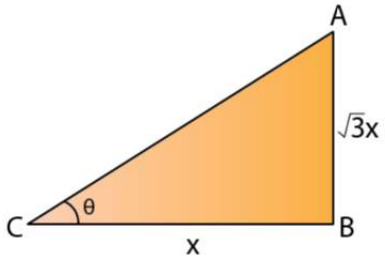
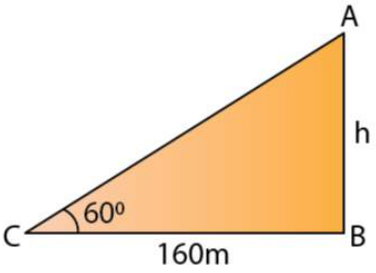
Exercise 22(A) Page No: 336

1. The height of a tree is √3 times the length of its shadow. Find the angle of elevation of the sun.
Solution:



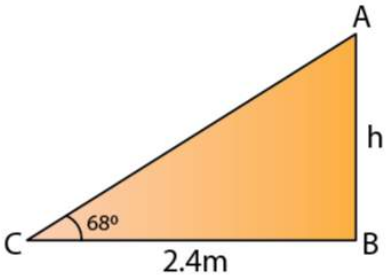
Let's assume the length of the shadow of the tree to be x m.
So, the height of the tree = √3 x m
If θ is the angle of elevation of the sun, then we have
tan θ = √3 x/ x = √3 = tan 60°
Therefore, θ = 60°

2. The angle of elevation of the top of a tower from a point on the ground and at a distance of 160 m from its foot, is found to be 60°. Find the height of the tower.
Solution:



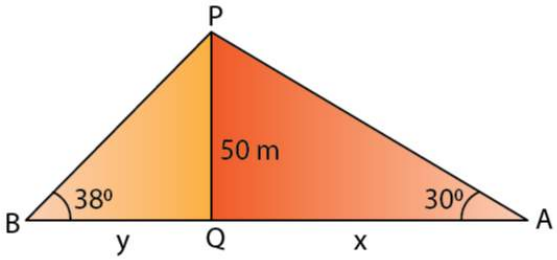
Let's take the height of the tower to be h m.
Given that, the angle of elevation is 60°
So, tan 60° = h/160
√3 = h/160
h = 160√3 = 277.12 m [For √3 = 1.732]
Thus, the height of the tower is 277.12 m.

3. A ladder is placed along a wall such that its upper end is resting against a vertical wall. The foot of the ladder is 2.4 m from the wall and the ladder is making an angle of 68° with the ground. Find the height, up to which the ladder reaches.
Solution:



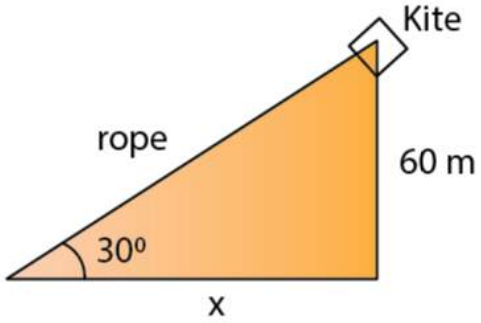
Let's take the height upto which the ladder reaches as 'h' m.
Given that, the angle of elevation is 68°
So, tan 68° = h/ 2.4
2.475 = h/2.4
h = 2.475 x 2.4 = 5.94 m
Thus, the ladder reaches upto a height of 5.94 m.

4. Two persons are standing on the opposite sides of a tower. They observe the angles of elevation of the top of the tower to be 30° and 38° respectively. Find the distance between them, if the height of the tower is 50 m.
Solution:



Let one of the persons, A be at a distance of 'x' m and the second person B be at a distance of 'y' m from the foot of the tower.
Given that angle of elevation of A is 30°
tan 30° = 50/x
1/√3 = 50/x
x = 50√3 = 86.60 m
And the angle of elevation of B is 38°
So, tan 38° = 50/y
0.7813 = 50/ y
y ≈ 64 m
Thus, the distance between A and B is x + y = 150.6 m

5. A kite is attached to a string. Find the length of the string, when the height of the kite is 60 m and the string makes an angle 30° with the ground.
Solution:



Let's assume the length of the rope to be x m.
Now, we have
sin 30° = 60/x
½ = 60/x

x = 120 m
Thus, the length of the rope is 120 m.

6. A boy, 1.6 m tall, is 20 m away from a tower and observes the angle of elevation of the top of the tower to be (i) 45º, (ii) 60º. Find the height of the tower in each case.
Solution:

Let's consider the height of the tower to be 'h' m.
(i) Here, $\theta = 45^o$
$\tan 45^o = (h - 1.6)/ 20$
$1 = (h - 1.6)/ 20$
$h = 21.6$ m
Thus, the height of the tower is 21.6 m.

(ii) Here, $\theta = 60^o$
$\tan 60^o = (h - 1.6)/ 20$
$\sqrt{3} = (h - 1.6)/ 20$
$h = 20 \times \sqrt{3} + 1.6 = 36.24$ m
Thus, the height of the tower is 36.24 m.