JEE MAIN + ADVANCED

MATHEMATICS

TOPIC NAME

HEIGHTS

&

DISTANCES

(PRACTICE SHEET)

LEVEL- 1

Question based on **Angle of elevation & depression (2-D diagram)**

Q.1 A kite is flying with the string inclined at 60º to the horizon. The height of the kite above the ground, when the string is 20 mts. long, is-

(A) 15 m (B) $15\sqrt{3}$ m

(C) 10 m (D) $10\sqrt{3}$ m

Q.2 If the length of the shadow of a vertical pole on the horizontal ground is equal to its height, find the angle of elevation of the sun -

(A) 60º (B) 30º (C) 45º (D) 90º

Q.3 The angle of elevation of the top of a tower from a point 20 m away from its base is 45º. The height of the tower is -

(A) 10 m (B) 20 m

(C) 40 m (D) $20\sqrt{3}$ m

Q.4 If the angle of depression of a point A on the ground from the top of a tower be 30º, then the angle of elevation of the top of the tower from the point A will be-

(A) 60º (B) 45º

(C) 30º (D) None of these

Q.5 Two poles of equal heights stand on either side of a 100 meters wide road. At a point between the poles, the angles of elevation of the tops of the poles are 30º and 60º. The height of each pole is -

(A) 25 m (B) $25\sqrt{3}$ m

(C) $\frac{100}{\sqrt{3}}$ m (D) None of these

Q.6 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 from the foot of the tower. Find the height of the flag- staff.

(A) 20 m (B) 30 m

(C) 25 m (D) 35 m

Q.7 A person walking along a straight road observes that a two points 1 km apart, the angles of elevation of a pole in front of him are 30º and 75º. The height of the pole is,

(A) 250 $(\sqrt{3}+1)$ m (B) 250 $(\sqrt{3}-1)$ m

(C) 225 $(\sqrt{2}-1)$ m (D) 225 $(\sqrt{2}+1)$ m

Q.8 An observer in a boat finds that the angle of elevation of a tower standing on the top of a cliff is 60º and that of the top of cliff is 30º. If the height of the tower be 60 meters, then the height of the cliff is -

(A) 30 m (B) $60\sqrt{3}$ m

(C) $20\sqrt{3}$ m (D) None of these

Q.9 A tree is broken by wind, its upper part touches the ground at a point 10 meters from the foot of the tree and makes an angle of 45º with the ground. The entire length of the tree is-

(A) 15 meters

(B) 20 meters

(C) 10 $(1+\sqrt{2})$ meters

(D) 10 $(1+\sqrt{3}/2)$ meters

Q.10 The length of the shadow of a pole inclined at 10º to the vertical towards the sun is 2.05 meters, when the elevation of the sun is 38º. The length of the pole is -

(A) $\frac{2.05\sin 38°}{\sin 42°}$ (B) $\frac{2.05\sin 42°}{\sin 38°}$

(C) $\frac{2.05\cos 38°}{\cos 42°}$ (D) None of these

Q.11 At a distance 2h from the foot of a tower of height h, the tower and a pole at the top of the tower subtend equal angles. Height of the pole should be -

(A) $\frac{5h}{3}$ (B) $\frac{4h}{3}$

(C) $\frac{7h}{5}$ (D) $\frac{3h}{2}$

Q.12 A flag-staff stands upon the top of a building. If at a distance of 40 meters from the base of the building, the angles of elevation of the topes of the flag-staff and the building are 60° and 30° respectively, then the height of the flag - staff is

(A) 46.17 m (B) 50 m

(C) 25 m (D) None of these

Question based on Directions or (3-D diagram)

Q.13 A tower subtends an angle α at a point A in the plane of its base and the angle of depression of the foot of the tower at a point ℓ meters just above A is β. The height of the tower is-

(A) $\ell \tan\beta \cot\alpha$ (B) $\ell \tan\alpha \cot\beta$

(C) $\ell \tan\alpha \tan\beta$ (D) $\ell \cot\alpha \cot\beta$

Q.14 The angle of elevation of the top of a hill from each of the vertices A, B, C of a horizontal triangle is α. The height of the hill is -

(A) b $\tan\alpha$. cosec B

(B) $\frac{1}{2}$ a $\tan\alpha$. cosec A

(C) $\frac{1}{2}$ c $\tan\alpha$. cosec C

(D) None of these

Q.15 The angle of elevation of the top of a TV tower from three points A, B, C in a straight line (in the horizontal plane) through the foot of the tower are α, 2α, 3α respectively. If AB = a, the height of the tower is -

(A) a $\tan \alpha$ (B) a $\sin \alpha$

(C) a $\sin 2\alpha$ (D) a $\sin 3\alpha$

Q.16 ABCD is a square plot. The angle of elevation of the top of a pole standing at D from A or C is 30º and that from B is θ, then $\tan \theta$ is equal to

(A) $\sqrt{6}$ (B) $1/\sqrt{6}$

(C) $\sqrt{3}/\sqrt{2}$ (D) $\sqrt{2}/\sqrt{3}$

Q.17 If the angles of a triangle are in the ratio 1 : 2 : 3, then their corresponding sides are in the ratio -

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

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

Q.18 The angle of elevation of the top of the tower observed from each of the three points A, B, C on the ground, forming a triangle is the same angle α. If R is the circum - radius of the triangle ABC, then the height of the tower is -

(A) R $\sin \alpha$ (B) R $\cos \alpha$

(C) R $\cot \alpha$ (D) R $\tan \alpha$

LEVEL- 2

Q.1 A house of height 100 meters subtends a right angle at the window of an opposite house. If the height of the window be 64 meter, then the distance between the two houses is -

(A) 48 m (B) 36 m (C) 54 m (D) 72 m

Q.2 On the level ground the angle of elevation of the top of a tower is 30º. On moving 20 mt. nearer the tower, the angle of elevation is found to be 60º. The height of the tower is-

(A) 10 m (B) 20 m (C) $10\sqrt{3}$ m (D) 15 m

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

(A) 4 min. (B) 4.5 min.(C) 1.5 min.(D) 2 min.

Q.4 The angles of elevation of the top of a tower from two point A and B on the ground distant a and b from the tower are complimentary. If the line AB passes through the foot of the tower, the height of the tower is -

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

Q.5 A vertical lamppost of height 9 metres stands at the corner of a rectangular field. The angle of elevation of its top from the farthest corner is 30º, while from another corner it is 45º. The area of the field is-

(A) $81\sqrt{2}$ metre^2 (B) $9\sqrt{2}$ metre^2

(C) $81\sqrt{3}$ metre^2 (D) $9\sqrt{3}$ metre^2

Q.6 A flagstaff stands vertically on a pillar, the height of the flagstaff being double the height of the pillar. A man on the ground at a distance finds that both the pillar and the flagstaff subtend equal angles at his eyes. The ratio of the height of the pillar and the distance of the man from the pillar, is-

(A) $\sqrt{3} : 1$ (B) 1 : 3

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

Q.7 The upper $\frac{3}{4}^{\text{th}}$ portion of a vertical pole subtends 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 – 2003]**

(A) 80 m (B) 20 m

(C) 40 m (D) 60 m

Q.8 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]**

(A) 20 m (B) 30 m

(C) 40 m (D) 60 m

Q.9 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 60º at the foot of the tower, and the angle of elevation of the top of the tower from A or B is 30º. The height of the tower is-**[AIEEE – 2007]**

(A) $2a/\sqrt{3}$ (B) $2a\sqrt{3}$

(C) $a/\sqrt{3}$ (D) $a\sqrt{3}$

Q.10 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 60º. 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 points A is 45º. Then the height of the pole is **[AIEEE – 2008]**

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

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

ANSWER KEY

LEVEL- 1

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ans.	D	C	B	C	B	A	A	A	C	A	A	A	B	B,C	C	B	B	D

LEVEL- 2

Q.No.	1	2	3	4	5	6	7	8	9	10
Ans.	A	C	C	C	A	C	C	A	C	A