

## Chapter-Some Applications of Trigonometry

Q1.

A round balloon of radius  $r$  subtends an angle  $\alpha$  at the eye of the observer, while the angle of elevation of its centre is  $\beta$ . Prove that the height of the centre of the balloon is  $r \sin \beta \csc \frac{\alpha}{2}$ .

Q2.

If the angle of elevation of a cloud from a point  $h$  meter above a lake has measure  $\alpha$  and the angle depression of its reflection of in the lake has measure  $\beta$ . Prove that the height of the cloud is  $\frac{h(\tan \beta + \tan \alpha)}{\tan \beta - \tan \alpha}$

Q3.

From an aeroplane vertically above a straight horizontal road, the angles of depression of two consecutive mile stones 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

$$\frac{\tan \alpha \tan \beta}{\tan \alpha + \tan \beta}$$

Q4

Two stations due South of a leaning tower which leans towards the North, are at distances  $a$  and  $b$  from its foot. If  $\alpha$  and  $\beta$  are the elevations of the top of the tower from these stations, then prove that its inclination  $\theta$  to the horizontal is given by

$$\cot \theta = \frac{b \cot \alpha - a \cot \beta}{b - a}$$

Q5

From a point on the ground the angle of elevation of top of a tower is  $\alpha$ . On moving 'a' meter towards the tower, the elevation changes to

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

$\beta$ . Prove that the height of the tower is

Q6.

If the angles of elevation of the top of a tower from two points distant  $a$  and  $b$  ( $a > b$ ) from its foot and in the same straight line from it are respectively  $30^\circ$  and  $60^\circ$ , then find the height of the tower.

Q7.

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 a 20 m high building finds the angle of elevation of the same bird to be  $45^\circ$ . Both the boy and the girl are on the opposite side of the bird. Find the distance of the bird from the girl.

Q8.

A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of  $30^\circ$ , which is approaching the foot of the tower with a uniform speed. 10 seconds later, the angle of depression of the car is found to be  $60^\circ$ . Find the time taken by the car to reach the foot of the tower from this point.

Q9.

A ladder rests against a wall at an angle  $\alpha$  to the horizontal. Its foot is pulled away from the wall through a distance  $p$ , so that it slides a distance  $q$  down the wall making an angle  $\beta$  with the horizontal. Prove that :

$$\frac{p}{q} = \frac{\cos \beta - \cos \alpha}{\sin \alpha - \sin \beta}$$

Q10.

From a window (9 m above the ground) of a house in a street, the angles of elevation and depression of the top and foot of another house on the opposite side of the street are  $30^\circ$  and  $60^\circ$  respectively. Find the height of the opposite house and the width of the street