SOME APPLICATIONS OF TRIGONOMETRY
PPT-2

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

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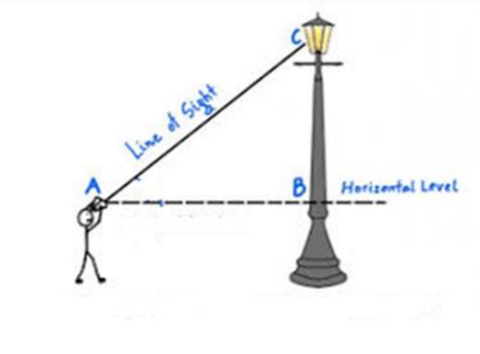
PREVIOUS KNOWLEDGE TEST

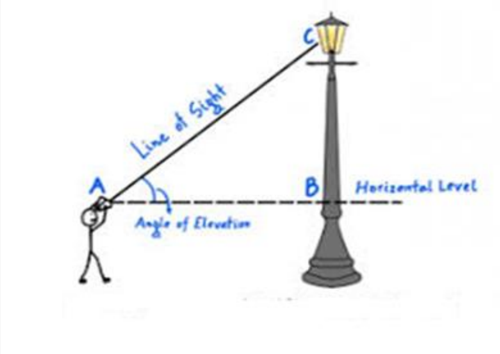
Line of sight: line of sight is the line drawn from the eye of an observer to the point in the object viewed by the observer

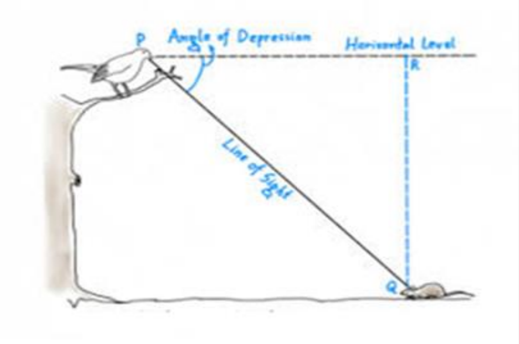
Horizontal level: It is the horizontal line through the eye of the observer

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







LEARNING OUTCOME

1 . Students will be able to know some ratios of the sides of a right triangle with respect to its acute angles.

2. Students will be able to know the relations between t- ratios.

3. Students will be able to apply and analyze trigonometry ratios in solving real life problems.

Problem solving on heights and distances

; https://youtu.be/LY5Zk9KZyAI (6.05)

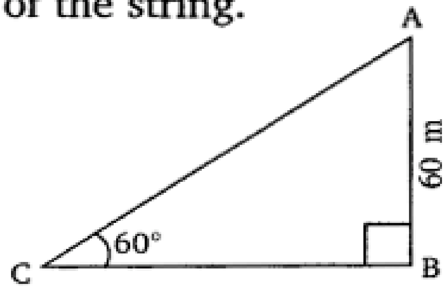
1. A kite is flying at a height of 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.

1. A kite is flying at a height of 60 m 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°. Find the length of the string, assuming that there is no slack in the string.

Given: $AB = 60$ m and $\angle ACB = 60°$

Let AC be the length of the string.

Then in right ΔABC,



$$\sin 60° = \frac{AB}{AC}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{60}{AC}$$

$$\Rightarrow AC = \frac{60 \times 2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{120 \times \sqrt{3}}{3} = 40\sqrt{3} \text{ m.}$$

Hence, the length of the string is **$40\sqrt{3}$ m**.

2. A 1.5 m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the building increases from 30° to 60° as he walks towards the building. Find the distance he walked towards the building.

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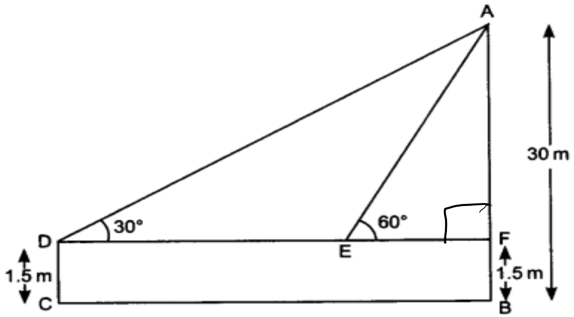
Let AB = height of the building

Given: $\angle ADF = 30°$, $\angle AEF = 60°$

$$AF = AB - FB \quad [\because CD = BF]$$

$$= 30 \text{ m} - 1.5 \text{ m} = 28.5 \text{ m}$$



In ΔAFE,

$$\frac{AF}{EF} = \tan 60°$$

$$\Rightarrow \frac{28.5}{EF} = \sqrt{3}$$

$$\Rightarrow EF = \frac{28.5}{\sqrt{3}} \text{ m}$$

In ΔAFD,

$$\frac{AF}{DF} = \tan 30°$$

$$\Rightarrow \frac{28.5}{DF} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow DF = 28.5\sqrt{3} \text{ m}$$

The distance walked by the boy towards building

$$DE = DF - EF$$

$$= 28.5\sqrt{3} - \frac{28.5}{\sqrt{3}} = \frac{28.5 \times 3 - 28.5}{\sqrt{3}} = \frac{28.5(3-1)}{\sqrt{3}}$$

$$= \frac{28.5 \times 2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{57\sqrt{3}}{3} = 19\sqrt{3} \text{ m}$$

3. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

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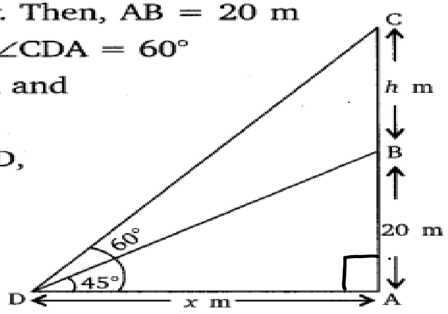
Let AB be the building and BC be the transmission tower. Then, AB = 20 m

$\angle BDA = 45°$ and $\angle CDA = 60°$

Also, let DA = x m and

BC = h m



Then in right ΔBAD,

$$\tan 45° = \frac{AB}{DA}$$

$$\Rightarrow \quad 1 = \frac{20}{x}$$

$$\Rightarrow \quad x = 20 \quad \ldots(i)$$

In right ΔCAD,

$$\tan 60° = \frac{AC}{DA} \quad \Rightarrow \quad \sqrt{3} = \frac{20+h}{x}$$

$$\Rightarrow \quad x = \frac{20+h}{\sqrt{3}} \quad \ldots(ii)$$

From equations (i) and (ii), we get:

$$\frac{20+h}{\sqrt{3}} = 20 \quad \Rightarrow \quad 20 + h = 20\sqrt{3}$$

$$\Rightarrow \quad h = 20(\sqrt{3}-1)\text{m}.$$

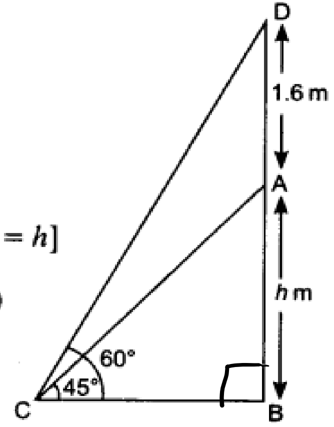
Hence, the height of the tower is **$20(\sqrt{3}-1)$m.**

4. A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal.

4. A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal.

Let the height of the pedestal AB = h m

Given: height of the statue = 1.6 m, ∠ACB = 45° and ∠DCB = 60°



In ΔABC, $\frac{AB}{BC} = \tan 45° \Rightarrow \frac{h}{BC} = 1 \Rightarrow BC = h$

In ΔDBC, $\frac{DB}{BC} = \tan 60°$

$\Rightarrow \frac{1.6+h}{h} = \sqrt{3}$ [∵ BC = h]

$\Rightarrow 1.6 + h = \sqrt{3}h \Rightarrow 1.6 = \sqrt{3}h - h \Rightarrow 1.6 = h(\sqrt{3} - 1)$

$\Rightarrow \frac{1.6}{\sqrt{3}-1} = h \Rightarrow \frac{1.6}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = h$

$\Rightarrow \frac{1.6(\sqrt{3}+1)}{3-1} = h \Rightarrow \frac{1.6(\sqrt{3}+1)}{2} = h \Rightarrow h = 0.8(\sqrt{3}+1)$

Hence, height of the pedestal $= 0.8(\sqrt{3}+1)$m

5.The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, find the height of the building.

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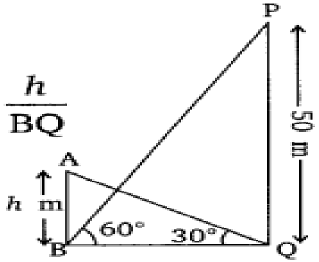
Given: height of the tower AB = 50 m,

Let h m be the height of the building

Then in right ΔABQ,



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

$$\Rightarrow \quad BQ = h\sqrt{3} \quad \dots (i)$$

In right ΔPQB,

$$\tan 60° = \frac{PQ}{BQ} \Rightarrow \sqrt{3} = \frac{50}{BQ}$$

$$\Rightarrow BQ\sqrt{3} = 50 \Rightarrow h\sqrt{3} \times \sqrt{3} = 50 \quad \text{[From (i)]}$$

$$\Rightarrow \quad 3h = 50$$

$$\Rightarrow \quad h = \frac{50}{3} = 16\frac{2}{3} \text{ m.}$$

Hence, the height of the building is **$16\frac{2}{3}$ m.**

HOME ASSIGNMENT Ex. 9.1 Q. No 5 to Q9

AHA

1. The angles of depression of the top and the bottom of an 8 m tall building from the top of a multistoried building are 30° and 45°, respectively. Find the height of the multistoried building and the distance between the two buildings.

2. An observer 1.5 m tall is 28.5 m away from a chimney. The angle of elevation of the top of the chimney from her eyes is 45°. What is the height of the chimney?.

THANKING YOU

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