

1. A vertical tower stands on a horizontal plane and is surmounted by a vertical flagstaff of height h . At a point on the plane, the angles of elevation of the bottom and the top of the flagstaff are α and β respectively. Prove that the height of the tower is $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$.
2. The angles of elevation of the top of a tower from two points at distances a and b metres from the base and in the same straight line with it are complementary. Prove that the height of the tower is \sqrt{ab} .
3. At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $\frac{5}{12}$. On walking 192 metres towards the tower, the tangent of the angle of elevation is $\frac{3}{4}$. Find the height of the tower.
4. From the top of a hill, the angles of elevation of two consecutive kilometer stones due east are found to be 30° and 45° . Find the height of the hill.
5. Two stations due south of a leaning tower which leans towards the north are at distances a and b from its foot. If α, β be the elevations of the tower from these stations, prove that its inclination θ to the horizontal is given by
$$\cot \theta = \frac{b \cot \alpha - a \cot \beta}{b - a}$$
6. An aeroplane at an altitude of 1200 metres finds that two ships are sailing towards it in the same direction. The angles of depression of the ships as observed from the aeroplane are 60° and 30° respectively. Find the distance between the two ships.
7. A man on the top of a vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change from 30° and 45° , how soon after this, will the car reach the tower? Give your answer to the nearest second.
8. The shadow of a flag staff is three times as long as the shadow of the flag staff when the sun rays meet the ground at an angle of 60° . Find the angle between the sun rays and the ground at the time of longer shadow.

9. Two pillars of equal height and on either side of a road, which is 100 m wide. The angles of elevation of the top of the pillars are 60° and 30° at a point on the road between the pillars. Find the position of the point between the pillars and the height of each pillar.
10. 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.

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