MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

HIGHT AND DISTANCE

Examples

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.

A. 400

B. 50

C. 100

D. 200

Answer: D

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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:

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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 observe that was 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 and that after he reached the top of the ledder , the angular depression β If the inclintaion of the ladder to the 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 $\frac{1}{2}$ What is 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 balloon of radius r subtends an angle α at the eyes of an observer and the center of balloon from the eye is β . Find the height of the center of the balloon from the eye of observer .

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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 . Then prove that the height of the tower is (abc) $\frac{\tan\theta}{4}$.

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Exercise

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 $30o$ 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. THEN

x=

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

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 hagstaffs 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° 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 snake observes an eagle perching on the top of a pole 20 m high. Its elevation from snake s eye is 45° before it hies off horizontally straight away from the snake and after one second the elevation of the eagle reduces to 30°.The speed of the eagle 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: C

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

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

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

D. None of these

Answer:

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11. A tower of height b subtends an angle α at a point on the same level as the food of the tower .At a second point , b meters above the first , the angle of depression of the foot pole and the finds that the elevation is now 2θ .The value of cot θ 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 -cot 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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Jee Previous Year

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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