SOME APPLICATIONS OF TRIGONOMETRY
ASSIGNMENT NO. 2

1. The angle of elevation of a jet plane from a point A on the ground is 60^0. After a flight of 30 seconds, the angle of elevation changes to 30^0. If the jet plane is flying at a constant height of $3600\sqrt{3}$ m, find the speed of the jet plane.
2. If the angle of elevation of a cloud from a point h metres above a lake is α and the angle of depression of its reflection in the lake is β, prove that the height of the cloud is $\frac{h(\tan\beta+\tan\alpha)}{\tan\beta-\tan\alpha}$.
3. The angle of elevation of a cloud from a point 60 m above a lake is 30^0 and the angle of depression of the reflection of cloud in the lake is 60^0. Find the height of the cloud.
4. A round balloon of radius r subtends an angle α at the eye of the observer while the angle of elevation of its centre is β. Prove that the height of the centre of the balloon is $r\sin\alpha\ cosec\frac{\alpha}{2}$.
5. The angle of elevation of a cliff from a fixed point is θ. After going up a distance k metres towards the top of the cliff at an angle ϕ, it is found that the angle of elevation is α. Show that the height of the cliff is $\frac{k\ (\cos\phi-\sin\phi\cot\alpha)}{\cot\theta-\cot\alpha}$ metres.
6. At the foot of a mountain the elevation of its summit is 45^0; after descending 1000 m towards the mountain up a slope of 30^0 inclination, the angle of elevation is found to be 60^0. Find the angle of elevation of the mountain.
7. The angle of elevation of the top of a tower from a point A due south of the tower is α and from B due east of the tower is β. If AB = d, show that the height of the tower is $\frac{d}{\sqrt{\cot^2\alpha+\cot^2\beta}}$
8. The elevation of a tower at a station A due north of it is α an at a distance B due west of A is β. Prove that the height of the tower is $\frac{AB\ sin\alpha\sin\beta}{\sqrt{\sin^2\alpha-\sin^2\beta}}$

9. An aeroplane when flying at a height of 4000 m from the ground passes vertically above another plane at an instant when the angles of the elevation of the two planes from the same point on the ground are 60^0 and 45^0 respectively. Find the vertical distance between the aeroplanes at that instant.
10. A man on a cliff observes a boat at an angle of depression of 30^0 which is approaching the shore to the point immediately beneath the observer with a uniform speed. Six minutes later, the angle of depression of the boat is found to be 60^0. Find the time taken by the boat to reach the shore.