ODM EDUCATIONAL GROUP
Changing your Tomorrow

SOME APPLICATIONS OF TRIGONOMETRY

INTRODUCTION

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 09
CHAPTER NAME : SOME APPLICATIONS OF TRIGONOMETRY

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LEARNING OUTCOME

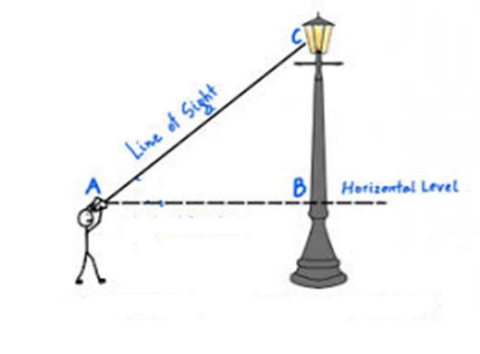
1. Students will be able to know the meaning of line of sight, angle of elevation & angle of depression.
2. Students will be able to analyze word problem and draw the corresponding figure.
3. Students will be able to apply the knowledge of trigonometry in solving real life problems.

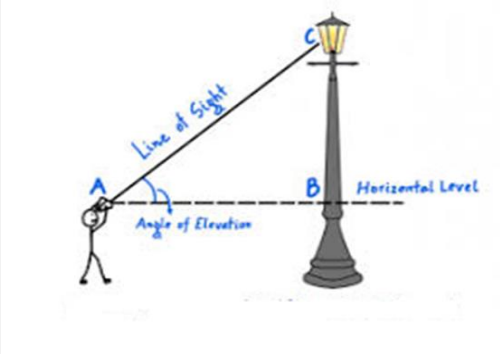
Line of sight: line of sight is the line drawn from the eye of an observer to the point in the object viewed by the observer

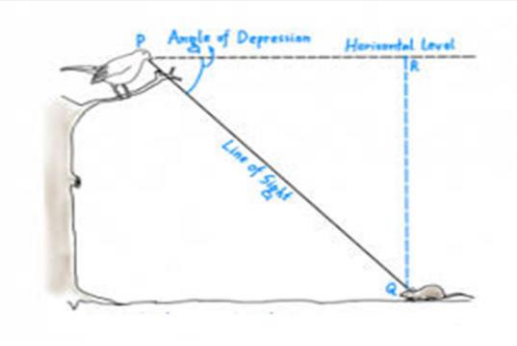
Horizontal level: It is the horizontal line through the eye of the observer

Angle of elevation: The angle of elevation of the point viewed is the angle formed by the line of sight with the horizontal when the point being viewed is above the horizontal level, i.e., the case when we raise our head to look at the object.

Angle of depression: The angle of depression of a point on the object being viewed is the angle formed by the line of sight with the horizontal when the point is below the horizontal level, i.e., the case when we lower our head to look at the point being viewed







Introduction, Heights and distances, angle of elevation, angle of depression

; https://youtu.be/0Cz2DJ_bujo(12.15)

1. The height of a tower is 10 m. Calculate the length of its shadow when sun's altitude is 45°.

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Let AB be the tower of height 10 m and BC be its shadow.

Then, $\angle ACB = 45°$.

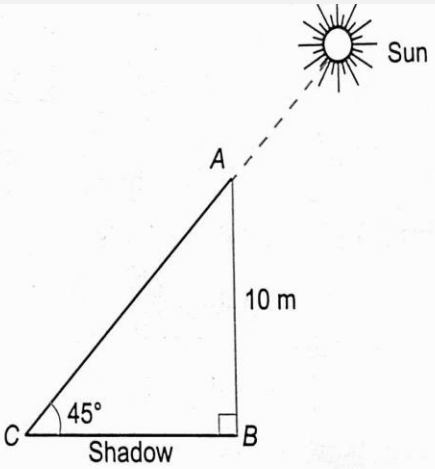
From right ΔABC, we have

$$\tan 45° = \frac{AB}{BC}$$

$$\Rightarrow \quad 1 = \frac{10}{BC}$$

$$\therefore \quad BC = 10 \text{ m}$$

Hence, the length of the shadow is 10 m.



2 .A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30°.

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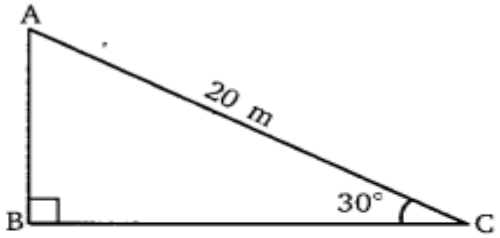
Given: length of the rope (AC) = 20 m, and $\angle ACB = 30°$

Let height AB of pole be h m.



Then in right ΔABC,

$$\sin 30° = \frac{AB}{AC}$$

$$\Rightarrow \quad \frac{1}{2} = \frac{h}{20} \qquad \left[\because \sin 30° = \frac{1}{2}\right]$$

$$\Rightarrow \quad h = \frac{20}{2} = 10 \text{ m}$$

Hence, height of the pole = 10 m

3. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.

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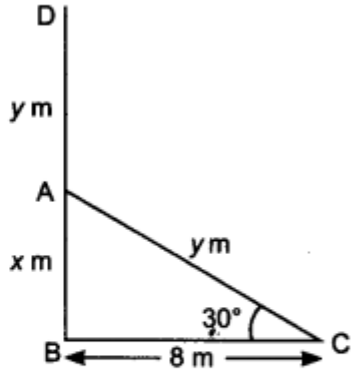
Let DB is a tree and AD is the broken part of it which touches the ground at C.

Given: $\angle ACB = 30°$ and $BC = 8$ m

Let $AB = x$ m and $AD = y$ m

$\therefore$ **Now,** length of the tree $= (x + y)$ m



In ΔABC,

$$\frac{AB}{BC} = \tan 30° \Rightarrow \frac{x}{8} = \frac{1}{\sqrt{3}} \Rightarrow x = \frac{8}{\sqrt{3}} \quad \ldots (i)$$

and $$\frac{AB}{AC} = \sin 30° \Rightarrow \frac{x}{y} = \frac{1}{2}$$

$$\Rightarrow \quad y = 2x \Rightarrow y = 2 \times \frac{8}{\sqrt{3}} = \frac{16}{\sqrt{3}}$$ [From equation (i)]

Hence, total height of the tree

$$x + y = \frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}} = \frac{24}{\sqrt{3}} = \frac{24}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{24\sqrt{3}}{3} = 8 \times 1.732 = 13.856 \text{ m}$$

4. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30°. Find the height of the tower.

4. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30°. Find the height of the tower.

Let AB be a tower of height h metres and C be a point on the ground such that

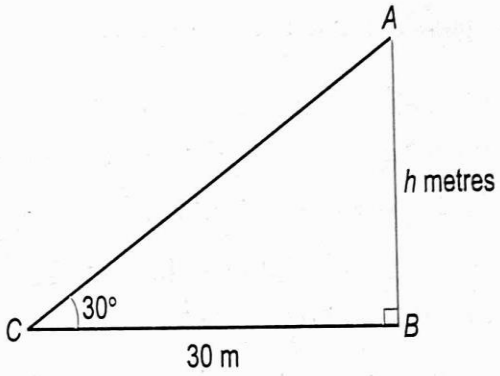
$BC = 30\,\text{m}$ and $\angle ACB = 30°$

From right ΔABC, we have

$$\tan 30° = \frac{AB}{BC} \quad \Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{30}$$

$$\therefore \quad h = \frac{30}{\sqrt{3}} = \frac{30}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 10\sqrt{3}\,\text{m}$$

Hence, the height of the tower is $10\sqrt{3}$ m.



HOME ASSIGNMENT Ex. 9.1 Q. 1 to Q 4

AHA

1. 1.The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun’s altitude is 30° than when it is 60°. Find the height of the tower..

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THANKING YOU

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