Trigonometry Height and Distance

1) If the angle of elevation of the sun increases from 45° to 60°, then the length of the shadow of a pillar is decreased by 60 m. Find the height of the pillar.
Ans: 7.1 m (approx)

2) If the angle of elevation of the Sun decreases from 45° to 30°, then the length of the shadow of a pillar increases by 60 m. Find the height of the pillar.
Ans: 81.96 m (approx)

3) There is a bridge perpendicular to the river bank. If you go some distance from one side of the bridge along the river bank, the other end of the bridge is seen at an angle of 45° and if you move another 400 meters along the bank, that end is seen at an angle of 30°. Find the length of the bridge.
Ans: 200(√3+1) m

4) There is a flagpole on a memorial monument. When the angle of elevation of the Sun is 30°, the shadow length of the flagpole is 3√3 meters. What is the height of the flagpole?
Ans: 3 m

5) A pole of 126 decimeters high tilted slightly above the ground and its top point touched the ground at an angle of 30°. How high is the pole twisted?
Ans: 42 decimeters

6) 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√3 meters from its foot and makes an angle of 30° with the horizontal. Then find the height at which the post is bent. Also find its total height.
Ans: 8 m, 24 m

7) The heights of two towers are 180 meters and 60 meters respectively. If the angle of elevation of the top of the first tower from the base of the second tower is 60°, what is the angle of elevation of the top of the second tower from the base of the first tower.
Ans: $30°$

8) The height of the two pillars is h_1 m and h_2 m respectively. If the angle of elevation of the first peak from the base of the second pillar is 60° and the angle of elevation of the second peak from the base of the first is 30°, show that the height of the first pillar is three times the height of the second.
Ans:

9) The ratio of the height of the two pillars is 1:3. If the angle of elevation from the foot of the smaller pillar to the peak of the larger pillar is 60°, what is the angle of elevation from the foot of the larger pillar to the pinnacle of the smaller pillar?
Ans: 30°

10) The heights of two towers are h_1 meter and h_2 meter. If the angle of elevation of the top of the first tower from the foot of the second tower is 60° and the angle of elevation of the second tower from the foot of the first tower is 45°, then prove that $h_1^2 = 3h_2^2$

Ans:

11) From a point on the roof a house of 11 meters height, it is observed that the angles of depression of the top and foot of a lamp post are 30° and 60° respectively. Find the height of the lamp post.

Ans: 7.34 m

12) From the roof of a five-storey building of 18 meters high, the angle of elevation of the top of the monument is 45° and the angle of depression at the foot of the monument is 60°. Find the height of the monument? [√3 = 1.732]

Ans: 28.392 m (approx)

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 h meters just above A is β. Prove that the height of the tower is $h. \tan \alpha. \cot \beta$ meters.

Ans:

14) A boy standing in the middle of a field, observes a flying bird in the north at an angle of elevation of 30° and after 2 minutes, he observes the same bird in the south at an angle of elevation of 60°. If the bird flies all along in a straight line at a height of 50√3 m, then find its speed in km/h.

Ans: 6 km/hr

15) A man standing on a railway overbridge of 5√3 m height observed the engine of the train from one side of the bridge at an angle of depression of 30°. But just after 2 seconds, he observed the engine at an angle of depression of 45° from the other side of the bridge. Find the speed of the train in m/s unit.

Ans: 11.83 m/s

16) An aeroplane is flying parallel to the road at an altitude of 3000 meters at a speed of 100√3 m/s over a straight road. From a point on the road, a man first saw the aeroplane at an angle of elevation 60° to its left and then at an angle of elevation 30° on its right. What is the time difference between those two observations?

Ans: 40 sec

17) A passenger of an airplane observes that Howrah station is at one side of the plane and Saheed Minar is just on the opposite side. The angles of depression of Howrah station and Saheed Minar from the passenger of airplane are 60° and 30° respectively. If the airplane is at a height of 545√3 meters at that time, let us find the distance between Howrah station and Saheed Minar.

Ans: 2180 m

18) If the angle of depression of two consecutive kilometer stones on a road from an airplane are 60° and 30° respectively. Find the height of the airplane, (i) when the two kilometer stones stand on opposite side of the airplane, (ii) when the two stones stand on the same side of the airplane.

Ans: (i) 250√3 meters, (ii) 500√3 meters.

19) The angle of elevation of the top of an unfinished pillar from a point 150 meters away from its base is 45°. Calculate the height of the pillar that must be raised so that its new angle of elevation from the same point be 60°.

Ans: 109.8 m

20) The length of the flag at the roof of three-storied building is 3.3 meters. From any point of road, the angles of elevation of the top and foot of the flag-post are 50° and 45°. Calculate the height of three-storied building. [tan 50° = 1.192]

Ans: 17.19 m (approx)

21) There is an h meter high flag bar on a pillar. If the angle of elevation of the top and foot of the flag bar from any point on the ground is α and β respectively, what is the height of the pillar?

Ans: $\dfrac{h \tan \beta}{\tan \alpha - \tan \beta}$

22) A vertical pillar of height h cm stands on the plane ground. At a fixed point on the plane ground the height of the top of the pillar and that of a point x cm below the top subtend angles 60° and 30° respectively. Prove that $x = \dfrac{2h}{3}$

Ans:

23) Two pillars of equal heights stand on either side of a road which is 150 m wide. At a point on the road between the pillars, the angles of elevation of the top of the pillars are 60° and 30°. Find the height of each pillar.

Ans: $\dfrac{75\sqrt{3}}{2}$ m

24) The distance between two pillars is 120√2 meters. The height of one pillar is twice the other. The angles of elevation of their tops from the midpoint of the line connecting their feet are complementary to each other. Find the height of the pillars.

Ans: 60 m, 120 m

25) The distance between two pillars is 150 meters. The height of one pillar is thrice the other. The angles of elevation of their tops from the midpoint of the line connecting their feet are complementary to each other. Find the height of the smaller pillar.

Ans: $25\sqrt{3}$ m

26) From a side of a river of 600 meters wide, two boats start in two different directions to reach the opposite side of the river. The first boat moves making an angle of 30° with this bank and the second boat moves making an angle 90° with direction of the first boat. What will be the distance between the two boats when both of them reach the other side?

Ans: 1385.6 m (approx)

27) The angles of elevation of the top of a tower from two points at distances d_1 and d_2 units from the base and in the same straight line with it, are complementary. Prove that the height of the tower is

$\sqrt{d_1 d_2}$ unit.

<u>Ans:</u>

28) The angle of elevation of a cloud from a point 60 m above the surface of the water of a lake is 30° and the angle of depression of its shadow from the same point in water of lake is 60°. Find the height of the cloud from the surface of water.

<u>Ans:</u> 120 m

29) If the angle of elevation of a cloud from a point h meters above a lake is α and the angle of depression of its reflection in the lake is β, prove that the distance of the cloud from the point of observation is $\dfrac{2h \sec \alpha}{\tan \beta - \tan \alpha}$

<u>Ans:</u>

30) The angle of elevation of the hilltop from the foot of a hill is 45°. Climbing up 2 km along the bottom at a 30° angle to the hill, the top of the hill can be seen at an angle of 60°. Find the height of the mountain.

<u>Ans:</u> $\left(\sqrt{3} + 1\right)$ km

31) A ladder rests against a vertical wall at an inclination α to the horizontal. Its foot is pulled away from the wall through a distance p unit so that its upper end slides q unit down the wall and then ladder make an angle β to the horizontal. Show that, $\dfrac{p}{q} = \dfrac{\cos \beta - \cos \alpha}{\sin \alpha - \sin \beta}$

<u>Ans:</u>