



## Octahedral classes, kharadi

2nd floor, yashwant plaza, near bank of India,

### Class 10 - Mathematics

### Trigonometry

Maximum Marks: 50

Time Allowed: 2 hours

#### Section A

1. Answer any 8 questions

8

a) If  $\tan A = \cot B$ , prove that  $A + B = 90^\circ$ .

b) Prove the trigonometric identity:  $\frac{\cos \theta}{(1 - \tan \theta)} - \frac{\sin^2 \theta}{(\cos \theta - \sin \theta)} = (\cos \theta + \sin \theta)$

c) Prove the trigonometric identity:

$$\tan^2 A \sec^2 B - \sec^2 A \tan^2 B = \tan^2 A - \tan^2 B$$

d) Prove that:  $\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$

e) Prove that:  $\frac{(\sin^4 \theta + \cos^4 \theta)}{1 - 2 \sin^2 \theta \cos^2 \theta} = 1$ .

f) A 7 m long flagstaff is fixed on the top of a tower standing on the horizontal plane. From point on the ground, the angles of elevation of the top and bottom of the flagstaff are  $60^\circ$  and  $45^\circ$  respectively. Find the height of the tower correct to one place of decimal.

g) An observer, 1.5 m tall, is 20.5 m away from tower 22 m high. Determine the angle of elevation of the top of the tower from the eye of the observer.

h) A window in a building is at height of 10 m from the ground. The angle of depression of a point P on the ground from the window is  $30^\circ$ . The angle of elevation of the top of the building from the point P is  $60^\circ$ . Find the height of the building.

i) Two ships are approaching a light house from opposite directions. The angle of depression of two ships from top of the light house are  $30^\circ$  and  $45^\circ$ . If the distance between two ships is 100 m. Find the height of light-house.

j) A player sitting on the top of a tower of height 20 m observes the angle of depression of a ball lying on the ground is  $60^\circ$ . Find the distance between the foot of the tower and the ball. Take  $\sqrt{3} = 1.732$

#### Section B

2. Answer any 6 questions

18

a) Without using trigonometric tables, evaluate  $\frac{\cos 58^\circ}{\sin 32^\circ} + \frac{\sin 22^\circ}{\cos 68^\circ} - \frac{\cos 38^\circ \operatorname{cosec} 52^\circ}{\tan 18^\circ \cdot \tan 35^\circ \tan 72^\circ \cdot \tan 55^\circ}$

b) Prove the trigonometric identity:

$$\text{If } \sin \theta + 2 \cos \theta = 1 \text{ prove that } 2 \sin \theta - \cos \theta = 2.$$

c) In a right triangle ABC, right angled at C, if  $\tan A = 1$ , then verify that  $2 \sin A \cos A = 1$

d)  $\angle A$  and  $\angle B$  are acute angles such that  $\cos A = \cos B$ , then show that  $\angle A = \angle B$ .

e) If  $\sec \alpha = \frac{5}{4}$  evaluate  $\frac{1 - \tan \alpha}{1 + \tan \alpha}$ ,

f) A man on the deck of a ship, 12 m above water level, observes that the angle of elevation of the top of a cliff is  $60^\circ$  and the angle of depression of the base of the cliff is  $30^\circ$ . Find the distance of the cliff from the ship and the height of the cliff. [Use  $\sqrt{3} = 1.732$ ]

g) From a point on a ground, the angle of elevation of bottom and top of a transmission tower fixed on the top of a 20 m high building are  $45^\circ$  and  $60^\circ$  respectively. Find the height of the tower.

h) If at some time of the day the ratio of the height of a vertically standing pole to the length of its shadow on the ground is  $\sqrt{3} : 1$ , then find the angle of elevation of the sun at that time.

#### Section C

3. Answer any 6 questions

24

a)

If  $\operatorname{cosec}(A - B) = 2$ ,  $\cot(A + B) = \frac{1}{\sqrt{3}}$ ,  $0^\circ < (A + B) \leq 90^\circ$ ,  $A > B$ . Find A and B.

b) Prove that :  $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = 2 \sec \theta$  .

c) Prove that:  $\frac{1+\tan^2 A}{1+\cot^2 A} = \left(\frac{1-\tan A}{1-\cot A}\right)^2 = \tan^2 A$

d) Evaluate :  $\tan^2 30^\circ \sin 30^\circ + \cos 60^\circ \sin^2 90^\circ \tan^2 60^\circ - 2 \tan 45^\circ \cos^2 0^\circ \sin 90^\circ$ .

e) On the same side of a tower, two objects are located. When observed from the top of the tower, their angles of depression are  $45^\circ$  and  $60^\circ$ . If the height of the tower is 150 m, find the distance between the objects.

f) 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.

g) The angle of elevation of a stationery cloud from a point 2500 m above a lake is  $15^\circ$  and the angle of depression of its reflection in the lake is  $45^\circ$ . What is the height of the cloud above the lake level?

h) A vertical pedestal stands on the ground and is surmounted by a vertical flagstaff of height 5 m. At a point on the ground the angles of elevation of the bottom and the top of the flagstaff are  $30^\circ$  and  $60^\circ$  respectively. Find the height of the pedestal.