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Class-X Assignment (Chapter-9) Height and Distance

Q1: A man is standing on the deck of a ship, which is 8m above water level. He observes the angle of elevation of the top of hill as 60° and the angle of depression of base of the hill as 30°. Calculate the distance of the hill from the ship and the height of hall.

Q2: An airplane, when 3000m high, passes vertically above another airplane at an instant when the angles of elevation of the two airplanes from the same point on the ground are 60° & 45° respectively. Find the vertical distance between the two airplanes.

Q3: A person standing on the bank of a river observes that angle of elevation of the top of a tree standing on the opposite bank is 60°. When he moves 40m 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.

Q4: A man on the deck of the ship is 12m above water level. He observes that the angle of elevation of the top of cliff is 45°, and the angle of depression is 30°. Calculate the distance of the cliff from the ship and the height of the cliff.

Q5: From the top of the tower 50m high the angles of the depression of the top and bottom of the pole are observed to be 45° & 60°. Find the height of the pole.

Q6: From the top of a tower 'h' m high, the angles of depression of two objects on the same side of the tower are found to be α and β (α > β). If the distance between the objects is 'p' metres, show that the height 'h' of the object is given by the expression $h = \frac{p \tan\alpha \, tan\beta}{\tan\alpha - tan\beta}$

Also, determine the height of tower, if p= 50m, α=60°, β=30°

Q7: From the top of building 15m high, the angle of elevation of the top of a tower is found to be 30°. From the bottom of the same building, the angle of elevation of the top of water is found to be 45°. Determine the height of the tower and the distance between the tower and the building.

Q8: The angle elevation θ of the top of a light house, as seen by a person on the ground, is such that $tan\theta = \frac{5}{12}$. When the person moves a distance of 240m towards the light house, the angle of elevation becomes ø such that $tan\ ø = \frac{3}{4}$. Find the height of the light house.

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Q9: From a window (60m high above the ground) of a house in a street the angles of elevation & the depression of the top & the foot of another house on the opposite side of street are 60° & 45° respectively. Show that the height of the opposite house is $60(1+\sqrt{3})$ metres.

Q10: If the angle of elevation of a cloud from a point h metres above a lake is α & the angle of depression of its reflection in the lake is β, prove that the distance of the cloud from the point of observation is $\frac{2h \sec \alpha}{\tan \beta - tan\alpha}$.

Q11: From an airplane vertically above a straight horizontal plane, the angle of depression of two consecutive kilometer stones on the opposite sides of the airplane are found to be α & β. Show that the height of the airplane is $\frac{\tan \alpha \tan \beta}{\tan \alpha + \tan \beta}$.

Q12: A man standing on the deck of the ship, which is 10m above water level, observes the angle of elevation of the top of a hill as 60° & the angle of depression of the base of the hill as 30°. Find the distance of the hill from the ship & the height of the hill.

Q13: The angle of elevation of the top if a tower from two points P & Q at distances of a & b respectively from the base & in the same straight line with it are complementary. Prove that the height of the tower is $\sqrt{ab}$.

Q14: As observed from the top of a light-house, 100m high above sea level, the angle of depression of a ship, sailing directly towards it, changes from 30° to 60°. Determine the distance travelled by the ship during the period of observation. $(use\ \sqrt{3} = 1.732)$

Q15: An aeroplane flying horizontally 1000m above the ground, is observed at an angle of elevation of 60° from a point on the ground. After a flight of 10 seconds the angle of elevation at the point of observation changes to 30°. Find the speed of the plane in m/sec.

Q16: The angle of elevation of a jet plane from a point A on the ground is 60°. After a flight of 15sec, the angle of elevation changes 30°. If the jet plane is flying at a constant height of $1500\sqrt{3}\ m$, find the speed of the jet plane.

Q17: The angle of elevation of the top of a tower as observed from a point on the ground is 'α' & on moving "α" meters towards the tower, the angle of elevation is 'β'. Prove that the height of the tower is $\frac{a \tan \alpha \tan \beta}{\tan \beta - \tan \alpha}$.

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Q18: The angle of elevation of an airplane from a point on the ground is 45°. After a flight of 15sec, the elevation changes to 30°. If the airplane is flying at a height of 3000m, find the speed of the airplane.

Q19: If the angle of elevation of a cloud from a point h metres above a lake is α & the angle of depression of its reflection in the lake is β. Prove that the distance of the cloud from the point of observation is $\frac{2h\sec\alpha}{\tan\beta-\tan\alpha}$.

Q20: From an airplane vertically above a straight horizontal road, the angles of depression of two consecutive milestones on opposite sides of the airplane are observed to be α & β. Show that the height of the airplane above the road is $\frac{\tan\alpha\tan\beta}{\tan\alpha+\tan\beta}$.

Q21: A ladder rests against a wall at angle α to the horizontal. Its foot is pulled away from the wall through a distance 'a', so that its slides a distance b down the wall making an angle β with the horizontal. Show that $\frac{a}{b}=\frac{\cos\alpha-\cos\beta}{\sin\beta-\sin\alpha}$.

Q22: A man rowing a boat away from a light house 150m high takes 2min to change the angle of elevation of the top of light house from 45° to 30°. Find the speed of the boat.

Q23: Two boats approach a light house in mid sea from opposite directions. The angles of elevations of the top of the light house from two boats are 30° & 45° respectively. If the distance between two boats is 100m, find the height of the light house.

Q24: The pilot of an aircraft flying horizontally at a speed of 1200km/hr observes that the angle of depression of a point on the ground changes from 30° to 45° in 15sec. Find the height at which the aircraft is flying.

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Answers:

Q1: $8\sqrt{3}$m, $32m$

Q2: $1268m$

Q3: $height\ of\ the\ tree = 34.64m\ \ \&\ \ width\ of\ the\ river = 20m$

Q4: $20.784m, 32.784m$

Q5: $21.13m$

Q6: $height = 25\sqrt{3}m$

Q7: $35.5m, 35.5m$

Q8: $225m$

Q12: $17.3m, 40m$

Q14: $115.46m$

Q15: $115.47m/sec$

Q16: $720km/hr$

Q18: $527.04km/hr$

Q22: $54.9m/min$

Q23: $50(\sqrt{3}-1)m$

Q24: $6.83km$