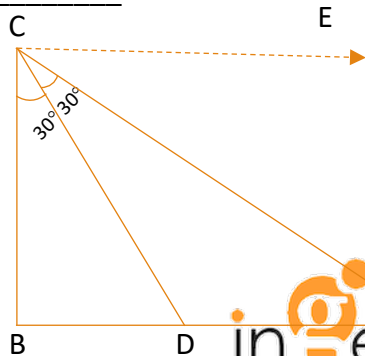


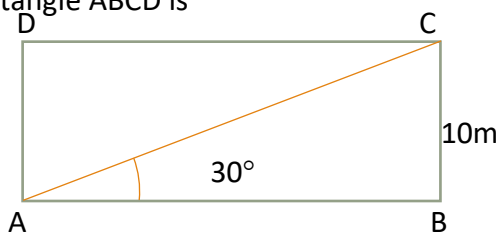
Application of Trigonometry

1 Mark

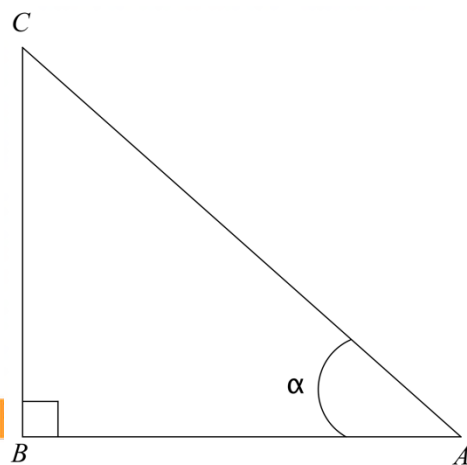
- If the length of the shadow of a man is equal to height of man. Then find the angle of elevation.
- The length of the shadow of a pole 30m high at some instant is $10\sqrt{3}m$. Find the angle of elevation of sun.
- In fig. $CE \parallel AB$. The angle of elevation at a points A and D respectively are _____



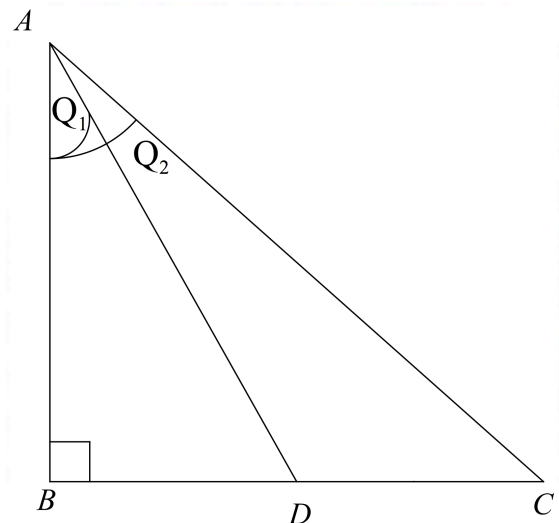
- The tops of two poles of height 10m and 18m are connected with wire. If wire makes an angle of 30° with horizontal, then find length of wire.
- From a point 20m away from the foot of tower, the angle of elevation of the top of the tower is 30° . Find the height of the tower.
- The ratio of the length of a tree and its shadow is $1 : \frac{1}{\sqrt{3}}$. Find the angle of elevation of sun.
- A kite is at a height of $50\sqrt{3}m$ above the level ground attached to string inclined at 60° to the horizontal, find length of the string.
- In given fig. the perimeter of rectangle ABCD is



- A tree is broken at a height of 10m above the ground. The broken part touches the ground and makes an angle of 30° with horizontal. Find the height of the tree
- In a given fig. $\tan \alpha = \frac{3}{4}$, if $AB = 12m$, then find height BC



- In given fig. D is mid point of BC, $\angle CAB = Q_1$ and $\angle DAB = Q_2$ then $\tan Q_1 : \tan Q_2 = ?$



- The height of a tower is 50m. When angle of elevation changes from 45° to 30° , the shadow of the tower becomes x meter more, the value of x is

4 Marks

1. A tower is $100\sqrt{3} m$ high. Find the angle of elevation of its top from a point 100 meters away from its foot.
2. A circus artist is climbing 5 m long rope which is tightly stretched and tied from the top of the vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground level is 30° .
3. A tree breaks due to storm and broken part bends so that the top of the tree touches the ground making an angle 30° with the ground. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find height of the tree.
4. A person standing on the bank of the river observes that the angle of elevation of the top of the tree standing on the opposite bank is 60° . When he was 40 m away from the bank he finds that the angle of elevation to be 30° . Find (i) Height of the tree. (ii) The width of the river, correct to two decimal places.
5. At a point on 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 meters towards the tower, the tangent of the angle of elevation is $\frac{3}{4}$. Find height of the tower.
6. From the top of the cliff 150m high, the angle of depression of the two boats are 60° and 30° . Find the distance between boats if (i) On the same side of the cliff (ii) On the opposite side of the cliff.
7. From a point on a bridge across a river the angles of depression of the banks on the opposite sides of the river are 30° and 45° respectively. If the bridge is at the height of 30m from the banks. Find the width of the river.
8. Two poles of equal heights are standing opposite to each other on either side of the road which is 80m wide. From a point between them on the road the angles of elevations of the top of the poles are 60° and 30° . Find the height of the

9. From the top of a cliff 90m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 60° respectively. Find the height of the tower.
10. A man standing on a deck of a ship, which is 10m above water level. He observes the angle of elevation of the top of a hill as 60° and angle of depression of the base of the hill as 30° . Calculate the distance of the hill from the ship and the height of the hill.
11. The angle of elevation of a jet plane from a point A on the ground is 60° . After a flight of 15 seconds, the angle of elevation changes to 30° . If the jet plane is flying at a constant height of $1500\sqrt{3}m$, find the speed of the jet plane.
12. A man on the top of a vertical tower observes a car moving at a uniform speed coming directly towards him. If it takes 12 minutes for the angle of depression to change from 30° to 45° , how soon after this, will car reach the tower? Give your answer to the nearest seconds.
13. 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 α and β respectively. Prove that the height of tower is $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$.
14. If the angle of the elevation of the cloud from a point h meter 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 $\frac{h(\tan \beta + \tan \alpha)}{\tan \beta - \tan \alpha}$.
15. A round balloon of radius r subtends an angle α at the eye of the observer while the angle of elevation of its center is β . Prove that the height of the center of the balloon is $r \sin \beta \operatorname{cosec} \left(\frac{\alpha}{2} \right)$.
16. If the angle of the elevation of the cloud from a point h meter above a lake is α

- and the angle of depression of its reflection in the lake is β , prove that the distance of the cloud from the point of observation is $\frac{2h \sec \alpha}{\tan \beta - \tan \alpha}$.
17. A kite is flying at a height of 60m above the ground. The string attached to the kite is temporarily tied to a point on the ground is 60° . Find the length of the string.
 18. A tree 12m high is broken by wind in such a way that its top touches the ground and makes an angle of 60° with the ground. At what height from the bottom the tree is broken by the winds?
 19. A tree is broken by the wind. The top struck the ground at an angle of 30° and at a distance of 30 meter from the root. Find the whole height of the tree.
 20. The angle of depression of the top and bottom of 8m tall building from the top of multi storied building are 30° and 45° respectively. Find the height of the multi storied building and the distance between the two buildings.
 21. A tall tree stands vertically on the bank of a river. At a point on the other bank directly opposite to the tree, the angle of elevation of the top of the tree is 60° . A point 20m behind this point on the same bank, the angle of elevation of the top of the tree is 30° . Find height of the tree and width of the river.
 22. The angle of elevation of artificial earth satellite, as two earth stations on the same side of it are 30° and 60° . If the distance between the earth stations is 4000 km, find the height of the satellite from earth.
 23. The shadow of a tower, standing on level ground is found to be 40m longer when the sun's altitude is 30° than when it was 60° . Find the height of the tower.
 24. A straight highway leads to the foot of a 50m tall tower. From the top of the tower, the angles of depression of two cars on the highway are 30° and 60° . What is the distance between two cars from the tower and how far is each car from the tower?
 25. From the top of a hill, the angles of depression of two consecutive 1km stones due east are found to be 30° and 45° . Find the height of the hill.
 26. As observed from the top of the light house 100m high the angles of depression of a ship, sailing directly towards it, changes 30° to 45° . Determine the distance travelled by the ship during the period of observation.
 27. From the top of a tower, the angles of depression of two objects on the same side of tower is found to be α and β ($\alpha > \beta$). If the distance between the objects is 'p' m, show that the height of the tower is given by $h = \frac{p \tan \beta \cdot \tan \alpha}{\tan \alpha - \tan \beta}$ determine the height of the tower if $p = 50m$, $\alpha = 60^\circ$, $\beta = 30^\circ$.
 28. A pole is 5m high fixed on the top of the tower. The angle of elevation of the top of the pole is observed from a point A on the ground is 60° and angle of depression of point A from the top of the tower is 45° . Find the height of the tower.
 29. The angle of elevation of the top of a tower from two points at a distance of a and b meters from the base and in the same straight line with it are complementary. Prove that the height of the tower is \sqrt{ab} m.
 30. An aeroplane at an altitude of 200 meters observes the angles of depression of opposite points on the two banks of a river to be 45° and 60° . Find the width of the river.
 31. Two men on either side of the cliff 80m height observes the angles of elevation of the top of the cliff to be 30° and 60° respectively. Find the distance between the two men.
 32. A boy standing on the ground and flying a kite with 100m of string at an elevation of 30° . Another boy is standing on the roof of a 10m high building and is flying his kite at an elevation of 45° . Both the boys are on opposite sides of both the kite. Find the length of the string that the

second boy must have so that the two kites must meet.

33. An aeroplane when 3000m high passes vertically above another plane an instant when the angles of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. Find vertical distance between two planes.
34. A man on a cliff observes a boat at an angle of depression of 30° which is approaching the shore to the point immediately beneath the observer with uniform speed. Six minutes later the angle of depression of the boat is found to be 60° . Find time taken by the boat to reach the shore.
35. From the top of a light house the angles of depression of two ships on the opposite side of it are observed to be α and β . If the height of the light-house be h meters and the line joining the ships passes through the foot of the light

Answers

1 Mark

1. 45°
2. 60°
3. $(30^\circ, 60^\circ)$
4. 16m
5. $\frac{20}{\sqrt{3}}m$
6. 60°
7. 100m
8. $20(\sqrt{3} + 1)m$
9. 30m
10. 9m
11. 1:2
12. $50(\sqrt{3} - 1)m$

4 Marks

1. 60°
2. 2.5m
3. 13.86m
4. 34.64m, 20m
5. 180m
6. 173.2m, 346.4m

house, show that the distance between the ships is $\frac{h(\tan \alpha + \tan \beta)}{\tan \alpha \tan \beta}$ meters.

36. A ladder leaning against a wall is inclined at an angle α to the horizontal. The top of the ladder touches the parapet. On moving its feet ' a ' meters away from the wall, the ladder makes an angle β to the horizontal and its top now touches the window. Prove that the distance of the parapet from the window is $\frac{a(\sin \alpha - \sin \beta)}{(\cos \beta - \cos \alpha)}$
37. The angle of elevation of a cliff from a fixed point is θ . After going up a distance of k meters towards the top of the cliff at an angle of ϕ , it is found that the angle of elevation is α . Show that the height of the cliff is $\frac{k(\cos \phi - \sin \phi \cdot \cot \alpha)}{\cot \theta - \cot \alpha}$ meters

7. $30(\sqrt{3} + 1)m$
8. 20m, 60m, 34.64m
9. 60m
10. 40m, $10\sqrt{3}m$
11. 720km/h
12. 16min23sec
17. 69.28m
18. 5.57m
19. 51.96m
20. $4(3 + \sqrt{3})m$, $4(3 + \sqrt{3})m$
21. 17.3m, 10m
22. 3464km
23. $20\sqrt{3}m$
24. 86.6m, 28.87m, 57.73m
25. 1.365km
26. 73.2m
27. 43.3m
28. 6.83m
30. 315.4m
31. 184.8m
32. $4\sqrt{2}m$
33. 1268m
34. 9 minutes

