Single Correct Answer Type:

1. The sum of angles of elevation of the top of a tower from two points distant 'a' and 'b' from the base and in the same straight line with it is $90°$. Then height of the tower is

   (A) a^2b (B) ab^2 (C) $\sqrt{ab}$ (D) ab

2. ABCD is a trapezium such that $AB \parallel CD$ and $BC \perp CD$, if $\angle ADB = \theta$, $BC = p$ and $CD = q$, then AB is equal to

   (A) $\frac{p^2+q^2}{p^2\cos\theta + q^2\sin\theta}$ (B) $\frac{(p^2+q^2)\sin\theta}{(p\cos\theta + q\sin\theta)^2}$ (C) $\frac{(p^2+q^2)\sin\theta}{p\cos\theta + q\sin\theta}$ (D) $\frac{(p^2+q^2)\cos\theta}{p\cos\theta + q\sin\theta}$

3. Let $'\alpha'$ be the solution of $16^{\sin^2\theta} + 16^{\cos^2\theta} = 10$ in $\left(0, \frac{\pi}{4}\right)$. If the shadow of a vertical pole is $\frac{1}{\sqrt{3}}$ of its height, then altitude of the sun is

   (A) α (B) $\frac{\alpha}{2}$ (C) 2α (D) $\frac{\alpha}{3}$

4. The angle of elevation of an object on a hill from a point on the ground is $30°$. After walking 120 m the elevation of the object is $60°$. Then height of the hill is

   (A) 120 m (B) $60\sqrt{3}$ m (C) $120\sqrt{3}$ m (D) 60 m

5. At the foot of the mountain the elevation of its summit is $45°$, after ascending 1000 m towards the mountain up a slope of $30°$ inclination, the elevation is found to be $60°$. The height of the mountain is

   (A) $\frac{\sqrt{3}+1}{2}$m (B) $\frac{\sqrt{3}-1}{2}$m (C) $\frac{\sqrt{3}+1}{2\sqrt{3}}$m (D) $\frac{\sqrt{3}-1}{2\sqrt{3}}$m

6. ABC is a triangular park with all sides equal. If a pillar at 'A' subtends an angle of $45°$ at 'C', then angle of elevation of the pillar at midpoint of BC is

   (A) $\text{Tan}^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (B) $\text{Tan}^{-1}\left(\sqrt{3}\right)$ (C) $\text{Cot}^{-1}\left(\sqrt{3}\right)$ (D) $\text{Tan}^{-1}\left(\frac{2}{\sqrt{3}}\right)$

7. Two poles of height 'a' and 'b' stand at the centres of two circular plots which touch each other externally at a point and the two poles subtend angles of $30°$ and $60°$ at this point respectively, then the distance between the centres of these plots is

   (A) $a+b$ (B) $\frac{(3a+b)}{\sqrt{3}}$ (C) $\frac{(a+3b)}{\sqrt{3}}$ (D) $a\sqrt{3}+b$

8. The longer side of a parallelogram is 10 cm and the shorter is 6 cm. If the longer diagonal makes an angle $30°$ with the longer side, the length of the longer diagonal is

   (A) $5\sqrt{3}+\sqrt{11}$ (B) $4\sqrt{3}+\sqrt{11}$ (C) $5\sqrt{3}+\sqrt{13}$ (D) $4\sqrt{3}+\sqrt{13}$

9. The angle of elevation of a lower from a point 'A' due South of it is x and from a point 'B' due East of 'A' is y. If $AB = \ell$, then height of the tower is

   (A) $\frac{\ell}{\sqrt{\cot^2 y - \cot^2 x}}$ (B) $\frac{\ell}{\sqrt{\text{Tan}^2 y - \text{Tan}^2 x}}$ (C) $\frac{2\ell}{\sqrt{\cot^2 x - \cot^2 y}}$ (D) $\frac{\ell}{\sqrt{\sin^2 y - \sin^2 x}}$

10. A bird is perched on the top of a tree 20 m high and its elevation from a point on the ground is $45°$. It flies off horizontally straight away from the observer and in one second the elevation of the bird is reduced to $30°$. The speed of the bird is

(A) 14.64 m/s (B) 17.71 m/s (C) 12 m/s (D) 13.65 m/s

11. The angle of elevation of the top of a vertical pole when observed from each vertex of a regular hexagon is $\frac{\pi}{3}$. If the area of the circle circumscribing the hexagon be A sq. metre, then the area of the hexagon is

(A) $\frac{3\sqrt{3}}{2}$ A sq.metres (B) $\frac{3\sqrt{3}}{\pi}$ A sq.metres (C) $\frac{3\sqrt{3}}{2}\frac{A}{\pi}$ sq.metres (D) None of these

12. Two straight roads OA and OB intersect O, A tower is situated within the angle formed by them and subtends angles of $45°$ and $30°$ at the points A and B where the roads are nearest to it. If $OA = a$ and $OB = b$, then the height of the tower is

(A) $\sqrt{\frac{a^2+b^2}{2}}$ (B) $\sqrt{a^2+b^2}$ (C) $\sqrt{\frac{a^2-b^2}{2}}$ (D) $\sqrt{a^2-b^2}$

13. A and B are two points in the horizontal plane through O, the foot of pillar OP of height h, such that $\Delta AOB = \theta$. If the elevation of the top of the pillar from A and B are also equal to θ, then AB is equal to

(A) $h\cot\theta$ (B) $h\cos\theta\sec\frac{\theta}{2}$ (C) $h\cot\theta\sin\frac{\theta}{2}$ (D) $h\cos\theta\operatorname{cosec}\frac{\theta}{2}$

14. An observer finds that the angular elevation of a tower is A. On advancing 3 m towards the tower the elevation is $45°$ and on advancing 2m nearer, the elevation is $90° - A$. The height of the tower is

(A) 2 m (B) 4 m (C) 6 m (D) 8 m

15. A lamp post standing at a point A on a circular path of radius r subtends an angle α at some point B on the Path, and AB subtends an angle of $45°$ at any other point on the path, then height of the lamppost is

(A) $\sqrt{2}r\cot\alpha$ (B) $\left(r/\sqrt{2}\right)\tan\alpha$ (C) $\sqrt{2}r\tan\alpha$ (D) $\left(r/\sqrt{2}\right)\cot\alpha$

16. PQ is a vertical tower, P is the foot, Q the top of the tower. 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 the area of the triangle ABC is Δ. The height of the tower is

(A) $(abc)\tan\theta/4\Delta$ (B) $(abc)\cot\theta/4\Delta$ (C) $(abc)4\Delta\tan\theta$ (D) None of these

17. The angle of elevation of a cloud from a point h metres above the surface of a lake is θ and the angles of depression of its reflection is ϕ. Then the height of the cloud is

(A) $\frac{h\sin(\phi+\theta)}{\sin(\phi-\theta)}$ (B) $\frac{h}{\sin(\phi-\theta)}$ (C) $h\tan(\phi-\theta)$ (D) $\frac{h\sin(\phi-\theta)}{\sin(\phi+\theta)}$

18. The angle of elevation of the top of a tree at point B due south of it is $60°$ and at a point C due north of it is $30°$. D is a point due north of C where the angle of elevation is $15°$. If $\sqrt{3} = 1\frac{8}{11}$ and $BC \times CD = 2^3 \times 3^2 \times 19 \times 11$, the height of the tree is

(A) 33 (B) 38 (C) 57 (D) 88

19. A stationary ballon is observed from three points A, B and C on the plane ground and is found that its angle of elevation from each point is α. If $\angle ABC = \beta$ and $AC = b$, the height of the ballon is

(A) $\frac{b}{2}\tan\alpha\operatorname{cosec}\beta$ (B) $\frac{b}{2}\tan\alpha\sin\beta$ (C) $\frac{b}{2}\cot\alpha\operatorname{cosec}\beta$ (D) $\frac{b}{2}\cot\alpha\sin\beta$

20. An angular elevation of tower CD at a point A due south of it is $60°$ and at a point B due west of A, the elevation is $30°$. If $AB = 3km$, the height of the tower is

(A) $2\sqrt{3}$ km (B) $2\sqrt{6}$ km (C) $\frac{3\sqrt{3}\text{ km}}{2}$ (D) $\frac{3\sqrt{6}\text{ km}}{4}$

Numerical Based:

21. OAB is a triangle in the horizontal plane through the foot P of the tower at the middle point of the side OB of the triangle. If $OA = 2m$, $OB = 6m$, $AB = 5m$ and $\angle AOB$ is equal to the angle subtended by the tower at A and height of the tower is $k\frac{5}{\sqrt{39}}$, then the value of k upto two places of decimals is _____

22. The angle of elevation of a stationary cloud from a point 2,500 m above a lake is $15°$ and the angle of depression of its reflection in the lake is $45°$. The height of the cloud above the lake level is $h\sqrt{3}$, then the value of h is _____

23. From the top of a tower 100 m height, the angles of depression of two objects 200 m apart on the horizontal plane and in a line passing through the foot of the tower and on the same side of the tower are $45° - A$ and $45° + A$. The angle A is equal to

24. ABC is triangular park with $AB = AC = 100m$. A clock tower is situated at the mid-point of BC. The angles of elevation of the top of the tower at A and B are $\cot^{-1}3.2$ and $\text{cosec}^{-1}2.6$ respectively. The height of the tower is

25. Each side of a square subtends an angle of $60°$ at the top of a tower h metre high standing in the centre of the square. If a is the length of each side of the square, then $\frac{h^2}{a^2}$ is _____

KEY

1.	C	2.	C	3.	A	4.	B	5.	A
6.	D	7.	B	8.	A	9.	A	10.	A
11.	C	12.	C	13.	B	14.	C	15.	C
16.	A	17.	A	18.	C	19.	A	20.	D
21.	2.34	22.	2500	23.	22.5	24.	25	25.	0.5