

SOME APPLICATIONS OF TRIGONOMETRY

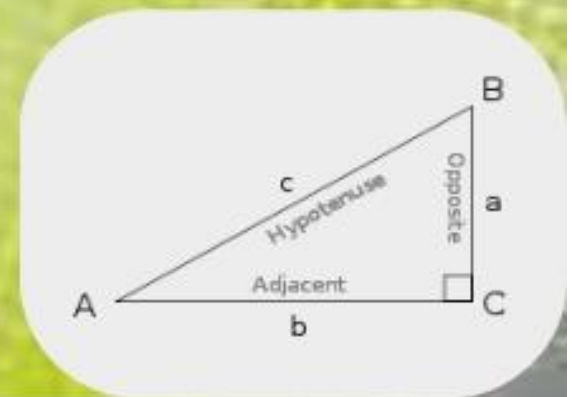
THE LADDER NEEDS TO BE 29.44 M IN ORDER
TO SAVE THE CAT



CREATED USING
PowToon

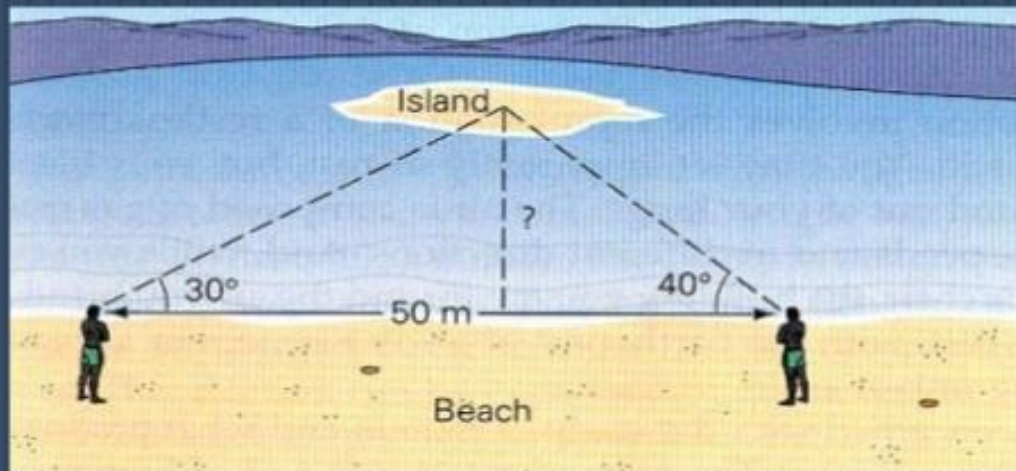
What is Trigonometry?

Trigonometry is a branch of mathematics that studies triangles and the relationships between their sides and the angles between these sides.



Introduction

- **Trigonometry** is the branch of mathematics that deals with triangles particularly right triangles. For one thing trigonometry works with all angles and not just triangles. They are behind how sound and light move and are also involved in our perceptions of *beauty* and other facets on how our mind works. So trigonometry turns out to be the fundamental to pretty much everything!



Line of Sight

**We observe generally that children usually look up to see an aeroplane when it passes overhead. This line joining their eye to the plane, while looking up is called
Line of sight**

Angle of Elevation

The angle which the line of sight makes with a horizontal line drawn away from their eyes is called the angle of Elevation of aeroplane from them.

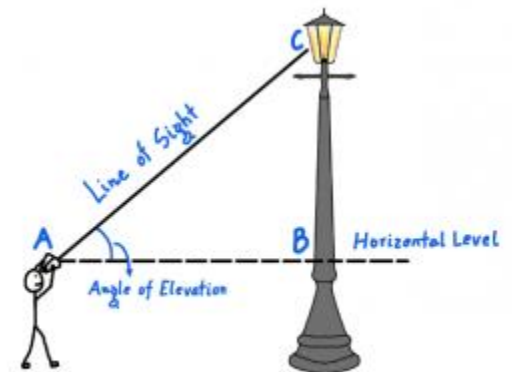
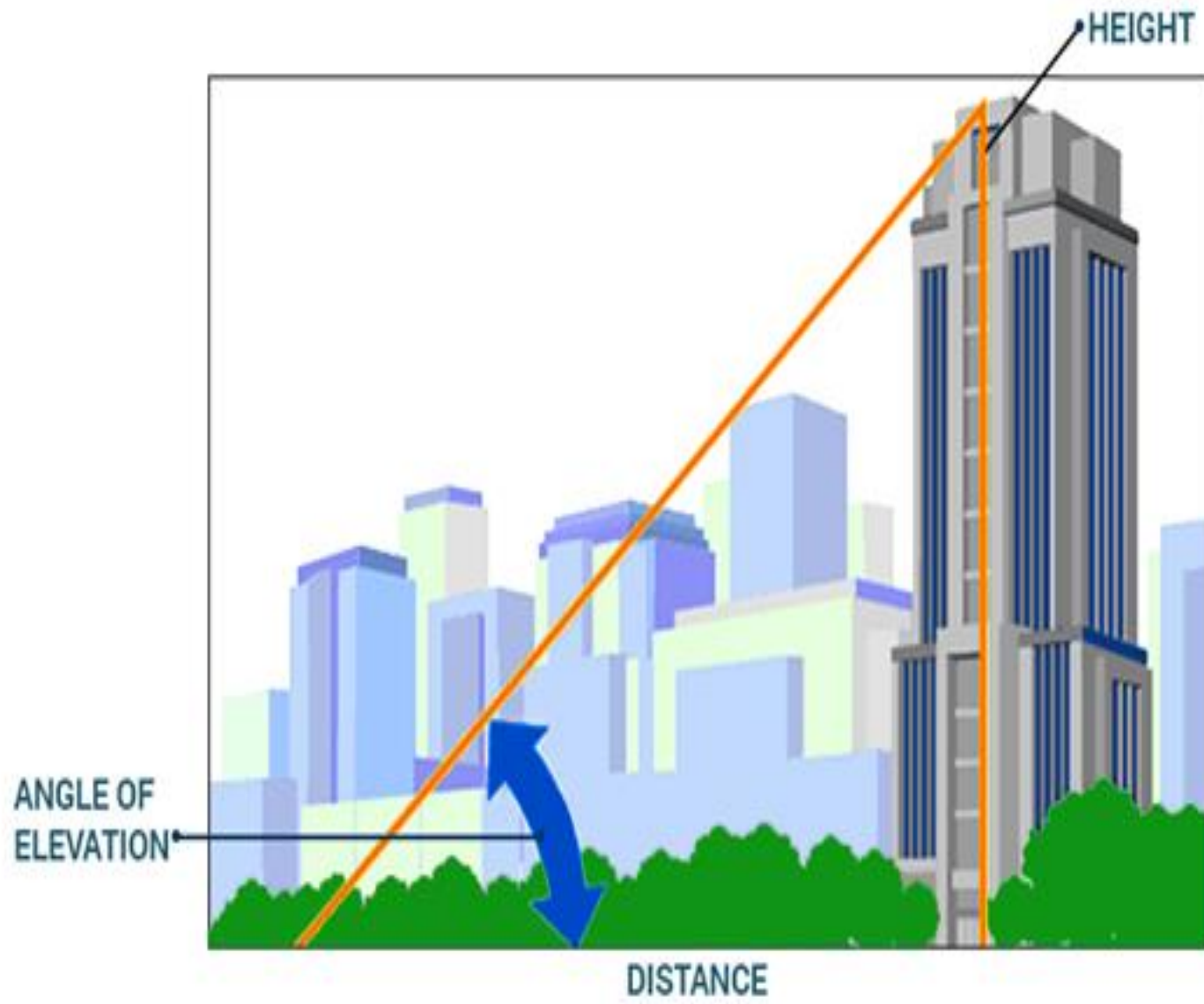
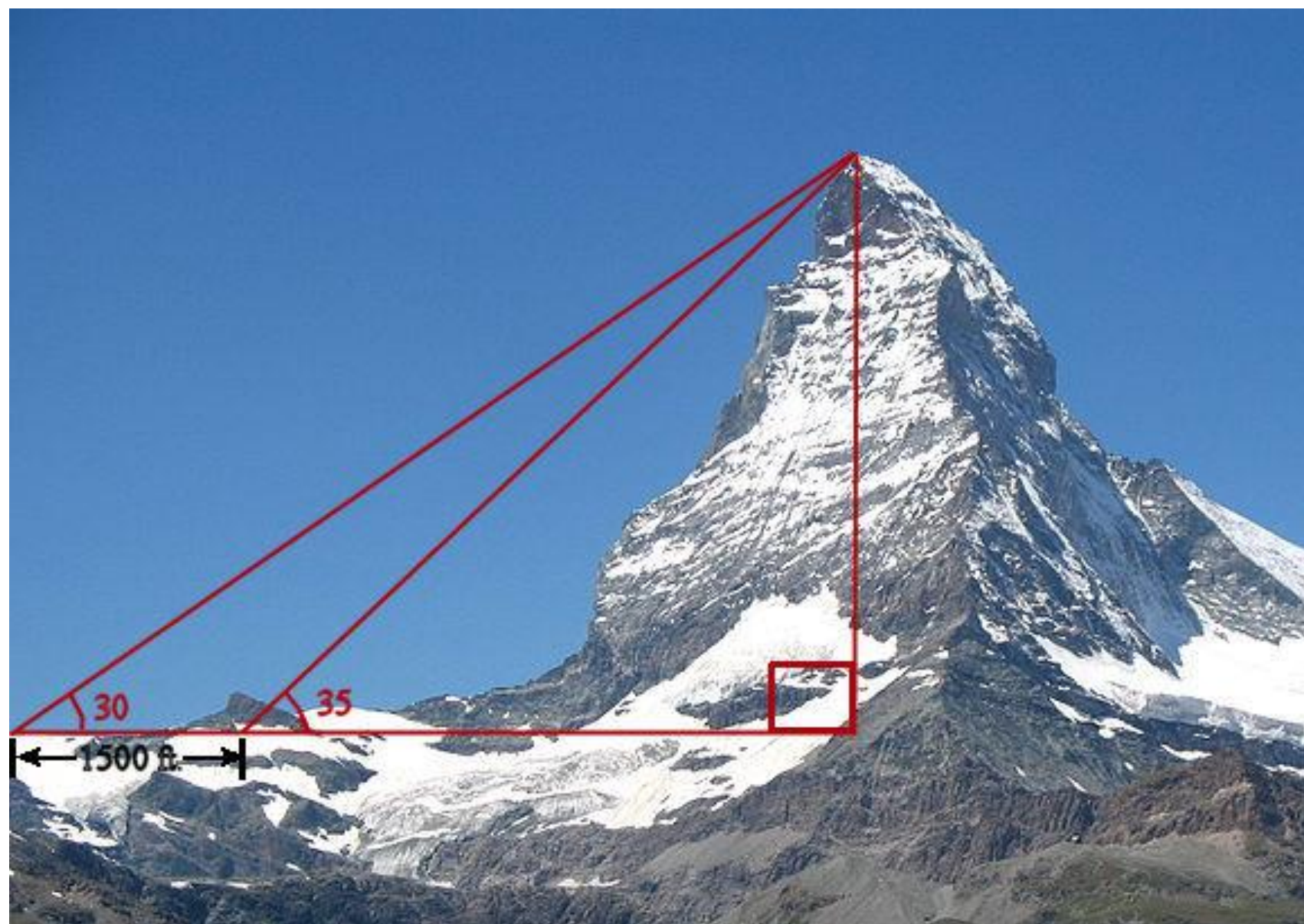


Figure 1: Angle of Elevation: A boy looking at the lamp





ANGLE OF DEPRESSION

If the pilot of the aeroplane looks downwards at any object on the ground then the Angle between his line of sight and horizontal line drawn away from his eyes is called Angle of Depression

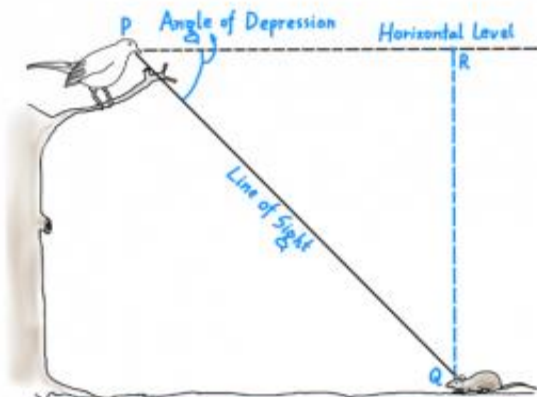


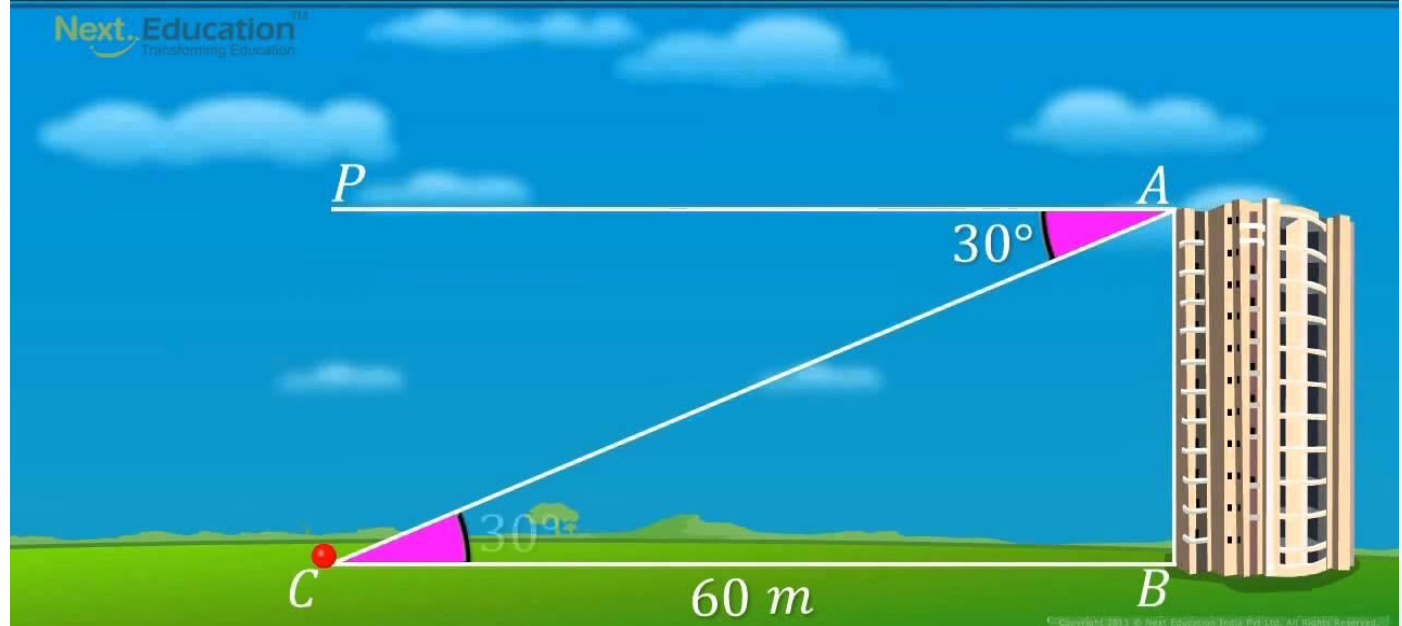
Figure 2: Angle of Depression: A bird viewing a rat

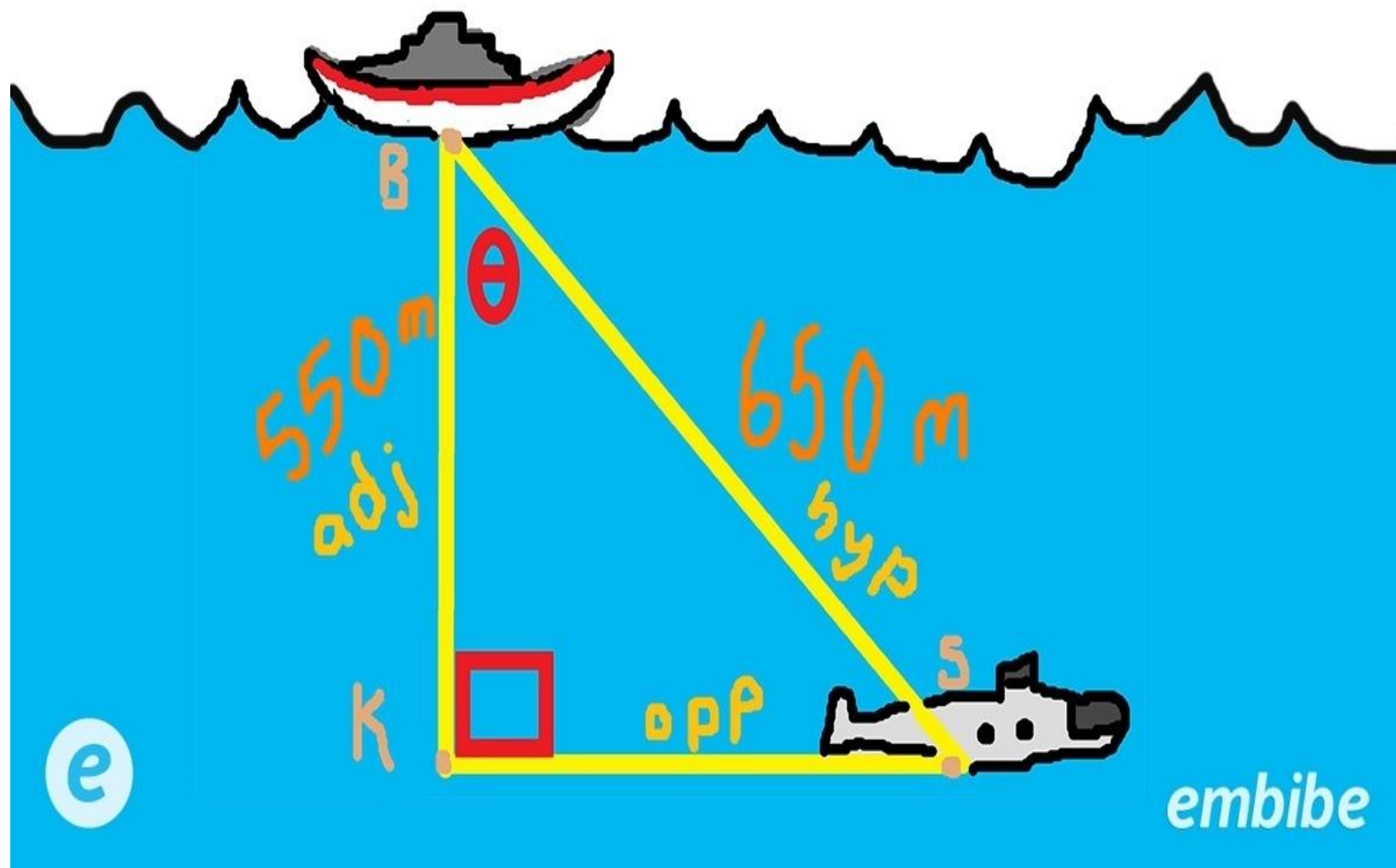
HEIGHTS AND DISTANCES

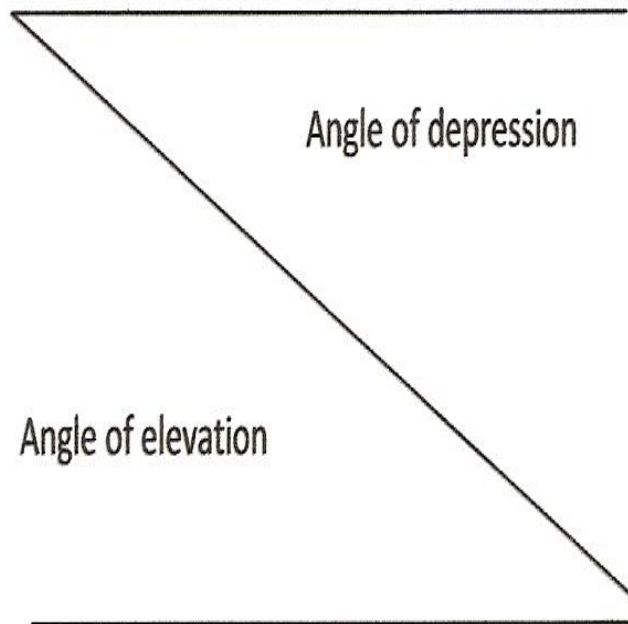
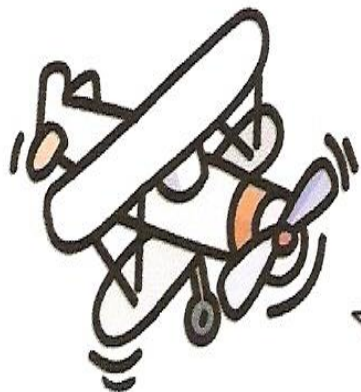
?

A boy standing on a tower observes a ball on the ground at angle of depression of 30° . The ball is located 60 metres from the foot of the tower. Find the height of the tower.

Next.Education
Transforming Education







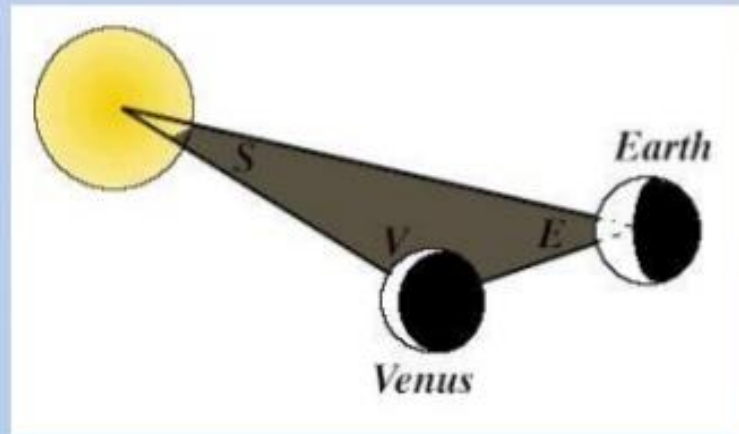
Angle of depression

Angle of elevation



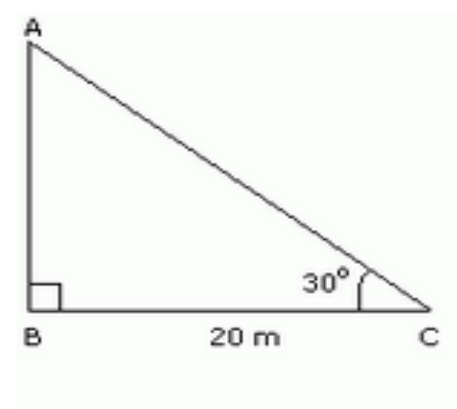
Applications of Trigonometry in Astronomy

- Since ancient times trigonometry was used in astronomy.
- The technique of triangulation is used to measure the distance to nearby stars.
- In 240 B.C., a mathematician named Eratosthenes discovered the radius of the Earth using trigonometry and geometry.
- In 2001, a group of European astronomers did an experiment that started in 1997 about the distance of Venus from the Sun. Venus was about 105,000,000 kilometers away from the Sun .



From a point 20 m away from the foot of a tower, the angle of elevation of the top of the tower is 30° . Find the height of the tower.

Solution:



Let AB be the height of the tower and C be the point.

In rt. $\triangle ABC$,

$$\tan 30^\circ = AB/BC$$

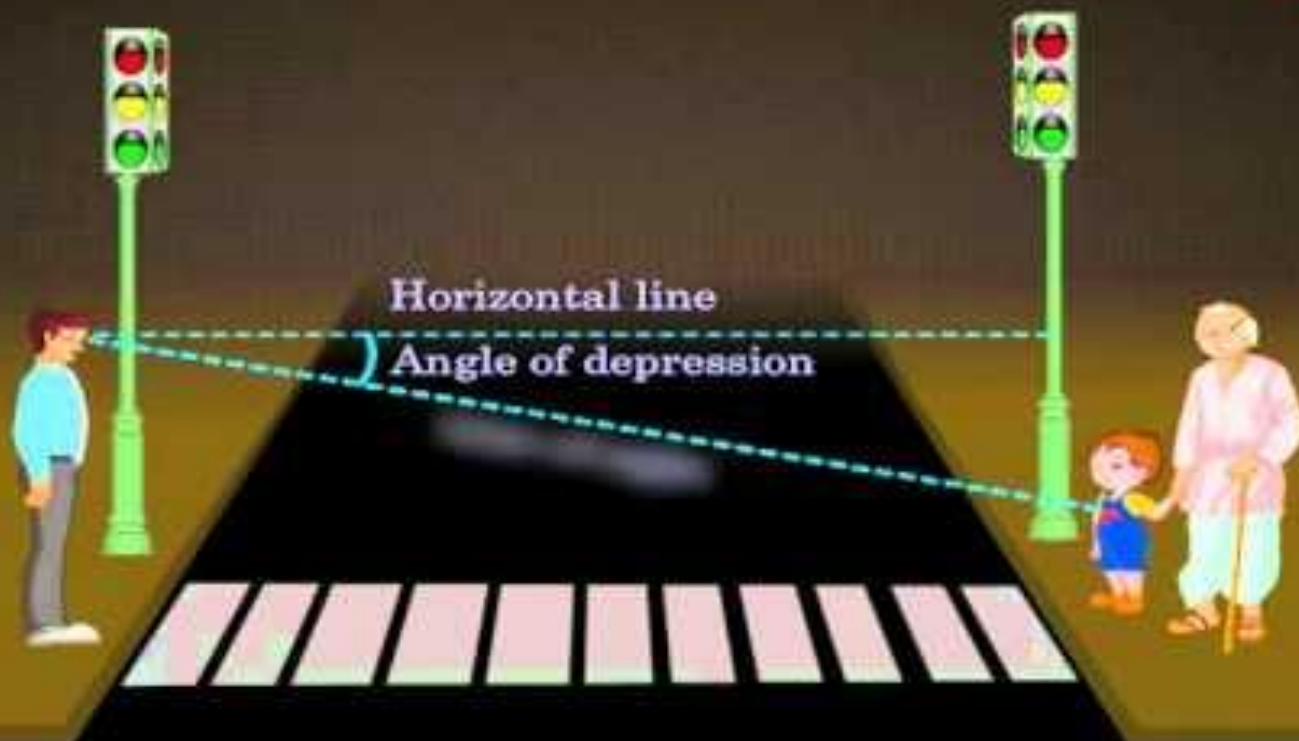
$$AB = BC \tan 30^\circ$$

$$= \frac{20}{\sqrt{3}} = \frac{20}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= 11.56 \text{ m}$$

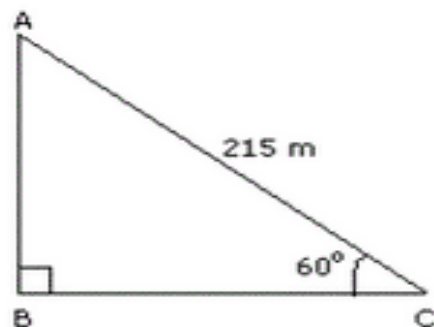
Therefore the height of the tower is 11.56 m.

The angle of depression of an object viewed is the angle formed by the



A balloon is connected to a meteorological ground station by a cable of length 215 m inclined at 60° to the horizontal. Determine the height of the balloon from the ground. Assume that there is no stack in the cable.

Solution:



Let A be the position of the balloon.

In rt. $\triangle ABC$,

$$\sin 60^\circ = AB/AC$$

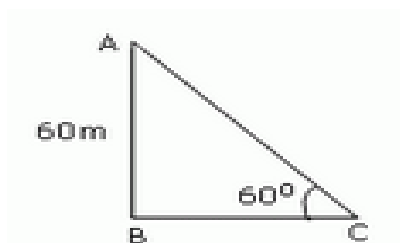
$$AB = 215 \sin 60^\circ$$

$$\begin{aligned} AB &= 215 \times \frac{\sqrt{3}}{2} \\ &= 215 \times \frac{1.73}{2} \\ &= 186 \text{ m} \end{aligned}$$

Therefore the height of the balloon from the ground is 186 m.

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.

Solution:



Let AB be the height of the tower and AC be the length of the string.

In $\triangle ABC$

$$\sin 60^\circ = \frac{AB}{AC}$$

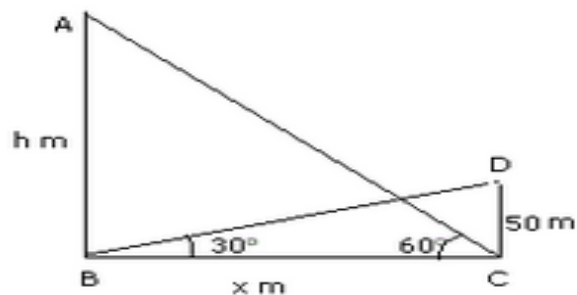
$$\frac{\sqrt{3}}{2} = \frac{60}{AC}$$

$$\begin{aligned} AC &= \frac{60 \times 2}{\sqrt{3}} \\ &= \frac{120}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{120\sqrt{3}}{3} \\ &= 40\sqrt{3} \text{ m} \end{aligned}$$

\ The length of the string = $40\sqrt{3}$ m.

The angle of elevation of the top of a hill at the foot of a tower is 60° and the angle of elevation of top of the tower from the foot of the hill is 30° . If the tower is 50 m high, what is the height of the hill ?

Solution:



Let h be the height of the hill and x m be the distance between the foot of the hill and foot of the tower.

In rt. $\triangle ABC$,

$$\cot 60^\circ = \frac{x}{h}$$

$$x = h \cot 60^\circ \dots\dots\dots (i)$$

In rt. $\triangle DCB$,

$$\cot 30^\circ = \frac{x}{50}$$

$$x = 50 \cot 30^\circ \dots\dots\dots (ii)$$

Equating (i) and (ii)

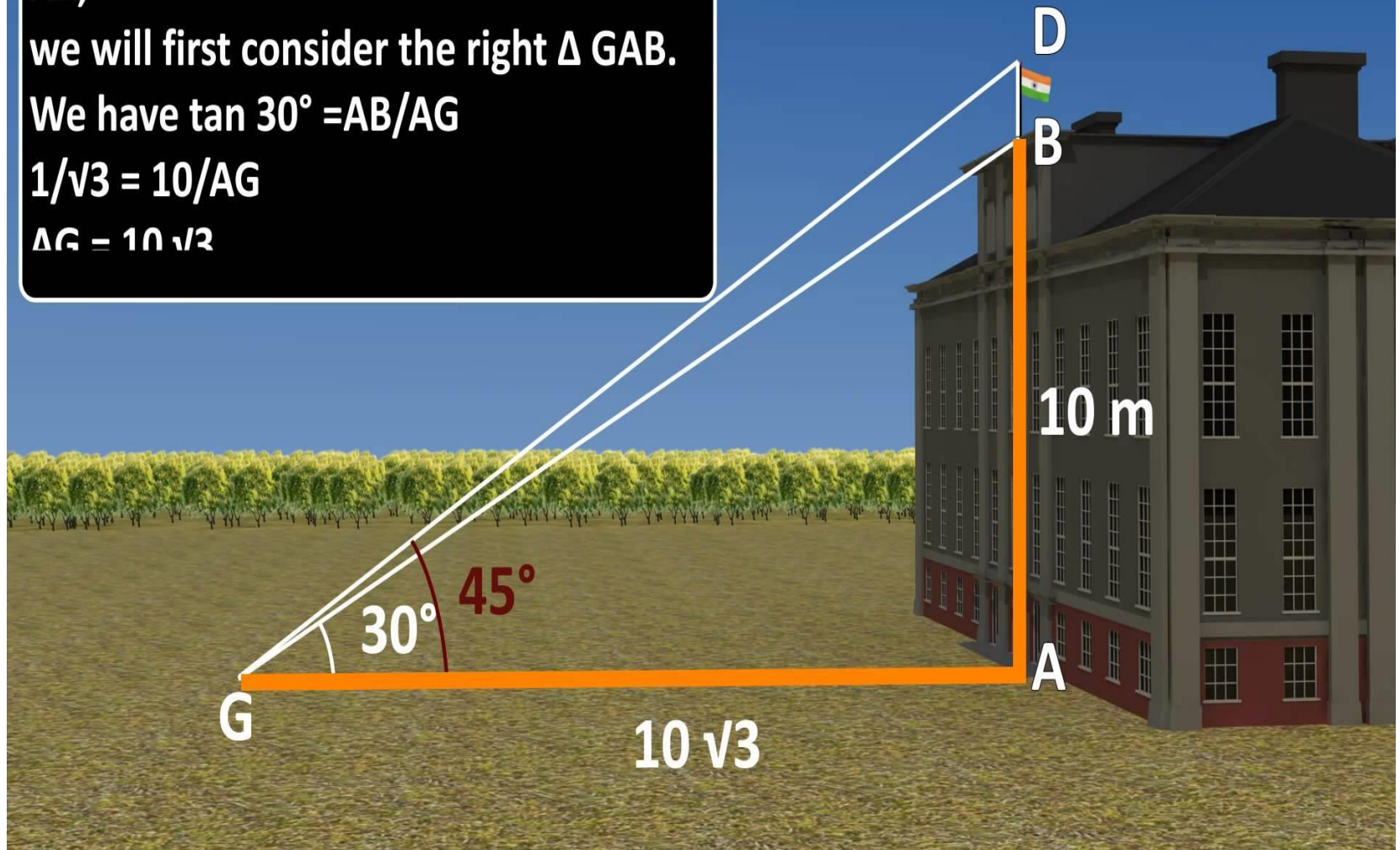
$$h \cot 60^\circ = 50 \cot 30^\circ$$

$$h = 50 \cot 30^\circ / \cot 60^\circ$$

$$h = 50 \times \frac{\sqrt{3}}{1} = 50 \times 3 = 150 \text{ m}$$

Therefore the height of the hill is 150 m.

we know the height of the building
AB,
we will first consider the right Δ GAB.
We have $\tan 30^\circ = AB/AG$
 $1/\sqrt{3} = 10/AG$
 $AG = 10\sqrt{3}$



1

$$\tan 60^\circ = \frac{h}{x}$$

1

$$x = \frac{h}{\sqrt{3}} \quad (1)$$

From the top of a tower the angle of depression of an object on the horizontal ground is found to be 60° . On descending 20 m vertically downwards from the top of the tower, the angle of depression of the object is found to be 30° . Find the height of the tower

In rt $\triangle BCP$

$$\tan 30^\circ = \frac{h-20}{x}$$

$$\frac{1}{\sqrt{3}} = \frac{h-20}{h/\sqrt{3}} \text{ from (1)} \qquad \qquad \qquad \mathbf{1}$$

$$\frac{h}{3} = h - 20 \qquad \qquad \qquad \mathbf{1/2}$$

$$h = 30 \text{ m} \qquad \qquad \qquad \mathbf{1/2}$$

$\therefore$ Height of the tower is 30 m

