



MATHS

BOOKS - R G PUBLICATION

SOME APPLICATION OF TRIGONOMETRY

Example

1. A ladder is kept standing at a slanting position against a wall of a house and in this

position the base of the ladder is at a distance of 9.5m from the wall.If the ladder makes an angle of 60° with the ground level,find the length of the ladder.



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2. When observed from the top of a 125 m high building,the angle of depression of a car was found to be 30° .Find the distance of the car from the building.



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3. The length of the shadow of a 9 m high vertical post is $3\sqrt{3}$ m. Find the altitude of the sun. [The altitude of the sun is the angle of elevation of the vertex of the post from the front of the shadow of the post].



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4. What will be the altitude of the sun when the length of the shadow of a vertical post is equal to the height of the post?



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5. When observed from a point on the horizontal line passing through the base point of a vertical tower the angle of elevation of the highest point of the tower was found to be 30° . If the distance from the tower to the point of observation is 200m, find the height of the tower.



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6. A tree of 15 m height was broken due to a heavy wind at a height of h m from the ground. But the broken ends were not completely separated and the top of the tree remained just touching the ground in a slanting position. If the broken portion of the tree makes an angle of 30° with the ground find h .



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7. The angle of elevation of the top of a temple from a point in the same horizontal plane is 30° . When observed from another point which is 150m straight ahead of the original point on the same plane, the angle of elevation of the top of the temple was 60° . Find the height of the temple.



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8. The distance between two poles of the same height standing on the same plane is 100m. The angles of elevation of the tops of the two poles from a point lying on the line joining the base-points of the poles are found to be 30° and 60° respectively. Find the heights of the poles and the position of the point.



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9. A tower makes an angle of 60° at a point P lying in the same plane. From a point Q which is at a vertical distance of 10m from P, the angle of depression of the floor of the tower is 30° . Find the height of the tower.



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10. The height of a telephone tower erected on a plane is $20(\sqrt{3} + 1)$ m. When the altitudes of the sun is 30° and 45° , the lengths of the

shadows of the tower on the plane are x m and y m respectively. Show that $x-y=40$ m.



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11. From a point which is $200\sqrt{2}$ m away from the base of a temple the angle of elevation of the top of the temple is 45° . Find the height of the temple and the slanting distance between the top of the temple and the point.



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12. P and Q are respectively the base and the vertex of the tower PQ. AB is another tower which is at a certain distance apart from PQ. The height of AB is less than that of PQ and the base of AB is A. The angles of elevation of Q from A and B are respectively 60° and 45° . If $AB=40\text{m}$, find PQ, QA and QB.



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13. $AB = h_1$ and $CD = h_2$ are two towers where $h_1 > h_2$. The angles of depression from

the vertex of AB to the vertex and the base of CD are respectively 30° and 60° . If $h_1 = 60m$, find the distance between the two towers. Also show that $h_1 - h_2 = 20m$.



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14. When the altitude of the sun is 30° the length of the shadow of a minaret on the ground is $30m$. When the altitude of the sun is 60° , find the length of the shadow of the minaret.

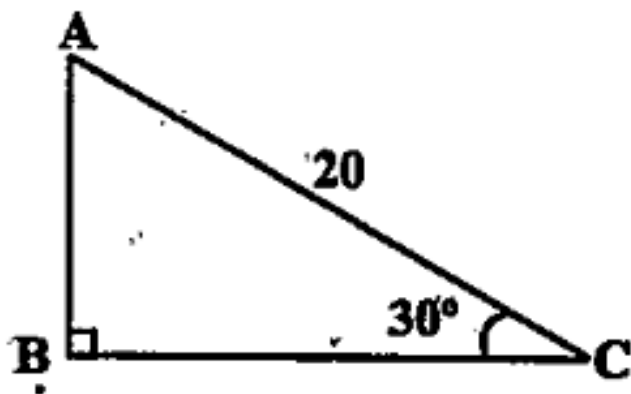


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Exercise

1. A circus artist is climbing a 20 m long rope which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the

rope with the ground level is 30° (see Fig 9.11)



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2. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The

distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.



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3. A contractor plans to install two slides for the children to play in a park. For the children below the age of 5 years, she prefers to have a slide whose top is at a height of 1.5m, and is inclined at an angle of 30° to the ground, whereas for elder children, she wants

to have a steep slide at a height of 3 m, and inclined at an angle of 60° to the ground. What should be the length of the slide in each case?



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4. The angle of elevation of the top of a tower from a point on the ground, which is 30m away from the foot of the tower, is 30° . Find the height of the tower.



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5. A kite is flying at a height of 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60° . Find the length of the string, assuming that there is no slack in the string.



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6. A 1.5 m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the

building increases from 30° to 60° as he walks towards the building. Find the distance he walked to towards the building.



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7. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20m high building are 45° and 60° respectively. Find the height of the tower.



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8. A statue, 1.6m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45° . Find the height of the pedestal.



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9. The angle of elevation of the top of a building from the foot of the tower is 30° and

the angle of elevation of the top of the tower from the foot of the building is 60° . If the tower is 50 m high, find the height of the building



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10. Two poles of equal heights are standing opposite each other on either side of the road, which is 80m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°

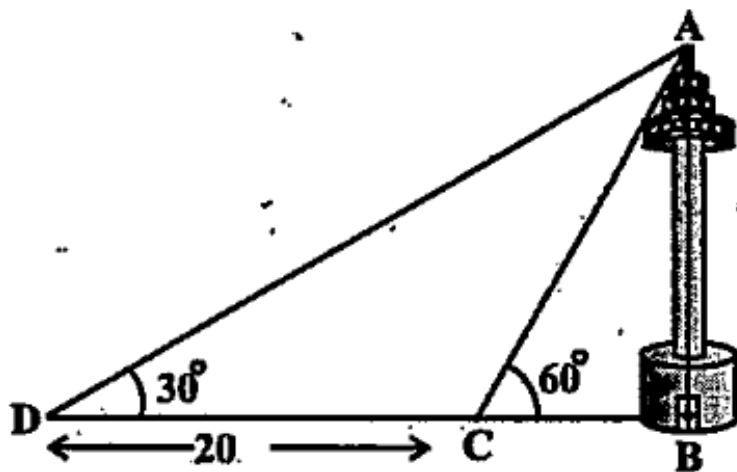
respectively. Find the height of the poles and the distances of the point from the poles.



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11. A TV tower stands vertically on a bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60° . From another point 20 m away from this point on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is

30° (see Fig). Find the height of the tower and the width of the canal.



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12. From the top of a 7 m high building, the angle of elevation of the top of a cable tower

is 60° and the angle of depression of its foot is 45° . Determine the height of the tower.



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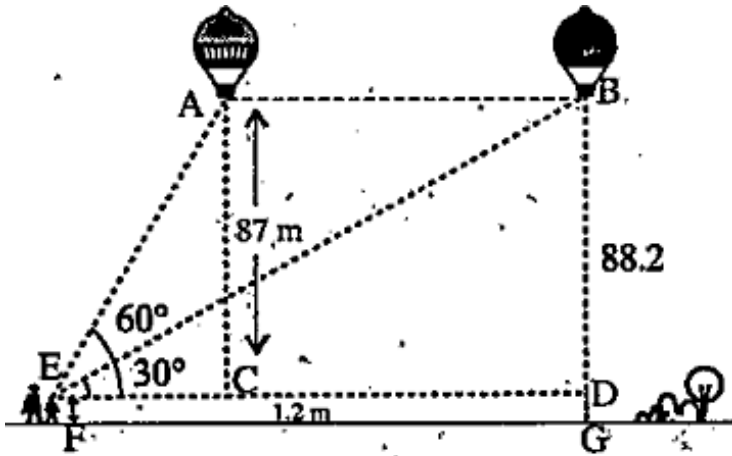
13. As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30° and 45° . If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships.



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14. A 1.2m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60° . After some time, the angle of elevation reduces to 30° (see Fig 9.13), Find the distance travelled by the balloon during the

interval..



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15. A straight highway leads to the foot of a tower. A man standing at the top of the tower observed a car at an angle of depression of 30° , which is approaching the foot of the

tower with a uniform speed. Six seconds later, the angle of depression of the car is found to be 60° . Find the time taken by the car to reach the foot of the tower from this point.



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16. The angles of elevation of the top of a tower from two points at a distance of 4 m and 9 m from the base of the tower and in the same straight line with it are

complementary. Prove that the height of the tower is 6m.



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17. Find the length of a shadow of a vertical post of height 6m when the angle of elevation of the sun is 30°



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18. Find the angle of elevation of the sun when the ratio of the length of a pillar and shadow is 1:1.



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19. Find the angle of elevation of the sun when the ratio of the length of a pillar and shadow is $1 : \sqrt{3}$.



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20. The height of a tower is 10m. What is the length of its shadow when sun's elevation is 45° ?



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21. A vertical post of height $5\sqrt{3}$ m above the horizontal ground casts a shadow of length 15 m on the ground. Find the angle of elevation of the sun.



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22. The ratio of the length of a pole and its shadow is $1 : \sqrt{3}$. The angle of elevation of the sun is

a) 30° b) 45° c) 60° d) 90°

A. 30°

B. 45°

C. 60°

D. 90°

Answer:



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23. If the height and length of the shadow of a man are the same, then the angle of elevation of the sun is

a) 15° b) 30° c) 45° d) 60°

A. 15°

B. 30°

C. 45°

D. 60°

Answer:



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24. The length of the string of a kite flying at 100 mts above the ground with the elevation of 60° is

A. 200m

B. 100m

C. $100\sqrt{2}$

D. $\frac{200}{\sqrt{3}}m$

Answer:



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25. A tree casts a shadow 4m long on the ground, when the angle of elevation of the sun is 45° . The height of the tree (in meters) is

a) 4 b) 3 c) 5.2 d) 4.5

A. 4

B. 3

C. 5.2

D. 4.5

Answer:



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26. The length of shadow of a tower on the plane ground is $\sqrt{3}$ times the height of the tower. The angle of elevation of sun is

A. 30°

B. 45°

C. 60°

D. 90°

Answer:



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27. A vertical post of height $5\sqrt{3}$ m above the horizontal ground casts a shadow of length 15 m on the ground. Find the angle of elevation of the sun.



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28. What is the angle of elevation of sun when the length of the shadow of a pole is $\sqrt{3}$ times the height of the pole?



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29. The angle of elevation of a post of height 55m as seen from the foot of a man standing on a road is 60° . Find the distance of the man from the post.





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30. A ladder 12m long is leaning on a wall. Its foot 6m away from the wall. Find the angle it makes with the ground.



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31. A ladder is kept standing at a slanting position against a wall of a house and in this position the base of the ladder is at a distance of 9.5m from the wall. If the ladder makes an

angle of 60° with the ground level, find the length of the ladder.



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32. If the top of a temple subtends an angle of 30° at a point on the ground 300m away from its base, find the height of the temple.



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33. If the top of a temple subtends an angle of 60° at a point on the ground 400m away from its base, find the height of the temple.



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34. When a telephone post is broken by a strong wind, its top touches the ground 3 metres a part from the base making an angle 60° . Find the height of the post and also the position at which the post is broken.





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35. A tree of 15 m height was broken due to a heavy wind at a height of h m from the ground. But the broken ends were not completely separated and the top of the tree remained just touching the ground in a slanting position. If the broken portion of the tree makes an angle of 30° with the ground find h .



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36. The angle of elevation of a temple is found to be 30° as seen from a place. By advancing 50m towards the temple the angle of its elevation is observed to be 45° . Find the height of the temple.



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37. The angle of elevation of the top of a temple when observed from a point on the horizontal line through the foot of the temple is found to be 30° . By advancing 200m

towards the temple the angle of elevation of the top of the temple is found to be 60° . Find the height of the temple.



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38. An observer has found the angle of elevation of a temple to be 60° when observed from a particular place. After retiring back 100m straight from the place he found the angle of elevation to be 30° . Find the height of the temple.



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39. An observer 1.5m tall is 30metres away from a tower,50m high.Determine the angle of elevation from his eyes to the top of the tower.



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40. From a point which is $200\sqrt{2}$ m away from the base of a temple the angle of elevation of the top of the temple is 45° .Find the height of

the temple and the slanting distance between the top of the temple and the point.



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41. The angle of depression of the top and bottom of a tower are found to be 30° and 60° respectively when the tower is observed from the top of a hill 100m high. Find the height of the tower.



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42. An observer standing 72 m away from a building notice that the angles of elevation of the top and the bottom of a flag staff on the building are respectively 60° and 45° . Find the height of the flag staff.



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43. The horizontal distance between two towers is 30 metres. The top of one makes an angle of depression of 30° at the top of the

other.If the height of the first tower is 150 meters,find the height of the second tower.



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44. The poles of equal height are standing opposite to each other on either side of a road which is 100meters wide.From a point between them on the road,the angle of elevation of the tops are 30° and 60° .Find the position of the point and also the height of the poles.



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45. Two light posts of equal heights stand on either side of a pond which is 100meters wide. From a boat in the pond between the posts the elevation of the tops of the post are found to be 60° and 30° . Find the height of the posts and the position of the posts.



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46. A man standing on a bank of a river found that the angles of elevation of a tree on the other bank of the river is 60° . By retiring 40m back, he found the angle of elevation to be 30° . Find the height of the tree and the breadth of the river.



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47. There are two consecutive kilometre posts on a straight road. From an aeroplane flying

vertically above the road in between the two km. Posts the angles of depression of the two km. Posts are seen to be 45° and 60° At what height is the aeroplane flying at the moment of observation?



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48. The angles of depression of two consecutive kilometer posts on a straight road as seen from an aeroplane above it are

α and β ($\alpha > \beta$). Find the height of the aeroplane above the road.



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49. The height of mobile telephone tower erected on a plane is $20(\sqrt{3} + 1)$ m. When the altitudes of the sun is 30° and 45° , the lengths of the shadows of the tower on the plane are x m and y m respectively, Show that $x - y = 40$ m.



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