MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

SOME APPLICATIONS OF TRIGONOMETRY

Others

1. A man sitting at a height of 20m on a tall tree on a small island in the middle of a river observes two poles directly opposite to each other on the two banks of the river and in line with the foot of tree. If the angles of depression of the feet of the poles from a point at which the man is sitting on the tree on either side of the river are $60^0 and 30^0$ respectively. Find the width of the river.

2. The angle of elevation of a cloud from a point h metre above a lake is θ.The angle depression of its reflection in the lake is $45°$ The height of the cloud is

3. Two boats approach a light house in mid-sea from opposite directions. The angles of elevation of the top of the light house from two boats are $30^0 and 45^0$ respectively. If the

distance between two boats is 100m, find the height of the light house.

4. A ladder rests against a vertical wall at inclination α to the horizontal. Its foot is pulled away from the wall through a distance p so that it's upper end slides q down the wall and then ladder make an angle β to the horizontal show that $\dfrac{p}{q} = \dfrac{\cos \beta - \cos \alpha}{\sin \alpha - \sin \beta}$.

5. A ladder makes an angle of 60^0 with the ground when placed against a wall. If the foot of the ladder is 2m away from the wall, then the length of the ladder (in metres) is

6. 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 45^0 (b) 30^0 (c) 60^0 (d) 90^0

7. The angle of elevation of the top of a tower at a point on the ground 50m away from the foot of the tower is 45^0. Then the height of the tower (in metres) is

8. A tower stands vertically on the ground. From a point on the ground, which is $15m$

away from the foot of the tower, the angle of elevation of the top of the tower is found to be $60°$. Find the height of the tower.

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9. 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

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10. Two poles are a metres apart and the height of one is double of the other. If from the middle point of the line joining their feet an observer finds the angular elevations of their tops to be complementary, then the height of the smaller is $\sqrt{2}a \, metres$ (b) $\dfrac{1}{2\sqrt{2}}metres$ $\dfrac{a}{\sqrt{2}}metres$ (d) $2a \, metres$

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11. The angle of elevation of a tower from a point on the same level as the foot of the tower is 30^0. On advancing 150 metres towards the foot of the tower, the angle of elevation of the tower becomes 60^0. Show that the height of the tower is 129.9 metres (Use $\sqrt{3} = 1.732$).

12. On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. At a point 9 metres away from the foot of the tower the angle of elevation of the top and bottom of the flag pole are $60^0 and 30^0$ respectively. Find the height of the tower and the flag pole mounted on it.

13. The angle of elevation of the top of a tower from a point A on the ground is 30^0. On moving a distance of 20 metres towards the foot of the tower to a point B the angle of elevation increases to 60^0. Find the height of the ttower and the distance of the tower from the point A.

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14. The angle of elevation of the top of a tower standing on a horizontal plane from a point A is α. After walking a distance d towards the foot of the tower the angle of elevation is found to be β. The height of the tower is (a) $\dfrac{d}{\cot \alpha + \cot \beta}$ (b) $\dfrac{d}{\cot \alpha - \cot \beta}$ (c) $\dfrac{d}{\tan \beta - tan\alpha}$ (d) $\dfrac{d}{\tan \beta + \tan \alpha}$

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15. A ladder 15 m long just reaches the top of a vertical wall. If the ladder makes an angle of 60^0 with the wall, then the height of the wall is

(a)$15\sqrt{3}m$ (b) $\dfrac{15\sqrt{3}}{2}m$ (c) $\dfrac{15}{2}m$ (d) $15m$

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16. From the top of a building 15m high the angle of elevation of the top of tower is found to be 30°. From the bottom of same building ; the angle of elevation of the top of the tower

is found to be $60°$. Find the height of the tower and the distance between tower and building .

17. A vertical tower stand on a horizontal plane and is surmounted by a vertical flag-staff of height 5 metres. At a point on the plane, the angles of elevation of the bottom and the top of the flag-staff are respectively $30^0 and 60^0$.

Find the height of the tower.

18. 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 the tower is $\dfrac{h \tan \alpha}{\tan \beta - \tan \alpha}$

19. The length of a string between a kite and a point on the ground is 90 metres. If the string makes an angle θ with the ground level such that $\tan\theta = \dfrac{15}{8}$, how high is the kite? Assume that there is no slack in the string.

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20. A 1.2 m 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 $60o$. After some time, the angle of elevatio

21. The elevation of a tower at a station A due north of it is α and at a station B due west of A is β. Prove that the height of the tower is

$$\frac{AB \sin \alpha \sin \beta}{\sqrt{\sin^2 \alpha - \sin^2 \beta}}$$

22. 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 tower is β. If $AB = d$, show that the height of the tower is

$$\frac{d}{\sqrt{\cot^2 \alpha + \cot^2 \beta}}.$$

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23. At the foot of a mountain the elevation of its summit is $45°$, after ascending 1000m towards the mountain up a slope of $30°$

inclination, the elevation is found to be $60°$

Find the height of the mountain.

24. The angle of elevation of a cliff from a fixed point is θ. After going up a distance of k meters towards the the top the cliff at an angle of ϕ, it is found that the angle of elevation is α. Show that the height of cliff is

$$k\frac{\cos\phi - \sin\phi\cot\alpha}{\cot\theta - \cot\alpha}$$

25. A round balloon of radius r subtends an angle 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 $r \sin \beta \cos ec\dfrac{\alpha}{2}$.

26. A tree 12m high, a broken by the wind in such a way that its top touches the ground and makes an angle 60^0 with the ground. At

what height from the bottom the tree is broken by the wind?

27. A vertical tower sands 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 flagstaff are α and β .Prove that the height of the tower $\dfrac{h \tan \alpha}{\tan \beta - \tan \alpha}$

28. The angles of elevation of the top of a tower from two points at distances a and b metres from the base and in the same straight line with it are complementary. Prove that the height of the tower is $\sqrt{ab}$ metres.

29. 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.

30. A circus artists is climbing a 20m 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 30^0.

31. A tree standing on horizontal plane is leaning towards east. At two points situated at distances a and b exactly due west on it, angles of elevation of the top are respectively α and β. Prove that height of the top from the ground is $\dfrac{(b-a).\tan\alpha.\tan\beta}{\tan\alpha - \tan\beta}$

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32. A person, standing on the bank of a river, observes that the angle subtended by a tree

on the opposite bank is 60^0. When he retreates 20m from the bank, he finds the angle to be 30^0. Find the height of the tree and the breadth of the river.

33. A bridge across a river makes an angles of 45^0 with the river bank as shown in Figure. If the lengthof the bridge across the river is 150m, what is the width of the river?

34. From the top of a light house, the angles of depression of two ships on the opposite sides of its are observed to be $\alpha \, and \, \beta$. If the height of the light house be h metres and the line joining the ships passes through the foot of the light house, show that the distance between the ship is $\left(h \dfrac{\tan \alpha + \tan \beta}{\tan \alpha \tan \beta} \right)$

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35. The shadow of a vertical tower on level ground increases by 10 metres, when the altitude of the sun changes from angle of elevatin $45^0 \rightarrow 30^0$. Find the height of the tower, correct to one place of decimal. $\left(Take\sqrt{3} = 1.73\right.$

36. An aeroplane flying horizontally 1 km above the ground is observed at an elevation of $60o$.

After 10 seconds, its elevation is observed to be $30o$. Find the speed of the aeroplane in km/hr.