HEIGHT AND DISTANCE- EXERCISE

1. 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-

(1) $100\sqrt{3}$ (2) $100/\sqrt{3}$

(3) 50 (4) $150(\sqrt{3}+1)$.

2. The angles of elevation of the top of a tower at the top and the foot of a pole of height 10 m are 30° and 60° respectively. The height of the tower is-

(1) 10 m (2) 15 m

(3) 20 m (4) None of these

3. The upper part of a tree broken over by the wind makes an angle of 30° with the ground, and the distance from the foot to the point where the top of the tree touches the ground is 15 m. The height of the tree is-

(1) 15 m (2) $15\sqrt{3}$ m

(3) 20 m (4) None of these

4. A flag staff on the top of the tower 80 meter high, subtends an angle $\tan^{-1}\left(\frac{1}{9}\right)$ at a point on the ground 100 meters away from the foot of the tower. Find the height of the flag-staff -

(1) 20 m (2) 30 m

(3) 25 m (4) 35 m

5. A 6-ft tall man finds that the angle of elevation of the top of a 24-ft-high pillar and the angle of depression of its base are complementary angles. The distance of the man from the pillar is-

(1) $2\sqrt{3}$ ft (2) $8\sqrt{3}$ ft

(3) $6\sqrt{3}$ ft (4) None of these

6. The shadow of a tower of height $(1+\sqrt{3})$ metre standing on the ground is found to be 2 metre longer when the sun's elevation is 30°, than when the sun's elevation was -

(1) 30° (2) 45°

(3) 60° (4) 75°

7. A vertical pole subtends an angle $\tan^{-1}(1/2)$ at a point P on the ground. The angle subtended by the upper half of the pole at the point P is-

(1) $\tan^{-1}(1/4)$ (2) $\tan^{-1}(2/9)$

(3) $\tan^{-1}(1/8)$ (4) $\tan^{-1}(2/3)$

8. The length of the shadow of a vertical pole of height h, thrown by the sun's rays at three different moments are h, 2h and 3h. The sum of the angles of elevation of the rays at these three moments is equal to-

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{6}$

9. A vertical lamp-post of height 9 metres stands at the corner of a rectangular field. The angle of elevation of its top from the farthest corner is 30°, while from another corner it is 45°. The area of the field is-

(1) $81\sqrt{2}$ m^2 (2) $9\sqrt{2}$ m^2

(3) $81\sqrt{3}$ m^2 (4) $9\sqrt{3}$ m^2

10. The upper $\frac{3}{4}$ th portion of a vertical pole subtends an an angle $\tan^{-1}\frac{3}{5}$ at a point in the horizontal plane through its foot and at a distance 40 m from the foot. A possible height of the vertical pole is-

[AIEEE-2002]

(1) 80 m (2) 20 m (3) 40 m (4) 60 m

11. A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of the river is 60° and when he retires 40 meters away from the tree the angle of elevation becomes 30°. The breadth of the river is-

[AIEEE-2004]

(1) 20 m (2) 30 m (3) 40 m (4) 60 m

12. A tower stands at the centre of a circular park. A and B are two points on the boundary of the park such that AB (=a) subtends an angle of 60° at the foot of the tower, and the angle of elevation of the top of the tower from A or B is 30°. The height of the tower is- **[AIEEE-2007]**

(1) $2a/\sqrt{3}$ (2) $2\sqrt{3}\,a$

(3) $a/\sqrt{3}$ (4) $\sqrt{3}\,a$

13. AB is a vertical pole with B at the ground level and A at the top. A man finds that the angle of elevation of the point A from a certain point C on the ground is 60°. He moves away from the pole along the line BC to a point D such that CD = 7 m. From D the angle of elevation of the point A is 45°. Then the height of the pole is- **[AIEEE-2008]**

(1) $\frac{7\sqrt{3}}{2}\frac{1}{\sqrt{3}-1}m$ (2) $\frac{7\sqrt{3}}{2}(\sqrt{3}+1)m$

(3) $\frac{7\sqrt{3}}{2}(\sqrt{3}-1)m$ (4) $\frac{7\sqrt{3}}{2}\frac{1}{\sqrt{3}+1}m$

14. A bird is sitting on the top of a vertical pole 20m high and its elevation 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 : **[JEE-MAINS-2014]**

(1) $40\left(\sqrt{2}-1\right)$ (2) $40\left(\sqrt{3}-\sqrt{2}\right)$

(3) $20\sqrt{2}$ (4) $20\left(\sqrt{3}-1\right)$

15. A verticle pole stands at a point 'A' on boundry of a circular park of radius a and blinds an angle α at another point B on the boundary. If the chord AB subtend angle α at the centre of the park, the height of pole is : **[JEE-MAINS-2014]**

(1) $2a\cos\frac{\alpha}{2}\cot\alpha$ (2) $2a\sin\frac{\alpha}{2}\tan\alpha$

(3) $2a\cos\frac{\alpha}{2}\tan\alpha$ (4) $2a\sin\frac{\alpha}{2}\cot\alpha$

16. The angle of elevation of the top of a vertical tower from a point P on the horizontal ground was observed to be α. After moving a distance 2 metres from P towards the foot of the tower, the angle of elevation changes to β. Then the height (in metres) of the tower is **[JEE-MAINS-2014 (Online)]**

(1) $\frac{\cos(\beta-\alpha)}{\sin\alpha\sin\beta}$ (2) $\frac{2\sin\alpha\sin\beta}{\sin(\beta-\alpha)}$

(3) $\frac{2\sin(\beta-\alpha)}{\sin\alpha\sin\beta}$ (4) $\frac{\sin\alpha\sin\beta}{\cos(\beta-\alpha)}$

17. If the angle of elevation of top of a tower from three collinear points A, B and C, on a line leading to the foot of the tower are 30°, 45° and 60° respectively . Then ratio of AB : BC is - **[JEE-MAINS-2015]**

(1) $\sqrt{3}:1$ (2) $\sqrt{3}:\sqrt{2}$

(3) $1:\sqrt{3}$ (4) 2 : 3

18. Let 10 vertical poles standing at equal distances on a straight line, subtend the same angle of elevation α at a point O on this line and all the poles are on the same side of O. If the height of the longest pole is 'h' and the distance of the foot of the smallest pole from O is 'a'; then the distance between two consecutive poles, is :- **[JEE-MAINS-2015 (Online)]**

(1) $\frac{h\cos\alpha-a\sin\alpha}{9\cos\alpha}$ (2) $\frac{h\cos\alpha-a\sin\alpha}{9\sin\alpha}$

(3) $\frac{h\sin\alpha+a\cos\alpha}{9\cos\alpha}$ (4) $\frac{h\sin\alpha+a\cos\alpha}{9\sin\alpha}$

19. A man is walking towards a vertical pillar in a straight path, at a uniform speed. At a certain point A on the path, he observes that the angle of elevation of the top of the pillar is 30°. After walking for 10 minutes from A in the same direction, at a point B, he observes that the angle of elevation of the top of the pillar is 60°. Then the time taken (in minutes) by him, form B to reach the pillar, is : **[JEE-MAINS-2016]**

(1) 5 (2) 6 (3) 10 (4) 20

20. The angle of elevation of the top of a vertical tower from a point A, due east of it is 45°. The angle of elevation of the top of the same tower from a point B, due south of A is 30°. If the distance between A and B is $54\sqrt{2}$ m, then the height of the tower (in metres), is :- **[JEE-Mains-2016(Online)]**

(1) $36\sqrt{3}$ (2) 108 (3) 54 (4) $54\sqrt{3}$

21. Let a vertical tower AB have its end A on the level ground. Let C be the mid-point of AB and P be a point on the ground such that AP = 2AB. If $\angle BPC = \beta$, then $\tan\beta$ is equal to :- **[JEE-MAINS-2017]**

(1) $\frac{4}{9}$ (2) $\frac{6}{7}$ (3) $\frac{1}{4}$ (4) $\frac{2}{9}$

22. PQR is a triangular park with PQ = PR = 200 m. 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 are respectively 45°, 30° and 30°, then the height of the tower (in m) is- **[JEE-MAINS-2018]**

(1) 50 (2) $100\sqrt{3}$ (3) $50\sqrt{2}$ (4) 100

23. An aeroplane flying at a constant speed, parallel to the horizontal ground, $\sqrt{3}$ km above it, is observed at an elevation of 60° from a point on the ground. If, after five seconds, its elevation from the same point, is 30°, then the speed (in km/hr) of the aeroplane, is : **[JEE-MAINS-2018 (Online)]**

(1) 750 (2) 1440 (3) 1500 (4) 720

24. A tower T_1 of height 60 m is located exactly opposite to a tower T_2 of height 80 m on a straight road. From the top of T_1, if the angle of depression of the foot of T_2 is twice the angle of elevaion of the top of T_2, then the width (in m) of the road between the feet of the towers T_1 and T_2 is :-

[JEE-MAINS-2018 (Online)]

(1) $20\sqrt{3}$ (2) $10\sqrt{3}$ (3) $10\sqrt{2}$ (4) $20\sqrt{2}$

25. A man on the top of a vertical tower observes a car moving at a uniform speed towards the tower on a horizontal road. If it takes 18 min. for the angle of depression of the car to change from 30° to 45°; then after this, the time taken (in min.) by the car to reach the foot of the tower, is :

[JEE-MAINS-2018 (Online)]

(1) $9\left(1+\sqrt{3}\right)$ (2) $18\left(\sqrt{3}-1\right)$

(3) $\frac{9}{2}\left(\sqrt{3}-1\right)$ (4) $18\left(1+\sqrt{3}\right)$

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**1**	**2**	**2**	**1**	**3**	**2**	**2**	**1**	**1**	**3**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**1**	**3**	**2**	**4**	**2**	**2**	**1**	**2**	**1**	**3**
Que.	21	22	23	24	25					
Ans.	**4**	**4**	**2**	**1**	**1**					