MATHS

BOOKS - CENGAGE PUBLICATION

HIGHT AND DISTANCE

Example

1. From te top of a tower , 60 meters high, the angles of depression of the top and bottom of

a pole are α and β respectively .Find the height of the pole.

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2. The angle of elevation of the top of a tower a point A due south of it is 30° and from a point B due west of it is 45° .If the height of the tower is 100 meters ,then find the distance AB.

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3. ABC is a triangular park with AB = AC = 100 m. A block tower is situated at the midpoint of BC.The angles of elevation of the top of the tower at A and B are $\cot^{-1}(3.2)$ and $\cos ec^{-1}(2.6)$ respectively.The height of the tower is: a) 16m b)25m c)50m d)None of These

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4. The angle of elevation of a stationary cloud from a point 2500 feet above a lake is 30° and the angle of depression of its reflection in the

lake is 45°.Find the height of cloud above the lake water surface .

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5. Some portion of a 20 meters long tree is broken by the wind and its top struck the ground at an angle of 30°.Find the height of the point where the tree is broken.

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6. An observer on the top of a tree ,finds the angle of depression of a car moving towards the tree to be 30° .After 3 minutes this angle becomes 60° .After how much more time , the car will reach the tree ?

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7. A man observes when he has climbed up $\frac{1}{3}$ of the length of an inclined ladder, placed against a wall, the angular depression of an

object on the floor is α. When he climbs the ladder completely, the angleof depression is β. If the inclination of the ladder to the floor is θ, then prove that $\cot\theta = \frac{3\cot\beta - \cot\alpha}{2}$

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8. A vertical pole with height more than 100 m consists of two parts, the lower being one-third of the whole. At a point on a horizontal plane through the foot and 40 m from it,the

upper part subtends an angle whose tangent is $\frac{1}{2}$.Find the height of the pole.

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9. A circular ring of radius 3cm hangs horizontally form a point 4cm vertically above the centre by 4 strings attached at equal intervals to its circumference. If the angle between two consecutive strings be θ , then $\cos\theta$ is equal to $\frac{4}{5}$ (b) $\frac{4}{25}$ (d) $\frac{16}{25}$ (d) none of these

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10. A balloon is observed simultaneously from three points A, B and C on a straight road directly under it. The angular elevation at B is twice and at C is thrice that at A . If the distance between A and B is 200 metres and the distance between B and C is 100 metres, then find the height of balloon above the road.

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11. A spherical ballon of radius r while floating in the sky, makes an angle α in the eye of viewer. If the angle of elevation of the centre of the ballon in the eye of the viewer be β, show that the altitude of the centre of the ballon from the ground is $r \cos ec \frac{\alpha}{2} \sin \beta$.

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12. A vertical tower PQ subtends the same anlgle of 30° at each of two points A and B ,60

m apart on the ground .If AB subtends an angle of 120° at P the foot of the tower ,then find the height of the tower .

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13. From a point on a hillside of constant inclination , the angle of elevation of the top a flagstaff on its summit is observed to be α and a meters nears the top of the hill, it is β .If h is the height of the flagstaff ,find the inclination of the hill to the horizon .

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14. PQ is a vertical tower having P as the foot. A,B,C are three points in the horizontal plane through P. The angles of elevation of Q from A,B,C are equal and each is equal to θ . The sides of the triangle ABC are a,b,c, and area of the triangle ABC is $\triangle$. Then prove that the height of the tower is (abc) $\frac{\tan\theta}{4' \triangle '.}$

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Exercises

1. The tops of two poles of height 20 m and 14 m are connected by a wire. If the wire makes an angle of 30^o with horizontal, then the length of the wire is (a) 12 m (b) 10 m (c) 8 m (d) 6 m

A. 8 m

B. 12 m

C. 10 m

D. 3 m

Answer:

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2. The angle of elevation of the top of an unfinished tower at a distance of 120 m from its base is 30°. How much higher must the tower be raised so that the angle of elevation of its top at the same point may be 60° ?

A. $120\left(\sqrt{3}+1\right)m$

B. $120\left(\sqrt{3}-1\right)m$

C. $120\sqrt{3}m$

D. 120m

Answer:

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3. A tower of height b subtends an angle at a point 0 on the ground level through the foot of the tower and at a distance a from the foot of the tower. A pole mounted on the top of

the tower also subtends an equal angle at 0.

The height of the pole is

A. $a\left(\frac{a^2-b^2}{a^2+b^2}\right)$

B. $a\left(\frac{a^2+b^2}{a^2-b^2}\right)$

C. $b\left(\frac{a^2-b^2}{a^2+b^2}\right)$

D. $b\left(\frac{a^2+b^2}{a^2-b^2}\right)$

Answer: option 4

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4. A ladder rest against a wall making an angle α with the horizontal. The foot of the ladder is pulled away from the wall through a distance $x,$ so that it slides a distance y down the wall making an angle β with the horizontal. Prove that $x = y\dfrac{\tan(\alpha+\beta)}{2}.$

A. $y = x\tan\dfrac{\alpha+\beta}{2}$

B. $x = y\tan\dfrac{\alpha+\beta}{2}$

C. $x = y\tan(\alpha+\beta)$

D. $y = x\tan(\alpha+\beta)$

Answer:

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5. Two flagstaffs stand on a horizontal plane. A and B are two points on the line joining their feet and between them. The angles of elevation of the tops of the flagstaffs as seen from A are 30° and60° and as seen from B are $60^\circ$and 45°. If AB is 30 m, then the distance between the flagstaffs is

A. $30 + 15\sqrt{3}$

B. $45 + 15\sqrt{3}$

C. $60 - 15\sqrt{3}$

D. $60 + 15\sqrt{3}$

Answer: D

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6. A bird is sitting on the top of a vertical pole 20 m high and its elevations from a point O on the ground is 45°. It flies off horizontally

straight away from the point O. After one second, the elevation of the bird from O is reduced to 30°. Then the speed (in m/s)of the bird is

A. 14.64m//s

B. 17.71m//s

C. 12m//s

D. None of these

Answer: A

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7. For a man , the angle of elevation of the highest point of a tower situated west to him is 60° . On walking 240 meters to north , the angle of elevation reduces to 30° . The height of the tower is

A. $50\sqrt{3}m$

B. $30\sqrt{6}m$

C. $60\sqrt{6}m$

D. 60m

Answer:

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8. A flagstaff stands in the centre of a rectangular field whose diagonal is 120 m. It subtends angles of 15° and 45° at the midpoints of the sides of the field. The height of the flagstaff is

A. 20m

B. $30\sqrt{2+\sqrt{3}}m$

C. $30\sqrt{2-\sqrt{3}}m$

D. 40m

Answer:

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9. AB is a vertical pole resting at the end A on the level ground. P is a point on the level ground such that AP = 3AB and C Is the midpoint of AB. If AC and CB subtend angles α

and β, respectively, at P, then the value of $\tan\beta$ is

A. $\frac{18}{19}$

B. $\frac{3}{19}$

C. $\frac{1}{6}$

D. $\frac{1}{3}$

Answer:

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10. From the bottom of a pole of height h, the angle of elevation of the top of a tower is α. The pole subtends an angle β at the top of the tower. find the height of the tower.

A. $\dfrac{h\cot(\alpha-\beta)}{\cot(\alpha-\beta)-\cot\alpha}$

B. $\dfrac{h\tan(\alpha-\beta)}{\tan(\alpha-\beta)-\tan\alpha}$

C. $\dfrac{\cot(\alpha-\beta)}{\cot(\alpha-\beta)-\cot\alpha}$

D. None of these

Answer:

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11. A tower subtends an angle α at a point on the same level as the root of the tower and at a second point, b meters above the first, the angle of depression of the foot of the tower is β. The height of the tower is

A. b cot α tan β

B. $b \tan \alpha \tan \beta$

C. $b \tan \alpha \cot \beta$

D. $b \cot \alpha \cot \beta$

Answer:

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12. A man standing on a level plane observes the elevation of the top of a pole to be θ. He then walks a distance equal to double the height of the pole and then finds that the elevation is now 2θ. The value of $\cot\theta$ is

A. $\sqrt{2}+1$

B. $2-\frac{\sqrt{3}}{2}$

C. $\sqrt{2-1}$

D. $2+\sqrt{3}$

Answer:

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13. 5 m high pole stands on a building of height 25 m. The pole and the building subtend equal angles at an antenna placed at a height of 30 m. The distanceo f the antenna from the top of the pole is

A. $5\sqrt{\frac{2}{3}}$

B. $\frac{5\sqrt{3}}{2}$

C. $5\sqrt{\frac{3}{2}}$

D. $5\sqrt{6}$

Answer:

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14. A vertical tower stands on a declivity which isinclined at 15° to the horizon. From the foot of the tower a man ascends the declivity from

80 feet and then finds that the tower subtends an angle of 30°. The height of the tower is

A. $40(\sqrt{6}+\sqrt{2})$

B. $20(\sqrt{6}-\sqrt{2})$

C. $40(\sqrt{6}-\sqrt{2})$

D. $80(\sqrt{6}-\sqrt{2})$

Answer:

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15. The length of the shadow of a pole inclined at 10° to the vertical towards the sun is 2.05 metres, when theelevation of the sun is 38°. Then, find the length of the pole.

A. $\frac{2.05\sin 42^\circ}{\sin 38^\circ}$

B. $\frac{2.05\sin 42^\circ}{\cos 42^\circ}$

C. $\frac{2.05\sin 38^\circ}{\sin 42^\circ}$

D. $\frac{2.05\sin 42^\circ}{\sin 38^\circ}$

Answer:

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16. A tower subtends angles $\alpha, 2\alpha, 3\alpha$ respectively, at point $A, B, andC$ all lying on a horizontal line through the foot of the tower. Prove that $\frac{AB}{BC} = 1 + 2\cos 2\alpha$.

A. $\frac{3\sin\alpha}{\sin 2\alpha}$

B. $1 + 2\cos^2\alpha$

C. $2 + \cos^3\alpha$

D. $\frac{\sin 2\alpha}{\sin\alpha}$

Answer:

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17. A harbour lies in a direction 60° south - west from a fort and at a distance 30 km from it .A ship sets from the habour at noon and sails due east at 10 km / hour .The ship will be 70 km from the fort at

A. 7 p.m

B. 8 p.m

C. 5 p.m

D. 10 p.m

Answer:

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18. A tower AB leans towards west making an angle α with the vertical . The anlgular elevation of B , the topmost point of the tower is β as obsreved from a point C due east of A at distance d from A.If the angular elevation of

B from a pont D at a distance 2d due east of C is γ , then prove that 2 tan α = cot γ -3cot β

A. $2\tan\alpha = 2\cot\beta - \cot\gamma$

B. $2\tan\alpha = 3\cot\beta - \cot\gamma$

C. $\tan\alpha = \cot\beta - \cot\gamma$

D. None of these

Answer:

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Archives

1. A bird is sitting on the top of a vertical pole 20 m high and its elevation from a point O on the ground is $45o$. It flies off horizontally straight away from the point O. After one second, the elevation of the bird from O is reduced to $30o$. Then the speed (in m/s) of the bird is (1) $40\left(\sqrt{2}-1\right)$ (2) $40\left(\sqrt{3}-2\right)$ (3) $20\sqrt{2}$ (4) $20\left(\sqrt{3}-1\right)$

A. $40\left(\sqrt{2}-1\right)$

B. $40\sqrt{(3)-\sqrt{2}}$

C. $20\sqrt{2}$

D. $20\left(\sqrt{3}-1\right)$

Answer:

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2. If the angles of elevation of the top of a tower from three collinear points A, B and C, on a line leading to the foot of the tower, are 30^0 , 45^0 and 60^0 respectively, then the ratio,

AB : BC, is : (1) $\sqrt{3}:1$ (2) $\sqrt{3}:\sqrt{2}$ (3) $1:\sqrt{3}$ (4) $2:3$

A. $\sqrt{3}:1$

B. $\sqrt{3}:\sqrt{2}$

C. $1:\sqrt{3}$

D. $2:3$

Answer:

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3. PQR is a triangular park with PQ=PR=200m . A T.V tower stands at the mid-point of QR. If the angles of elevation of the top of the tower at P , Q and R respectively 45° , 30° and 30° then the height of the tower in m is

A. $50\sqrt{2}$

B. 100

C. 50

D. $100\sqrt{3}$

Answer: B

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