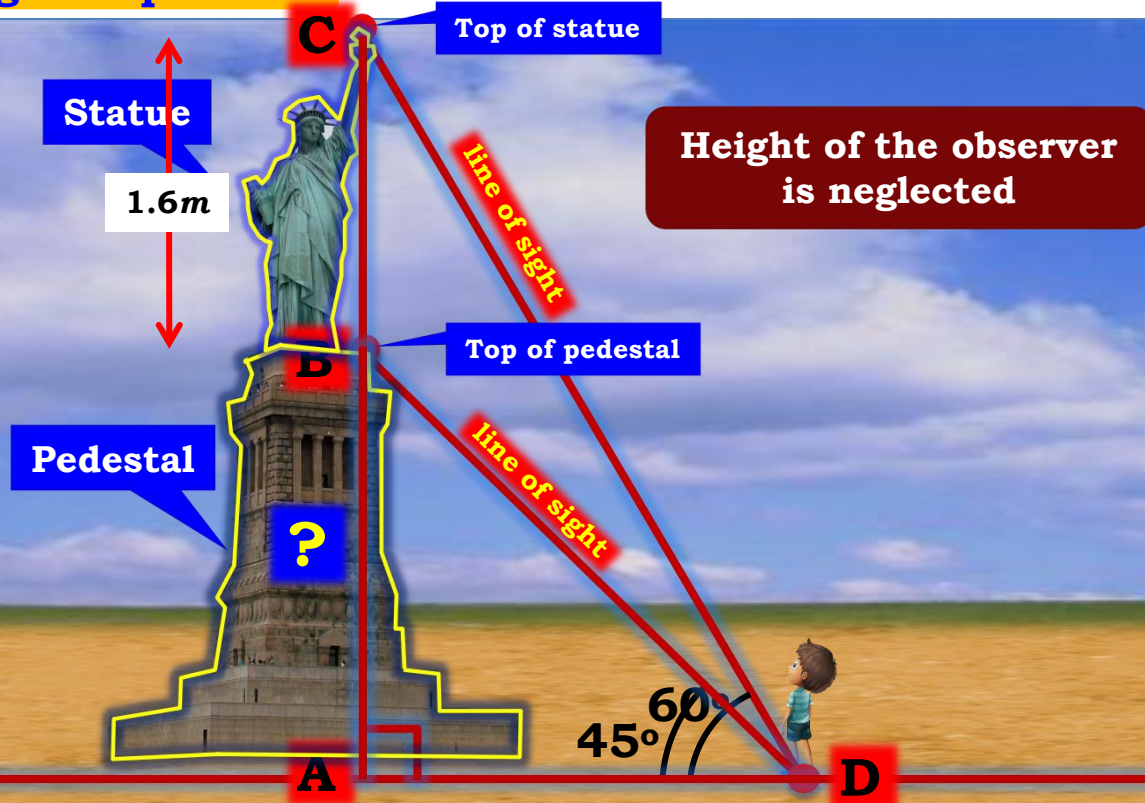
$$\therefore x = 20 \times 0.73$$

$$\therefore x = 14.6$$

Height of the transmission tower is 14.6 m



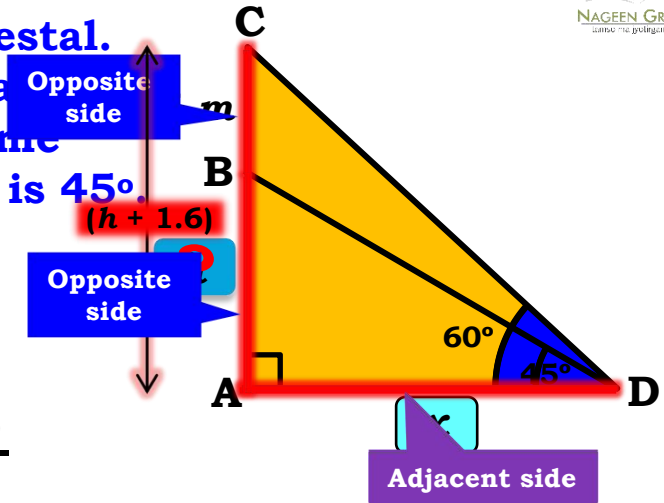
Q. A statue 1.6m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point angle of elevation of the top of pedestal is 45° . Find the height of pedestal.



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

Observe $\angle D$

Sol. Let the height of pedestal (AB) be 'h' m
Height of statue (BC) = 1.6 m



$\tan 45^\circ = 1$

$$\tan 45^\circ = \frac{AB}{AD}$$

$$\therefore 1 = \frac{h}{x}$$

$\tan 60^\circ = \sqrt{3}$

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

$$\therefore \sqrt{3} = \frac{h + 1.6}{x}$$

$$\therefore \sqrt{3}x = h + 1.6$$

$$\therefore \sqrt{3}h = h + 1.6 \quad \text{[From (i)]}$$

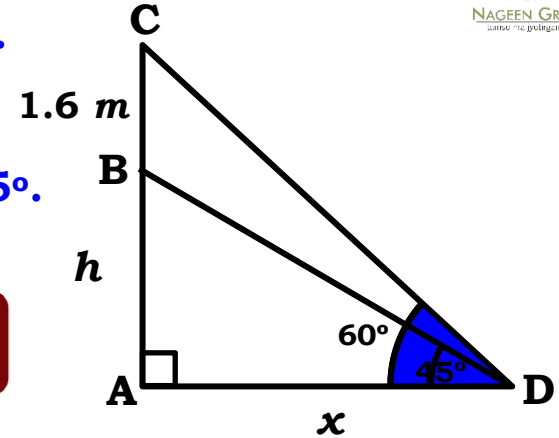
$$\therefore \sqrt{3}h - h = 1.6$$

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

$$\therefore h = \frac{1.6}{\sqrt{3} - 1}$$

Q. A statue 1.6m 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 the angle of elevation of the top of the pedestal is 45°. Find the height of pedestal.

Now, let us rationalise the denominator by taking its conjugate



Sol.

$$h = \frac{1.6}{\sqrt{3} - 1}$$

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

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

$$\therefore h = \frac{1.6 \times (\sqrt{3} + 1)}{3 - 1}$$

$$\therefore h = \frac{0.8 \times \cancel{1.6}}{\cancel{2}} \times (\sqrt{3} + 1)$$

$$\sqrt{3} = 1.73$$

$$\therefore h = 0.8(\sqrt{3} + 1)$$

$$\therefore h = 0.8(1.73 + 1)$$

$$\therefore h = 0.8(2.73)$$

$$\therefore h = 2.184$$

$$\therefore \text{Height of the pedestal is } 2.184 \text{ m}$$

Thank You