1. The height of a tree is $\sqrt{3}$ times the length of its shadow. Find the angle of elevation of the sun.

2. The angle of elevation of the top of a tower, from a point on the ground and at a distance of 160 m from its foot, is found to be 60°. Find the height of the tower.

3. A ladder is placed along a wall such that its upper end is resting against a vertical wall. The foot of the ladder is 2·4 m from the wall and the ladder is making an angle of 68° with the ground. Find the height, upto which the ladder reaches.

4. Two persons are standing on the opposite sides of a tower. They observe the angles of elevation of the top of the tower to be 30° and 38° respectively. Find the distance between them, if the height of the tower is 50 m.

5. A kite is attached to a string. Find the length of the string, when the height of the kite is 60 m and the string makes an angle 30° with the ground.

6. A boy, 1·6 m tall, is 20 m away from a tower and observes the angle of elevation of the top of the tower to be (i) 45° (ii) 60°. Find the height of the tower in each case.

7. The upper part of a tree, broken over by the wind, makes an angle of 45° with the ground; and the distance from the root to the point where the top of the tree touches the ground, is 15 m. What was the height of the tree before it was broken ?

8. The angle of elevation of the top of an unfinished tower from a point at a distance of 80 m from its base is 30°. How much higher must the tower be raised so that its angle of elevation at the same point may be 60° ?

9. At a particular time, when the sun's altitude is 30°, the length of the shadow of a vertical tower is 45 m. Calculate :
   (i) the height of the tower,
   (ii) the length of the shadow tower, when the sun's altitu
   (a) 45°   (b) 60°.

10. Two vertical poles are on either A 30 m long ladder is placed poles. When the ladder rests a it makes angle 32°24′ with the it is turned to rest against makes angle 32°24′ with the the width of the road.

11. Two climbers are at points vertical cliff face. To an ob from the foot of the cliff, on A is at an elevation of 48° an is the distance between the c

12. A man stands 9 m away fro observes that angle of eleva the pole is 28° and the angle the bottom of the pole is height of the pole.

13. From the top of a cliff 92 of depression of a buoy i to the nearest metre, the dis from the foot of the cliff.

1. In the figure, given below, it is given that AB is perpendicular to BD and is of length X metres. DC = 30 m, $\angle ADB = 30°$ and $\angle ACB = 45°$.

Without using tables, find X.
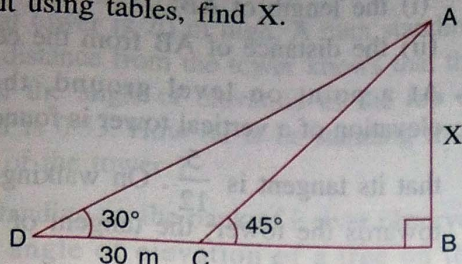
2. Find the height of a tree when it is found that on walking away from it 20 m, in a horizontal line through its base, the elevation of its top changes from 60° to 30°.

3. Find the height of a building, when it is found that on walking towards it 40 m in a horizontal line through its base the angular elevation of its top changes from 30° to 45°.

4. From the top of a light house 100 m high, the angles of depression of two ships are observed as 48° and 36° respectively. Find the distance between the two ships (in the nearest metre) if :

   (i) the ships are on the same side of the light house,

   (ii) the ships are on the opposite sides of the light house.   [2010]

5. Two pillars of equal heights stand on either side of a roadway, which is 150 m wide. At a point in the roadway between the pillars the elevations of the tops of the pillars are 60° and 30°; find the height of the pillars and the position of the point.

6. From the figure, given below, calculate the length of CD.
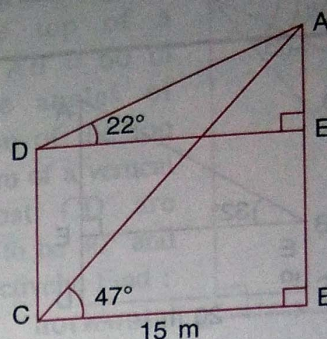
7. The angle of elevation of the top of a tower is observed to be 60°. At a point, 30 m vertically above the first point of observation, the elevation is found to be 45°. Find :

   (i) the height of the tower,

   (ii) its horizontal distance from the points of observation.

8. From the top of a cliff, 60 metres high, the angles of depression of the top and bottom of a tower are observed to be 30° and 60°. Find the height of the tower.

9. A man on a cliff observes a boat, at an angle of depression 30°, which is sailing towards the shore to the point immediately beneath him. Three minutes later, the angle of depression of the boat is found to be 60°. Assuming that the boat sails at a uniform speed, determine :

   (i) how much more time it will take to reach the shore ?

   (ii) the speed of the boat in metre per second, if the height of the cliff is 500 m.

10. A man in a boat rowing away from a lighthouse 150 m high, takes 2 minutes to change the angle of elevation of the top of the lighthouse from 60° to 45°. Find the speed of the boat.

11. 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 m away from the bank, he finds the angle of elevation to be 30°. Find :

(i) the height of the tree, correct to 2 decimal places,

(ii) the width of the river.

12. The horizontal distance between two towers is 75 m and the angular depression of the top of the first tower as seen from the top of the second, which is 160 m high, is 45°. Find the height of the first tower.

13. The length of the shadow of a tower standing on level plane is found to be $2y$ metres longer when the sun's altitude is 30° than when it was 45°. Prove that the height of the tower is $y(\sqrt{3} + 1)$ metres.

14. An aeroplane flying horizontally 1 km above the ground and going away from the observer is observed at an elevation of 60°. After 10 seconds, its elevation is observed to be 30°; find the uniform speed of the aeroplane in km per hour.

15. From the top of a hill, the angles of depression of two consecutive kilometre stones, due east, are found to be 30° and 45° respectively. Find the distances of the two stones from the foot of the hill.

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1. Find AD.
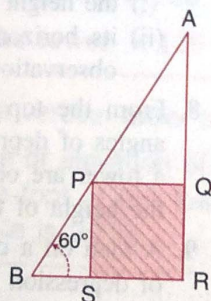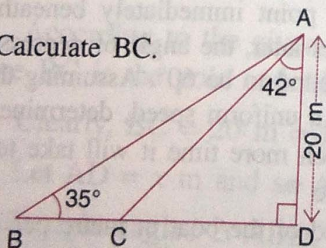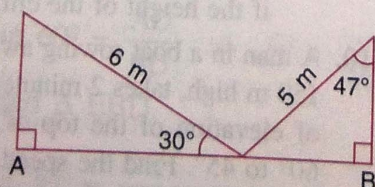
(i)
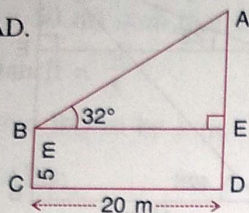
(ii)
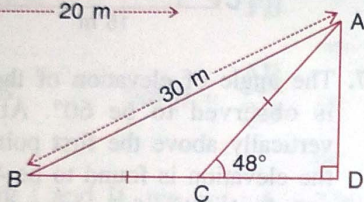
2. In the following diagram, AB is a floor-board; PQRS is a cubical box with each edge = 1 m and $\angle B = 60°$. Calculate the length of the board AB.

3. Calculate BC.

4. Calculate AB.

5. The radius of a circle is given as 15 cm and chord AB subtends an angle of 131° at the centre C of the circle. Using trigonometry,

calculate :

(i) the length of AB;

(ii) the distance of AB from the centre C.

6. At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $\dfrac{5}{12}$. On walking 192 metres towards the tower; the tangent of the angle is found to be $\dfrac{3}{4}$. Find the height of the tower.

7. A vertical tower stands on horizontal plane and is surmounted by a vertical flagstaff of height h metre. At a point on the plane, the angle of elevation of the bottom of the flagstaff is α and that of the top of flagstaff is β. Prove that the height of the tower is

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

8. With reference to the given figure, a man stands on the ground at point A, which is on the same horizontal plane as B, the foot of the vertical pole BC. The height of the pole is 10 m. The man's eye is 2 m above the ground. He observes the angle of elevation of C, the top of the pole, as $x°$, where $\tan x° = \dfrac{2}{5}$. Calculate : (i) the distance AB in metres; (ii) angle of elevation of the top of the pole when he is standing 15 metres from the pole. Give your answer to the nearest degree.