MATHS

BOOKS - NDA PREVIOUS YEARS

HEIGHT & DISTANCE

Math

1. A vertical pole with height more than $100m$ consists of two parts, the lower being one-third of the whole. At a point on a horizontal

plane through the foot and $40m$ from it, the upper part subtends an angle whose tangent is $\dfrac{1}{2}$ What is the height of the pole.

A. $110m$

B. $200m$

C. $120m$

D. $150m$

Answer: C

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2. The angle of elevation of the top of a pillar of height h at a point on the ground at a distance x from the pillar is $30°$. On walking a distance 'd' towards the pillar the angle of elevation becomes $60°$. Then, which one of the following is correct?

A. x=d+h

B. $x = \dfrac{3d}{2}$

C. $x = \dfrac{5d}{4}$

D. $x = 2d$

Answer: B

3. The angle of elevation of the top of a tower EF (F being the foot of the tower) as seen from a point A which is on the same level as F, is α. On advancing towards the foot of the tower the angle of elevation of the top of the tower as seen from a point B such that AB=x , is β. If BF=y, h is the height of the tower and

$\alpha + \beta = \dfrac{\pi}{2}$, then which one of the following

is correct?

A. $h^2 = x^2 + xy$

B. $h = y^2 + xy^2$

C. $h^2 = y^2 + xy$

D. $h = y + x^2 y$

Answer: C

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4. The lower 24 m portion of a 50 m tall tower is painted green and the remaining portion red. What is the distance of a point on the ground from the base of the tower where the two different portions of the tower subtend equal angles?

    A. 60m

    B. 72m

    C. 90m

    D. 120m

Answer: D

5. What should be the height of a flag where a 20 feet long ladder reaches 20 feet below the flag (The angle of elevation of the top of the flag at the foot of the ladder is $60°$) ?

A. 20 feet

B. 30 feet

C. 40 feet

D. $20\sqrt{2}$ feet

Answer: B

6. PT, a tower of height 2^x metre, p being the foot, T being the top of the tower. A, B are points on the same line with P. If $AP = 2^{x+1}$ m, BP=192` m and if the angle of elevation of the tower as seen from b is double the angle

of the elevation of the tower as seen from A, then what is the value of x?

A. 6

B. 7

C. 8

D. 9

Answer: C

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7. The foot of a tower of height h m is in a direct line between two observers A and B. If the angles of elevation of the top of the tower as seen from from A and B are α and β respectively and if AB=d m, then what is h/d equal to ?

A. $\dfrac{\tan(\alpha + \beta)}{(\cot\alpha\cot\beta - 1)}$

B. $\dfrac{\cot(\alpha + \beta)}{(\cot\alpha\cot\beta - 1)}$

C. $\dfrac{\tan(\alpha + \beta)}{(\cot\alpha\cot\beta + 1)}$

D. $\dfrac{\cot(\alpha + \beta)}{(\cot\alpha\cot\beta + 1)}$

Answer: B

8. A man observes the elevation of a balloon to be $30°$. He, then walks 1 km towards the balloon and finds that the elevation is $60°$. What is the height of the balloon?

   A. 1/2 km

   B. $\sqrt{3}/2$km

   C. 1/3 km

D. 1 km

Answer: B

9. The angle of elevation from a point on the bank of a river of the top of a temple on the other bank is $45°$. Retreating 50 m, the observer finds the new angle of elevation as $30°$. What is the width of the river?

A. 50m

B. $50\sqrt{3}$m

C. $50/(\sqrt{3}-1)m$

D. 100m

Answer: C

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10. Looking from the top of a 20 m high building, the angle of elevation of the top of a tower is $60°$ and the angle of depression of its

bottom is $30°$. What is the height of the

tower?

A. 50m

B. 60m

C. 70m

D. 80m

Answer: D

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11. The angle of elevation of the top of a flag post from a point 5 m away from its base is $75°$. What is the approximate height of the flag post?

   A. 15m

   B. 17m

   C. 19m

   D. 21m

Answer: C

12. Two poles are 10 m and 20 m high. The line joining their tops makes an angle of $15°$ with the horizontal. What is the approximate distance between the poles?

A. 35.3m

B. 37.3m

C. 41m

D. 44m

Answer: B

13. From the top of a lighthouse 120m above the sea, the angle of depression of a boat is $15°$. What is the distance of the boat from the lighthouse?

   A. 400 m

   B. 421 m

   C. 444 m

D. 460 m

Answer: C

14. A man standing on the bank of a river observes that the angle of elevation of the top of a tree just on the opposite bank is $60°$. The angle of elevation is $30°$ from a point at a distance y m from the bank of the river. What is the height of the tree ?

A. y m

B. 2y m

C. $\dfrac{\sqrt{3}y}{2}m$

D. $\dfrac{y}{2}m$

Answer: C

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15. At a point 15 m away from the base of a 15 m high house, the angle of elevation of the top is

A. $90°$

B. $60°$

C. $45°$

D. $30°$

Answer: C

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16. A tower of height 15 m stands vertically on the ground. From a point on the ground the angle of elevation of the top of the tower is

found to be $30°$. What is the distance of the point from the foot of the tower?

A. $15\sqrt{3}m$

B. $10\sqrt{3}m$

C. $5\sqrt{3}m$

D. 30m

Answer: A

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17. 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 $\dfrac{h \tan \alpha}{\tan \beta - \tan \alpha}$

A. $\dfrac{h \tan \beta}{\tan \alpha - \tan \beta}$

B. $\dfrac{h \tan \beta}{\tan \alpha + \tan \beta}$

C. $\dfrac{h \cos \beta}{\cos \alpha - \cos \beta}$

D. $\dfrac{h}{\cos(\alpha - \beta)}$

Answer: A

18. An aeroplane flying at a height 300 metre above the ground passes vertically above another plane at an instant when the angles of elevation of the two planes from the same point on the ground are $60°$ and $45°$ respectively. Then the height of the lower plane from the ground in metres is

A. 50m

B. $\dfrac{100}{\sqrt{3}}m$

C. $100\sqrt{3}m$

D. $150\left(\sqrt{3}+1\right)m$

Answer: C

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19. The angle of elevation of the tip of a flag staff from a point 10 m due South of its base is

$60°$. What is the height of the flag staff

correct of the nearest meter?

A. 15m

B. 16m

C. 17m

D. 18m

Answer: C

20. Two poles are 10 m and 20 m high. The line joining their tops makes an angle of $15°$ with the horizontal. What is the approximate distance between the poles?

A. $10(\sqrt{3} - 1)m$

B. $5(4 + 2\sqrt{3})m$

C. $20(\sqrt{3} + 1)m$

D. $10(\sqrt{3} + 1)m$

Answer: B

21. The angle of elevation of a tower at a level ground is $30°$. The angle of elevation becomes θ when 10 m moved towards the tower. If the height of tower is $5\sqrt{3}$ m, then what is θ equal to ?

A. $45°$

B. $60°$

C. $75°$

D. None of the above

Answer: B

22. From the top of a building of height h meter, the angle of depression of an object on the ground is θ. What is the distance (in meter) of the object from the foot of the building ?

A. $h \cot \theta$

B. $h \tan \theta$

C. $h \cos \theta$

D. $h \sin \theta$

Answer: A

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23. The top of a hill when observed from the top and bottom of a building of height h is at angles of elevation P and q respectively. What is the height of the hill ?

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

B. $\dfrac{h \cot \alpha}{\cot \alpha - \cot \beta}$

C. $\dfrac{h \tan \alpha}{\tan \alpha - \tan \beta}$

D. None of the above

Answer: B

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24. From the top of a lighthouse 70 m high with its base at sea level, the angle of

depression of a boat is $15°$. The distance of the boat from the foot of the lighthouse is :

A. $70\left(2 - \sqrt{3}\right)m$

B. $70\left(2 + \sqrt{3}\right)m$

C. $70\left(3 - \sqrt{3}\right)m$

D. $70\left(3 + \sqrt{3}\right)m$

Answer: B

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25. The angle of elevation of the top of a tower of height H from the foot of another tower in the same plane is $60°$ and the angle of elevation of the top of the second tower from the foot of the first tower is $30°$. If h is the height of the other tower, then which one of the following is correct?

A. H=2h

B. $H = \sqrt{3h}$

C. H=3h

D. None of the above

Answer: C

26. A man walks 10m towards a lamp post and notices that the angle of elevation of the top of the post increases from $30°$ to $45°$. The height of the lamp posts is :

A. 10m

B. $\left(5\sqrt{3} + 5\right)m$

C. $\left(5\sqrt{3} - 5\right)m$

D. $\left(10\sqrt{3} + 10\right)m$

Answer: B

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27. The shadow of a tower standing on a level plane is found to be 50 m longer when when sun's elevation is $30°$ than when it is $60°$. Find the height of the tower.

A. 25m

B. $25\sqrt{3}m$

C. 50m

D. None of the above

Answer: B

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28. The angle of elevation of the top of a tower from two places situated at distances 21m.

And x m. from the base of the tower are $45°$ and $60°$ respectively. What is the value of x ?

A. $7\sqrt{3}$

B. $7 - \sqrt{3}$

C. $7 + \sqrt{3}$

D. 14

Answer: A

29. A person standing on the bank of a river observes that the angle subtended by a tree on the opposite of bank is $60°$. When he retires 40 m.from the bank, he finds the angle to be $30°$. What is the breadth of the river ?

A. 60m

B. 40m

C. 30m

D. 20m

Answer: D

30. From an aeroplane above a straight road the angle of depression of two positions at a distance 20 m apart on the road are observed to be $30°$ and $45°$. The height of the aeroplane above the ground is :

A. $10\sqrt{3}m$

B. $10(\sqrt{3} - 1)m$

C. $10(\sqrt{3} + 1)m$

D. 20m

Answer: C

31. A lamp post stands on a horizontal plane. From a point situated at a distance 150 m from its foot, the angle of elevation of the top is $30°$. What is the height of the lamp post?

A. 50m

B. $50\sqrt{3}m$

C. $\dfrac{50}{\sqrt{3}}m$

D. 100m

Answer: B

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32. The angle of elevation of the top of a tower form a point 20 m away from its base is $45°$. What is the height of the tower?

A. 10 m

B. 20m

C. 30m

D. 40m

Answer: B

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33. The angles of elevation of the top of a tower standing on a horizontal plane from two points of a line passing through the foot

of the tower at distances 49 m and 36 m are $43°$ and $47°$ respectively. What is the height of the tower ?

A. 40m

B. 42m

C. 45m

D. 47m

Answer: B

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34. Two poles are 10 m and 20 m high. The line joining their tops makes an angle of $15°$ with the horizontal. What is the approximate distance between the poles?

A. 36.3 m

B. 37.3 in

C. 38.3 m

D. 39.3 in

Answer: B

35. A vertical tower standing on a levelled field is mounted with a vertical flag staff of length 3 m. From a point on the field, the angles of elevation of the bottom and tip of the flag staff are $30°$ and $45°$ respectively. Which one of the following gives the best approximation to the height of the tower?

A. 3.90m

B. 4.00m

C. 4.10m

D. 4.25 m

Answer: C

36. The top of a hill when observed from the top and bottom of a building of height h is at angles of elevation P and q respectively. What is the height of the hill ?

A. $\dfrac{h \cot q}{\cot q - \cot p}$

B. $\dfrac{h \cot p}{\cot P - \cot q}$

C. $\dfrac{2h \tan p}{\tan p - \tan q}$

D. $\dfrac{2h \tan q}{\tan q - \tan p}$

Answer: B

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37. A moving boat is observed from the top of a 150 m high cliff moving away from the cliff. The angle of depression of the boat changes

from $60°$ to $45°$ in 2 minutes. Find the speed

of the boat in m/h.

A. $\dfrac{4500}{\sqrt{3}}$

B. $\dfrac{4500\left(\sqrt{3}-1\right)}{\sqrt{3}}$

C. $4500\sqrt{3}$

D. $\dfrac{4500\left(\sqrt{3}+1\right)}{\sqrt{3}}$

Answer: B

38. From the top of a lighthouse, 100 m high, the angle of depression of a boat is $\tan^{-1}\left(\dfrac{5}{12}\right)$. What is the distance between the boat and the lighthouse?

A. 120m

B. 180m

C. 240m

D. 360m

Answer: C

39. The angle of elevation of a stationary cloud from a point 25 m above a lake is $15°$ and the angle of depression of its image in the lake is $45°$. The height of the cloud above the lake level is

A. 25m

B. $25\sqrt{3}m$

C. 50m

D. $50\sqrt{3}m$

Answer: B

40. The angles of elevation of the top of a tower from the top and foot of a pole are respectively $30°$ and $45°$. If h_T is the height of the tower and h_P is the height of the pole, then which of the following are correct?

1. $\dfrac{2h_P h_T}{3 + \sqrt{3}} = h_P^2$

2. $\dfrac{h_T - h_P}{\sqrt{3} + 1} = \dfrac{h_P}{2}$

3. $\dfrac{2(h_P + h_T)}{h_P} = 4 + \sqrt{3}$

Select the correct answer using the code given below.

A. 1 and 3 only

B. 2 and 3 only

C. 1 and 2 only

D. 1, 2 and 3

Answer: C

41. If a flag-staff of 6 m height placed on the top of a tower throws a shadow of $2\sqrt{3}$ m along the ground, then what is the angle that the sun makes with the ground?

    A. 60°

    B. 45°

    C. 30°

    D. 15°

Answer: A

42. A balloon of radious r suntends an angle α at the eyes of an observer and the center of balloon from the eye is β . Find the ofcentre of the centre of the balloon from the eye of observer .

A. $\dfrac{r \sin \beta}{\sin\left(\frac{\alpha}{2}\right)}$

B. $\dfrac{r \sin \beta}{\sin\left(\frac{\alpha}{4}\right)}$

C. $\dfrac{r \sin\left(\frac{\beta}{2}\right)}{\sin \alpha}$

D. $\dfrac{r\sin\alpha}{\sin\left(\frac{\beta}{2}\right)}$

Answer: A

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43. A balloon is directly above one end of a bridge. The angle of depression of the other end of the bridge from the balloon is $48°$. If the height of the balloon above the bridge is 122 m, then what is the length of the bridge ?

A. $122\sin 48° \, m$

B. $122\tan 42° \, m$

C. $122\cos 48° \, m$

D. $122\tan 48° \, m$

Answer: A

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44. The top of a hill observed from the top and bottom of a building of height h is at angles

of elevation $\dfrac{\pi}{6}$ and $\dfrac{\pi}{3}$ respectively. What is the height of the hill ?

A. 2h

B. $\dfrac{3h}{2}$

C. H=3h

D. $\dfrac{h}{2}$

Answer: B

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45. The angle of elevation of a tower of height h from a point A due South of it is x and from a point B due East of A is y. If AB=, then which one of the following is correct?

A. $h^2 \left(\cot^2 y - \cot^2 x \right) = z^2$

B. $z^2 \left(\cot^2 y - \cot^2 x \right) = h^2$

C. $h^2 \left(\tan^2 y - \tan^2 x \right) = z^2$

D. $z^2 \left(\tan^2 y - \tan^2 x \right) = h^2$

Answer: A

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