



**Octahedral classes, kharadi**  
**2nd floor, yashwant plaza, near bank of India,**

**Class 10 - Mathematics**  
**Heights and Distances**

**Maximum Marks: 105**

**Time Allowed: 2 hours**

**Section A**

1. As observed from the top of a lighthouse, 100m above sea level, the angle of depression of a ship, sailing directly towards it, changes from  $30^\circ$  to  $60^\circ$ . Determine the distance travelled by the ship during the period of observation.  
[Use  $\sqrt{3} = 1.732$ .]
2. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle  $30^\circ$  with it. The distance between the foot of the tree to the point where the top touches the ground is 9m. Find the height of the tree.
3. Two posts are k metre apart and the height of one is double that of the other. If from the mid-point of the line segment joining their feet, an observer finds the angles of elevation of their tops to be complementary, then find the height of the shortest post.
4. The angle of elevation of the top of a chimney from the top of a tower is  $60^\circ$  and the angle of depression of the foot of the chimney from the top of the tower is  $30^\circ$ . If the height of the tower is 40 m, find the height of the chimney.
5. The angle of elevation of a cloud from a point h metres above a lake is  $\alpha$  and the angle of depression of its reflection in the lake is  $\beta$ . Prove that the height of the cloud is  $\frac{h(\tan \beta + \tan \alpha)}{(\tan \beta - \tan \alpha)}$  metres.
6. An aeroplane when flying at a height of 3000 metres from the ground passes vertically above another aeroplane at an instant when the angles of elevation of the two planes from the same point on the ground are  $60^\circ$  and  $45^\circ$  respectively. Find the vertical distance between the aeroplanes at that instant. [Take  $\sqrt{3}=1.732$ ]
7. A vertical tower stands on a horizontal plane and is surmounted by a vertical flagstaff of height 6m. At a point on the plane, the angle of elevation of the

bottom of the flagstaff is  $30^\circ$  and that of the top of the flagstaff is  $60^\circ$ . Find the height of the tower. [Use  $\sqrt{3} = 1.732$ .]

8. From the top of a hill, the angles of depression of two consecutive kilometre stones due east are found to be  $45^\circ$  and  $30^\circ$  respectively. Find the height of the hill.
9. From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are  $30^\circ$  and  $45^\circ$  respectively. If the bridge is at a height of 2.5m from the banks, find the width of the river. [Take  $\sqrt{3} = 1.732$ .]
10. The angle of depression of two ships from an aeroplane flying at the height of 7500 m are  $30^\circ$  and  $45^\circ$ . If both the ships are in the same line and on the same side of the aeroplane such that one ship is exactly behind the other, find the distance between the ships.
11. From the top of a building, 60 m high, the angle of depression of the top of a tower is  $45^\circ$  and from the foot of the tower, the angle of elevation of the top of the building is  $60^\circ$ . Find the height of the tower and its distance from the building.
12. The angle of depression of the top and bottom of a building 50 metres high as observed from the top of a tower are  $30^\circ$  and  $45^\circ$  respectively. Find the height of the tower and also the horizontal distance between the building and the tower.
13. The angle of elevation of the top of an unfinished tower at a distance of 75m from its base is  $30^\circ$ . How much higher must the tower be raised so that the angle of elevation of its top at the same point may be  $60^\circ$ ? [Take  $\sqrt{3} = 1.732$ .]
14. A fire in a building B is reported on telephone to two fire stations P and Q, 20 km apart from each other on a straight road. P observes that the fire is at an angle of  $60^\circ$  to the road and Q observes that it is at an angle of  $45^\circ$  to the road. Which station should send its team and how much will this team have to travel?
15. A man on the deck of a ship, 16 m above water level, observes that the angles of elevation and depression respectively of the top and bottom of a cliff are  $60^\circ$  and  $30^\circ$ . Calculate the distance of the cliff from the ship and height of the cliff. [Take  $\sqrt{3} = 1.732$ ]
16. A ladder of length 6 metres makes an angle of  $45^\circ$  with the floor while leaning against one wall of a room. If the foot of the ladder is kept fixed on the floor and it is made to lean against the opposite wall of the room, it makes an angle of  $60^\circ$  with the floor. Find the distance between two walls of the room.

17. From the top of a building 15 m high, the angle of elevation of the top of a tower is found to be  $30^\circ$ . From the bottom of the same building, the angle of elevation of the top of the tower is found to be  $45^\circ$ . Determine the height of the tower and the distance between the tower and the building.
18. The angle of elevation of a cloud from a point 120 m above a lake is  $30^\circ$  and the angle of depression of its reflection in the lake is  $60^\circ$ . Find the height of the cloud.
19. 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  $60^\circ$ . When he moves 30 metres away from the bank, he finds the angle of elevation to be  $30^\circ$ . Find the height of the tree and the width of the river. [Take  $\sqrt{3} = 1.732$ .]
20. On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. At a point 9 metres away from the foot of the tower the angle of elevation of the top and bottom of the flag pole are  $60^\circ$  and  $30^\circ$  respectively. Find the height of the tower and the flag pole mounted on it.
21. The shadow of a tower, when the angle of elevation of the sun is  $45^\circ$ , is found to be 10 metres longer than when the angle of elevation is  $60^\circ$ . Find the height of the tower. [Given  $\sqrt{3} = 1.732$ .]
22. From the top of tower, 100 m high, a man observes two cars on the opposite sides of the tower with the angles of depression  $30^\circ$  &  $45^\circ$  respectively. Find the distance between the cars. (Use  $\sqrt{3} = 1.73$ )
23. The length of the shadow of a tower standing on level plane is found to be  $2x$  metres longer when the sun's altitude is  $30^\circ$  than when it was  $45^\circ$ . Prove that the height of tower is  $x(\sqrt{3} + 1)$  metres.
24. On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. At a point 9 metres away from the foot of the tower the angles of elevation of the top and bottom of the flag pole are  $60^\circ$  and  $30^\circ$  respectively. Find the height of the tower and flag pole mounted on it. ( $\sqrt{3} = 1.732$ )
25. From a window ( $h$  metres high above the ground) of a house 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  $\theta$  and  $\phi$  respectively. Show that the height of the opposite house is  $h(1 + \tan \theta \cot \phi)$  metres.
26. From a point 100 m above a lake, the angle of elevation of a stationary helicopter is  $30^\circ$  and the angle of depression of reflection of the helicopter in the lake is  $60^\circ$ .

Find the height of the helicopter.

27. The angle of elevation of a cloud from a point 60m above the surface of the water of a lake is  $30^\circ$  and the angle of depression of its shadow in water of lake is  $60^\circ$ . Find the height of the cloud from the surface of water.
28. From the top of a building AB, 60m high, the angles of depression of the top and bottom of a vertical lamp-post CD are observed to be  $30^\circ$  and  $60^\circ$  respectively. Find the height of the lamp-post,
29. From the top of a building AB, 60 m high, the angles of depression of the top and bottom of a vertical lamp-post CD are observed to be  $30^\circ$  and  $60^\circ$  respectively. Find the horizontal distance between AB and CD.
30. A boy is standing on the ground and flying a kite with 100 m of string at an elevation of  $30^\circ$ . Another boy is standing on the roof of a 10 m high building and is flying his kite at an elevation of  $45^\circ$ . Both the boys are on opposite sides of both the kites. Find the length of the string that the second boy must have so that the two kites meet.
31. From an aeroplane vertically above a straight horizontal plane, the angles of depression of two consecutive kilometer stones on the opposite sides of the aeroplane are found to be  $\alpha$  and  $\beta$ . Show that the height of the aeroplane is  $\frac{\tan \alpha \tan \beta}{\tan \alpha + \tan \beta}$ .
32. The angles of elevation of the top of a tower from two points at distances of 5 metres and 20 metres from the base of the tower and in the same straight line with it, are complementary. Find the height of the tower.
33. The angles of depression of the top and bottom of a tower as seen from the top of a  $60\sqrt{3}$ -m-high cliff are  $45^\circ$  and  $60^\circ$  respectively. Find the height of the tower.
34. The angles of depression of two ships from the top of a light house and on the same side of it are found to be  $45^\circ$  and  $30^\circ$  respectively. If the ships are 200 m apart, find the height of the light house.
35. A boy standing on a horizontal plane finds a bird flying at a distance of 100m from him at an elevation of  $30^\circ$ . A girl standing on the roof of a 20-m-high building, finds the angle of elevation of the same bird to be  $45^\circ$ . The boy and the girl are on the opposite sides of the bird. Find the distance of the bird from the girl. [Given  $\sqrt{2}=1.41$ .]