MATHEMATICS

9. Application to Trigonometry

Name: _____ Date:_____ Class: X Sec: ___

1. At some time of the day, the length of the shadow of a tower is equal to its height. Then the Sun's angle of elevation at that time is _____.
   a) 60^0 b)30^0 c) 45^0 d) 90^0

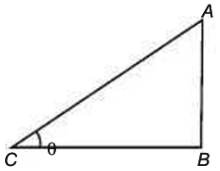
2. A tower stands vertically on the ground. From a point on the ground which is 25m away from the foot of the tower, the angle of elevetion of the top of the tower is found to be 45^0. Then the height (in meters) of the tower is :
   (A) $25\sqrt{2}$ (B) $25\sqrt{3}$
   (C) 25 (D) 12.5

3. The length of the shadow of a tower on the plane ground is $\sqrt{3}$ times the height of the tower. The angle of elevation of sun is :
   (A) 45° (B) 30°
   (C) 60° (D) 90°

4. The angle of depression of a car, standing on the ground, from the top of a 75m high tower, is 30^0 . The distance of the car from the base of the tower (in meter) is :
   (A) $25\sqrt{3}$ (B) $50\sqrt{3}$
   (C) $75\sqrt{3}$ (D) 150

5. A ladder makes an angle of 60^0 with the ground when placed against a wall. If the foot of the ladder is 2m away from the wall, then the length (in meters) is :
   (A) $\frac{4}{\sqrt{3}}$ (B) $4\sqrt{3}$
   (C) $2\sqrt{2}$ (D) 4

6. In the following figure, a tower AB is 20 m high and BC, its shadow on the ground is $20\sqrt{3}$m long. Find the Sun's altitude:



7. From the top of a vertical tower, the angles of depression of two cars, in the same straight line with the base of the tower, at an instant are found to be 45^0 *and* 60^0. If the cars are 100m apart and are on the same side of the tower. Find the height of the tower. (use $\sqrt{3} = 1.73$)

8. A kite is flying at a height of 45m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60^0 .
   Find the length of the string assuming that there is no slack in the string.

9. The horizontal distance between two poles is 15m. The angle of depression of the top of first pole as seen from the top of second pole is 30^0. If the height of the second pole is 24m, find the height of the first pole. (use $\sqrt{3} = 1.732$).

10. Two ships are there in the sea on either side of a light house in sucha way that the ships and the light house are in the same straight line. The angles of depression of two ships as observed from the top of the light house are 60^0 and 45^0. If the height of the light house is 200m, find the distance between the two ships. (use $\sqrt{3} = 1.73$).

11. Two poles of equal heights are standing opposite to each other on either side of the roads, which is 80m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60^0 and 30^0 respectively. Find the height of the poles and the distances of the point from the poles.

12. The angles of elevation and depression of the top and the bottom of a tower from the top of a building 60m high are are 30^0 and 60^0 respectively. Find the difference between the heights of the building and the tower and the distance between them.

13. At a point A, 20 metres above the level of water in a lake, the angle of elevation of a cloud is 30^0. The angle of depression of the reflection of the cloud in the lake, at A is 60^0. Find the distance of the clould from A.

14. The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60^0. From a point Y, 40 m vertically above X, the angle of elevation of the top Q of tower is 45^0 . Find the height of the tower PQ and the distance PX. (use $\sqrt{3} = 1.73$)

15. An aeroplane is flying at a height of 300m above the ground. Flying at this height, the angles of depression from the aeroplane of two points on both banks of a river in opposite directions are 45^0 and 30^0 respectively. Find the width of the river. (use $\sqrt{3} = 1.732$)

16. As observed from the top of a 100m high light house from the sea-level, the angles of depression of two ships are 30^0 *and* 45^0. If one ship is exactly being the other on the same side of the light house, find the distance between the two ships. (use $\sqrt{3} = 1.732$)

17. The angle of elevation of the top of a hill from the foot of a tower 60^0 and the angle of depression from the top of the tower to the foot of the hill is 30^0 . If the tower is 50 m high, find the height of the hill.

18. The angle of depression of two ships from the top of a light house on the same side of it are found to be 45^0 and 30^0. If the ships are 200m apart, then find the height of the light house.

19. From the top of a tower 100m high, a man observes two cars on the opposite sides of the tower with angles of depression 30^0 and 45^0 respectively. Find the distance between the cars.
[use $\sqrt{3} = 1.732$]

20. As observed from the top of light house, 50 m above sea level the angle of depression of ship, sailing directly towards it, changes from 30^0 to 45^0. Determine the distance travelled by the ship.

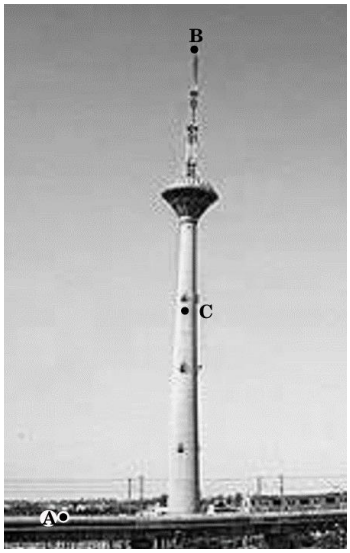
21. Two lamp posts are of equal height. A boy measured the elevation of the top of each lamp-post from the mid-point of the line-segment joining the feet of lamp-post as 30^0. After walking 15m towards one of them, he measured the elevation of the top of the neasrest lamp-post at the point where he stands as 60^0. Determine the height of each lamp-post and the distance between them.

22. The angleof elevation of the top of a tower at a distance of 120m from a point A on the ground is 45^0. If the angle of elevation of the top of a flagstaff fixed at the top of the tower, from A is 60^0, then find the

height of the flagstaff. [Use $\sqrt{3} = 1.732$]

CASE STUDY

23. The following TV Tower was built in 1988 and is located in Pitampura, Delhi. It has an observation deck. Observe the picture given below :



The TV tower stands vertically on the ground. From a point "A" on the ground, the angle of elevation of top of the tower (point"B") is 60^0. There is a point "C" on the tower which is 78 m (apporx.) above the ground.

The angle of elevation of the point C from point A is found to be 30^0.

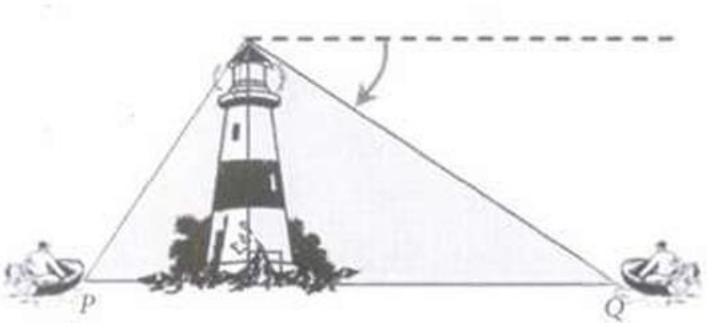
(a) Draw a well-labelled figure, based on the information given above.
(b) Find the height of the tower and the distance of the tower from point A.

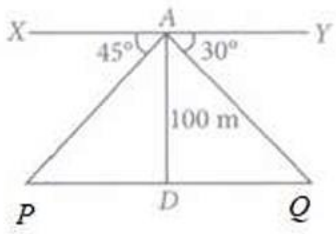
24. Gadisar lake is located in the Jaisalmer district of Rajasthan. It was built by King of Jaisalmer and rebuilt by Gadsi Singh in 14th century. The lake has many Chhatris. One of them is shown below:

Observe the picture. From a point "A" which is h m above from water level, the angle of elevation of top of Chhatri (point B) is 45^0 and angle of depression of its reflection in water (point C) is 60^0. If the heigh tof Chhatri above water level is (approximately) 10m, then

a) Draw a well-labelled figure based on the above information:
b) Find the heigh (h) of the point A above water level. (use $\sqrt{3} = 1.73$)

A boy is standing on the top of light house. He observed that boat P and Q are approaching the light house from oppostie directions. He finds that angle of depression of boat P is 45^0 and angle of depression of boat Q is 30^0. He also knows that height of the light house is 100m.





Based on the above information, answer the following questions:

i) What is the measure of $\angle APD$?

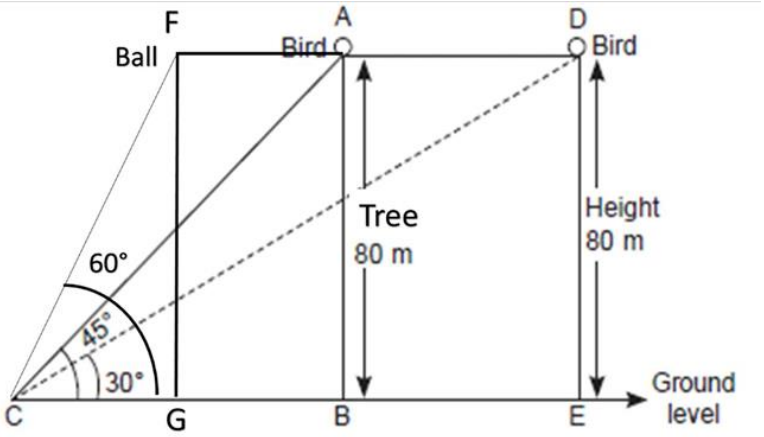
ii) If $\angle YAQ = 30^0$, then $\angle AQD$ is also 30^0, why?

iii) Find the length of PD

OR

Find the length of DQ.

25. One evening, Kaushik was in a park. Children were playing cricket. Birds were singing on a nearby tree of height 80m. He observed a bird on the tree at an angle of elevation of 45°. When a sixer was hit, a ball flew through the tree frightening the bird to fly away. In 2 seconds, he observed the bird flying at the same height at an angle of elevation of 30° and the ball flying towards him at the same height at an angle of elevation of 60°.



(i) At what distance from the foot of the tree was he observing the bird sitting on the tree?

(ii) (A) How far did the bird fly in the mentioned time?

(or)

(B) After hitting the tree, how far did the ball travel in the sky when Kaushik saw the ball?

(iii) What is the speed of the bird in m/min if it had flown $20(\sqrt{3} + 1)$ m?