










## Height and Distance

1. The angle of elevation of a tower from a distance 100 m from its foot is  $30^\circ$ . Height of the tower is
-  a)  $\frac{100}{\sqrt{3}}\text{m}$       b)  $50\sqrt{3}\text{m}$       c)  $\frac{200}{\sqrt{3}}\text{m}$       d)  $100\sqrt{3}\text{m}$
2. The tops of two poles of height 24 m and 36 m are connected by a wire. If the wire makes an angle of  $60^\circ$  with the horizontal, then the length of the wire is
-  a) 6m      b)  $8\sqrt{3}\text{m}$       c) 8m      d)  $6\sqrt{3}\text{m}$
3. From a point A on the ground, the angle of elevation of the top of a 20m tall building is  $45^\circ$ . A flag is hoisted at the top of the building and the angle of the elevation of the top of the flagstaff from A is  $60^\circ$ . Find the length of flagstaff and the distance of the building from point A.
-  a) 20m, 14.64m      b) 24m, 16.24m  
c) 26m, 16m      d) 32m, 14.54m
4. A man standing in one corner of a square football field observes that, the angle subtended by a pole in the corner just diagonally opposite to this corner is  $60^\circ$ . When he retires 80m from the corner, along the same straight line, he finds the angle to be  $30^\circ$ . What is the length of the field?
-  a) 40m      b) 120m      c)  $40\sqrt{2}\text{m}$       d)  $20\sqrt{2}\text{m}$
5. The angles of depression of two ships from the top of a light house are  $45^\circ$  and  $30^\circ$  towards East. If the ships are 200m apart, find the height of the light house?
-  a) 100m      b) 173m      c) 200m      d) 273m

6. When the angle of elevation of the sun increases from  $30^\circ$  to  $60^\circ$ , the shadow of a post is diminished by 5 meters. Then the height of the post is
-  a)  $\frac{5\sqrt{3}}{2}$ m      b)  $\frac{2\sqrt{3}}{5}$ m      c)  $\frac{2}{5\sqrt{3}}$ m      d)  $\frac{4}{5\sqrt{3}}$ m
7. A tower standing on a horizontal plane subtends a certain angle at a point 160m apart from the foot of the tower. On advancing 100m towards it, the tower is found to subtend an angle two as before. What is the height of the tower?
-  a) 80m      b) 100m      c) 160m      d) 200m
8. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle of  $30^\circ$  with it. The distance between the feet of the tree to the point where the top touches the ground is 12m. Find the height of the tree?
-  a)  $\frac{12}{\sqrt{3}}$ m      b)  $\frac{8}{\sqrt{3}}$ m      c)  $12\sqrt{3}$ m      d)  $4\sqrt{3}$ m
9. Two posts are  $x$  meters apart and the height of one is double that of the other. If from the midpoint of the line joining their feet, an observer finds the angular elevations of their tops to be complementary, and then what is the height of the shorter post?
-  a)  $x\sqrt{2}$       b)  $\frac{x}{\sqrt{2}}$       c)  $\frac{x}{2\sqrt{2}}$       d)  $\frac{x}{4}$
10. A pole stands vertically inside a scalene triangular park ABC. If the angle of elevation of the top of the pole from each corner of the park is the same, then in  $\triangle ABC$ , the foot of the pole is at the
- a) centroid      b) circumcentre  
c) incentre      d) orthocenter

11. A rail road curve is to be laid out on a circle. What radius should be used if the track is to change direction by  $25^\circ$  in a distance of 40 meters?
- a) 91.64 meters                      b) 90.46 meters  
c) 89.64 meters                      d) 93.64 meters
12. A telegraph post is bent at a point above the ground due to storm. Its top just meets the ground at a distance of  $8\sqrt{3}$  metres from its foot and makes an angle of  $30^\circ$ , then the height of the post is:
- a) 16 meters      b) 23 meters    c) 24 meters    d) 10 meters
13. There are two vertical posts, one on each side of a road, just opposite to each other. One post is 108 meter high. From the top of this post, the angles of depression of the top and foot of the other post are  $30^\circ$  and  $60^\circ$  respectively. The height of the other post, in meter, is
- a) 36                      b) 72                      c) 108                      d) 110
14. The angles of elevation of the top of a building and the top of the chimney on the roof of the building from a point on the ground are  $x$  and  $45^\circ$  respectively. The height of building is  $h$  meter. Then the height of the chimney, in meter, is:
- a)  $h \cot x + h$       b)  $h \cot x - h$     c)  $h \tan x - h$     d)  $h \tan x + h$
15. An aeroplane when flying at a height of 5000m from the ground passes vertically above another aeroplane at an instant, when the angles of elevation of the two aeroplanes from the same point on the ground are  $60^\circ$  and  $45^\circ$  respectively. The vertical distance between the aeroplanes at that instant is
- a)  $5000(\sqrt{3} - 1)m$                       b)  $5000(3 - \sqrt{3})m$   
c)  $5000(1 - \frac{1}{\sqrt{3}})m$                       d) 4500m

16. A man standing at a point P is watching the top of a tower, which makes an angle of elevation of  $30^\circ$ . The man walks some distance towards the tower and then his angle of elevation of the top of the tower is  $60^\circ$ . If the height of the tower is 30m, then the distance he moves is
- a) 22m                      b)  $22\sqrt{3}$ m                      c) 20m                      d)  $20\sqrt{3}$ m
17. The distance between two vertical poles is 60m. The height of one of the poles is double the height of the other. The angles of elevation of the top of the poles from the middle point of the line segment joining their feet are complementary to each other. The heights of the poles are:
- a) 10m and 20m    b) 20m and 40m  
c) 20.9m and 41.8m    d)  $15\sqrt{2}$ m and  $30\sqrt{2}$ m
18. There are two temples, one on each bank of a river, just opposite to each other. One temple is 54m high. From the top of this temple, the angles of depression of the top and the foot of the other temple are  $30^\circ$  and  $60^\circ$  respectively. The length of the temple is:
- a) 18m                      b) 36m                      c)  $36\sqrt{3}$ m                      d)  $18\sqrt{3}$ m
19. An aeroplane when flying at a height of 3125m from the ground passes vertically below another plane at an instant when the angles of elevation of the two planes from the same point on the ground are  $30^\circ$  and  $60^\circ$  respectively. The distance between the two planes at that instant is
- a) 6520m                      b) 6000m                      c) 5000m                      d) 6250m

20. The shadow of the tower becomes 60 meters longer when the altitude of the sun changes from  $45^\circ$  to  $30^\circ$ . Then the height of the tower is

- a)  $20(\sqrt{3} + 1)m$                       b)  $24(\sqrt{3} + 1)m$   
c)  $30(\sqrt{3} + 1)m$                       d)  $30(\sqrt{3} - 1)m$

## Answers

1 - a	2 - b	3 - a	4 - d	5 - d	6 - a	7 - a	8 - c	9 - c	10 - c
11 - a	12 - c	13 - b	14 - b	15 - c	16 - d	17 - d	18 - b	19 - d	20 - c

## Additional Examples

1. The angle of elevation of the top of a TV tower from three points A, B and C in a straight line through the foot of the tower are  $\alpha$ ,  $2\alpha$  and  $3\alpha$ , respectively. If  $AB = x$ , then the height of the tower is

- a)  $x \cos \alpha$       b)  $x \sin 2\alpha$       c)  $x \sin 3\alpha$       d)  $x \tan \alpha$

2. The length of a string between a kite and a point on the ground is 65 m. If the string makes an angle  $\alpha$  with the level ground such that  $\tan \alpha = \frac{12}{5}$ , how high is the kite?

- a) 60m                      b) 40m                      c) 35m                      d) 25m

3. The angle of elevation of an aeroplane from a point on the ground is  $45^\circ$ . After 15 second's flight, the elevation changes to  $30^\circ$ . If the aeroplane is flying at a height of 3000m, then the approximate speed of the plane in km per hour is .....

- a) 304.32      b) 152.16      c) 527      d) 263.5

4. A flagstaff of height  $(1/5)$  of the height of a tower is mounted on the top of the tower. If the angle of elevation of the top of the flagstaff as seen from the ground is  $45^\circ$  and the angle of elevation of the top of the tower as seen from the same place is  $\theta$ , then the value of  $\tan \theta$  is
- a)  $\frac{6}{5}$                       b)  $\frac{5\sqrt{3}}{6}$                       c)  $\frac{5}{6}$                       d)  $\frac{4}{5}$
5. A man standing in one corner of a square football field observes that the angle subtended by a pole in the corner just diagonally opposite to this corner is  $60^\circ$ . When he retires 80m from the corner, along the same straight line. He finds the angle to be  $30^\circ$ . The length of the field, in m, is:
- a) 40                      b)  $20\sqrt{2}$                       c) 20                      d)  $40\sqrt{2}$
6. From the top of a pillar of height 20m the angles of elevation and depression of the top and bottom of another pillar are  $30^\circ$  and  $45^\circ$  respectively. The height of the second pillar (in metre) is:
- a)  $\frac{20}{\sqrt{3}}(\sqrt{3} - 1)$  m                      b)  $\frac{20}{\sqrt{3}}(\sqrt{3} + 1)$  m
- c)  $20\sqrt{3}$  m                      d)  $\frac{20}{\sqrt{3}}$  m
7. A balloon of radius  $r$  makes an angle  $\alpha$  at the eye of an observer and the angle of elevation of its centre is  $\beta$ . The height of its centre from the ground level is given by:
- a)  $r \sin \beta \operatorname{cosec} \alpha/2$                       b)  $r \operatorname{cosec} \alpha / 2 \sin \alpha$
- c)  $r \operatorname{cosec} \alpha \sin \beta$                       d) None of these
8. At the foot of a mountain the elevation of its summit is  $45^\circ$ ; after ascending 1000m towards the mountain up a slope of  $30^\circ$  inclination, the elevation is found to be  $60^\circ$ , Find the height of the mountain:
- a)  $\frac{\sqrt{3}+1}{2}$  km                      b)  $\frac{\sqrt{3}-1}{2}$  km                      c)  $\frac{\sqrt{3}}{2}$  km                      d)  $\frac{1}{\sqrt{3}}$  km

9. A tower on horizontal ground leans towards the north. At two points due south at distance  $a$  and  $b$  respectively from the foot, the angular elevations of the top of the tower are  $\alpha$  and  $\beta$ .

Find the inclination  $\theta$  of the tower to the horizon.

a)  $\frac{b \cot \alpha + a \cot \beta}{a - b}$

b)  $\frac{b \sin \alpha + b \cos \beta}{b - a}$

c)  $\frac{b \cot \alpha - a \cot \beta}{b - a}$

d) None of these

10. P and Q are two points observed from the top of a building  $10\sqrt{3}$  m high. If the angles of depression of the points are complementary and  $PQ = 20$  m, then the distance of P from the building is

a) 25m

b) 45m

c) 30m

d) 40m

### Answers

1 - b	2 - a	3 - c	4 - c	5 - b	6 - b	7 - a	8 - a	9 - b	10 - c
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