

## ASSIGNMENT CLASS X APPLICATIONS OF TRIGONOMETRY

1. 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  $30^\circ$  with the ground. The distance from the foot of the tree to the point where the top touches the ground is 10 m. Find the height of the tree before it was broken.
2. From the top of a building 60 m high the angles of depressions of the top and the bottom of a tower are observed to be  $30^\circ$  and  $60^\circ$ . Find the height of the tower.
3. From a point on the ground the angles of elevation of the bottom and top of a water tank kept at the top of 20 m high tower are  $45^\circ$  and  $60^\circ$ . Find the height of the water tank.
4. 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 40 meters 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.
5. The angle of elevation of the top of a tower from a point A on the ground is  $30^\circ$ . On moving a distance of 20 metres towards the foot of the tower to a point B, the angle of elevation increases to  $60^\circ$ . Find the height of the tower and the distance of the tower from the point A.
6. A flagstaff stands on the top of a 5 m high tower. From a point on the ground, the angle of elevation of the top of the flag-staff is  $60^\circ$  and from the same point, the angle of elevation of the top of the tower is  $45^\circ$ . Find the height of the flag-staff.
7. The shadow of a tower, when the angle of elevation of the sun is  $45^\circ$ , is found to be 10 m longer than when it was  $60^\circ$ . Find the height of the tower.
8. 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.
9. A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of  $30^\circ$ . A girl standing on the roof of 20 metre high building, finds the angle of elevation of the same bird to be  $45^\circ$ . Both the boy and the girl are on opposite sides of the bird. Find the distance of bird from the girl.
10. 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  $60^\circ$ . Find the height of the tower and the distance between the tower and the building.
11. At a point on the 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 m towards the tower, the tangent of the angle is found to be  $\frac{3}{4}$ . Find the height of the tower.
12. Two men on either side of a cliff 80 m high observe the angles of elevation of top of the cliff to be  $30^\circ$  and  $60^\circ$  respectively. Find the distance between the two men.
13. An aeroplane, when 1500 m high passes vertically above another aeroplane at an instance when the angles of the two aeroplanes from the same point on the ground are  $60^\circ$  and  $45^\circ$  respectively. Find the vertical distance between the two aeroplanes.
14. The angles of elevation of the top of a tower from two points on the ground at distances 9m and 4m from the base of the tower are in same straight line with it are complementary. Find height of the tower.
15. The horizontal distance between two towers is 140 m. The angle of elevation of the top of the first tower when seen from the top of the second tower is  $30^\circ$ . If the height of the second tower is 60 m, find the height of the first tower.
16. The angle of elevation of a jet plane from a point A on the ground is  $60^\circ$ . After a flight of 15 seconds, the angle of elevation changes to  $30^\circ$ . If the jet plane is flying at a constant height of  $1500\sqrt{3}$  m, find the speed of the jet plane.
17. An aeroplane flying horizontally 1 km above the ground is observed at an elevation of  $60^\circ$ . After 10 seconds, its elevation is observed to be  $30^\circ$ . Find the speed of the aeroplane in km/hr.
18. The angle of elevation of the top of a hill at the foot of the tower is  $60^\circ$  and the angle of elevation of the top of the tower from the foot of the hill is  $30^\circ$ . If the tower is 50 m high, what is the height of hill?

19. The angles of elevation and depression of the top and bottom of a light-house from the top of a building 60 m high, are  $30^\circ$  and  $60^\circ$  respectively. Find
- the difference between the heights of the light-house and the building.
  - distance between the light-house and the building.
20. A bird is sitting on the top of a tree, which is 80 m high. The angle of elevation of the bird from a point on the ground is  $45^\circ$ . The bird flies away from the point of observation horizontally and remains at a constant height. After 2 seconds, the angle of elevation of the bird from the point of observation becomes  $30^\circ$ . Find the speed of the flying bird.
21. As observed from the top of a light-house, 100 m above sea level, the angle of depression of a ship sailing directly towards it, changes from  $30^\circ$  to  $45^\circ$ . Determine the distance travelled by the ship during the period of observation.
22. From a window 15 m high above the ground 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  $30^\circ$  and  $45^\circ$  respectively. Show that the height of the opposite house is 23.66 metres. (take  $\sqrt{3} = 1.732$ )
23. From the top of a cliff 50 m high, the angles of depression of the top and bottom of a tower are observed to be  $30^\circ$  and  $45^\circ$  respectively. Find the height of the tower.
24. 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  $30^\circ$  to  $45^\circ$ , how soon after this will the car reach the observation tower?
25. The angles of depression of the top and the bottom of a building, 50 metres high, as observed from the top of a tower are  $30^\circ$  and  $60^\circ$  respectively. Find the height of the tower and also the horizontal distance between the building and the tower.
26. Two ships are sailing in the sea on the either side of the light-house, the angles of depression of two ships as observed from the top of the light-house are  $60^\circ$  and  $45^\circ$  respectively. If the distance between the ships is metres, find the height of the light-house.
27. From a building 60 m high, the angle of depression of the top and bottom of a lamp post are  $30^\circ$  and  $60^\circ$  respectively. Find the distance between the lamp post and building. Also find the difference of height between lamp post and building.
- 28\*. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff of height  $h$ . At a point on the plane, the angles of elevation of the bottom and the top of the flag-staff are  $\alpha$  and  $\beta$  respectively. Prove that the height of the tower is  $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$ .
- 29\*. From an aeroplane vertically above a straight horizontal road, the angles of depression of two consecutive milestone on opposite sides of the aeroplane are observed to be  $\alpha$  and  $\beta$ . Show that the height in miles of aeroplane above the road is given by  $\frac{\tan \alpha \tan \beta}{\tan \alpha + \tan \beta}$ .
- 30\*. If 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 be  $\beta$ , prove that the distance of the cloud from the point of observation is  $\frac{2h \sec \alpha}{\tan \beta - \tan \alpha}$ .

## ANSWERS

1. 17.3 m    2. 40 m    3. 14.60 m    4. height of tree = 34.64 m, width of river = 20 m  
 5. Height = 17.32 m, Distance = 30 m    6. 3.65 m    7. 23.66 m    8.  $3\sqrt{3}$  m,  $6\sqrt{3}$  m  
 9.  $30\sqrt{2}$  m    10. Height = 22.5 m, Distance = 12.975 m    11. 180 m    12. 184.64 m  
 13. 634 m    14. 6 m    15. 140.73 m    16. 720 km/hr = 200 m/s    17. 415.66 km/hr  
 18. 150 m    19. (i) 20 m (ii) 34.64 m    20. 29.28 m/s    21. 73.2 m    23. 21.17 m  
 24. 16 minutes 23 seconds    25. 43.25 m and 75 m    26. 200 m    27. 225 m