

# TOPIC

- Introduction

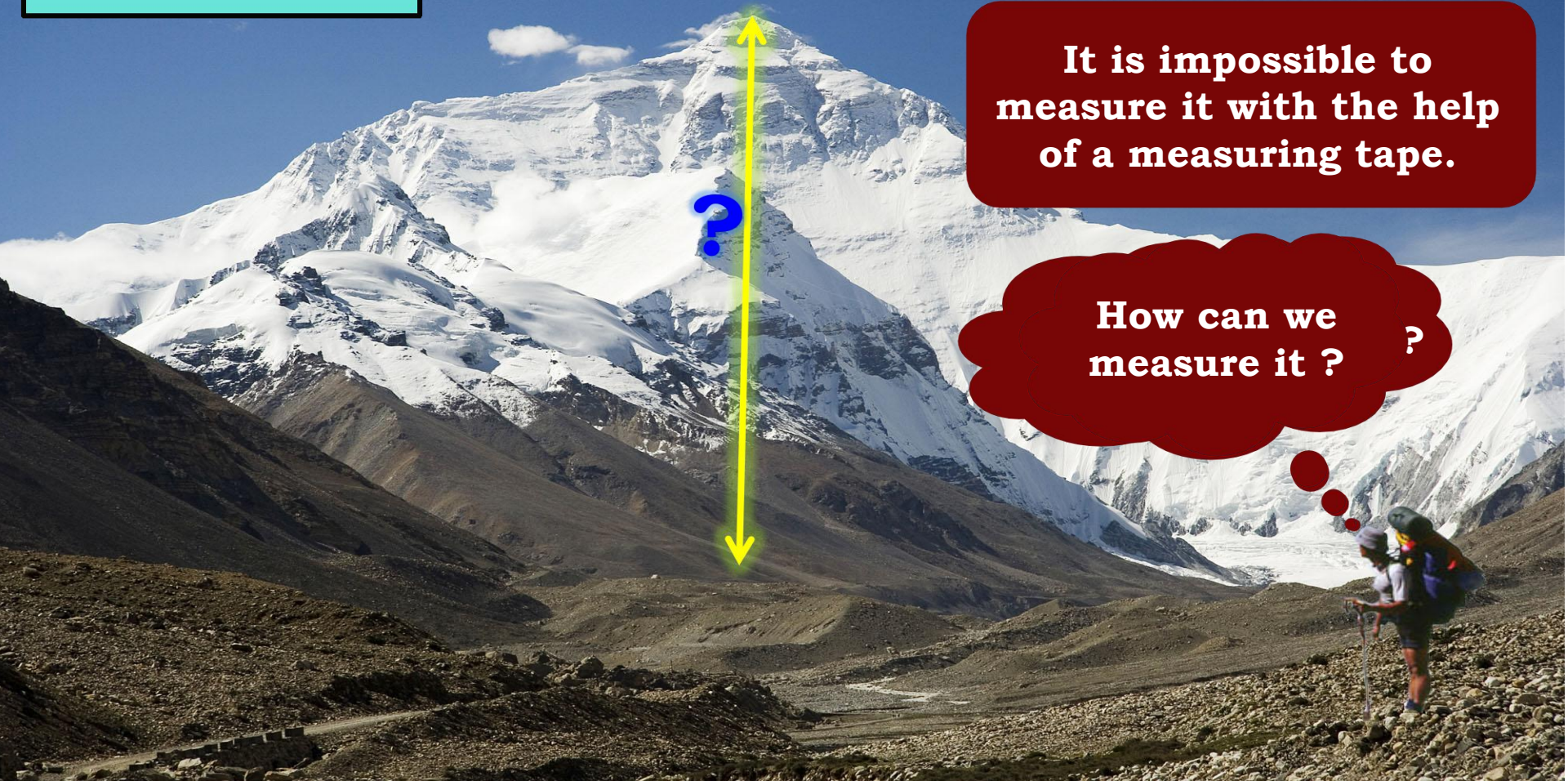
# SOME APPLICATIONS OF TRIGONOMETRY

- **Introduction**

# MOUNT EVEREST

It is impossible to measure it with the help of a measuring tape.

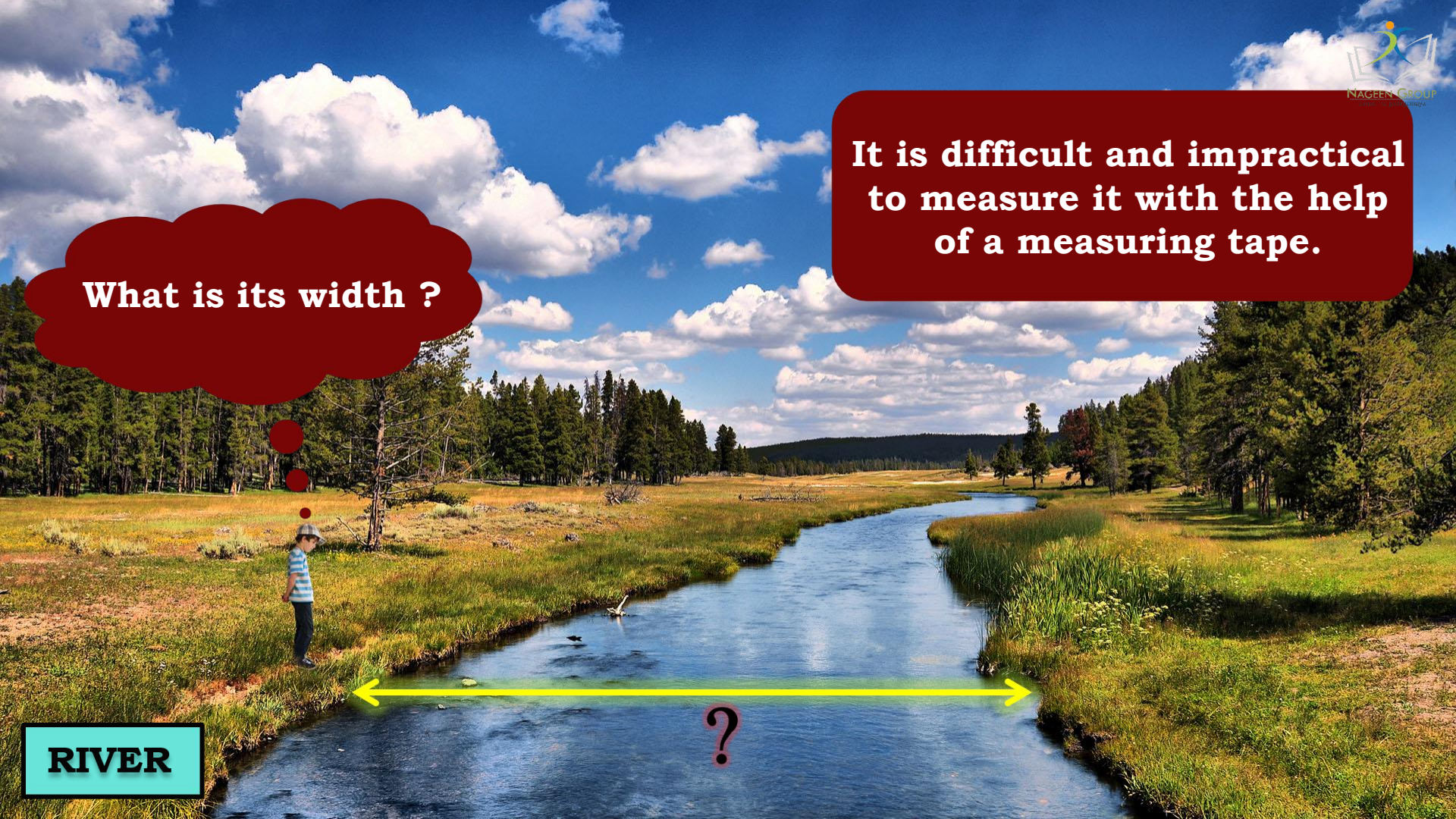
How can we measure it ?



**It is difficult and impractical to measure it with the help of a measuring tape.**

**What is its width ?**

**RIVER**



# EIFFEL TOWER

It is impossible to measure it with the help of a measuring tape.

Hey...Its looking beautiful. Yes  
What is its height ?





Such **Heights** and **Distances** can be found  
by Applying **TRIGONOMETRY**.

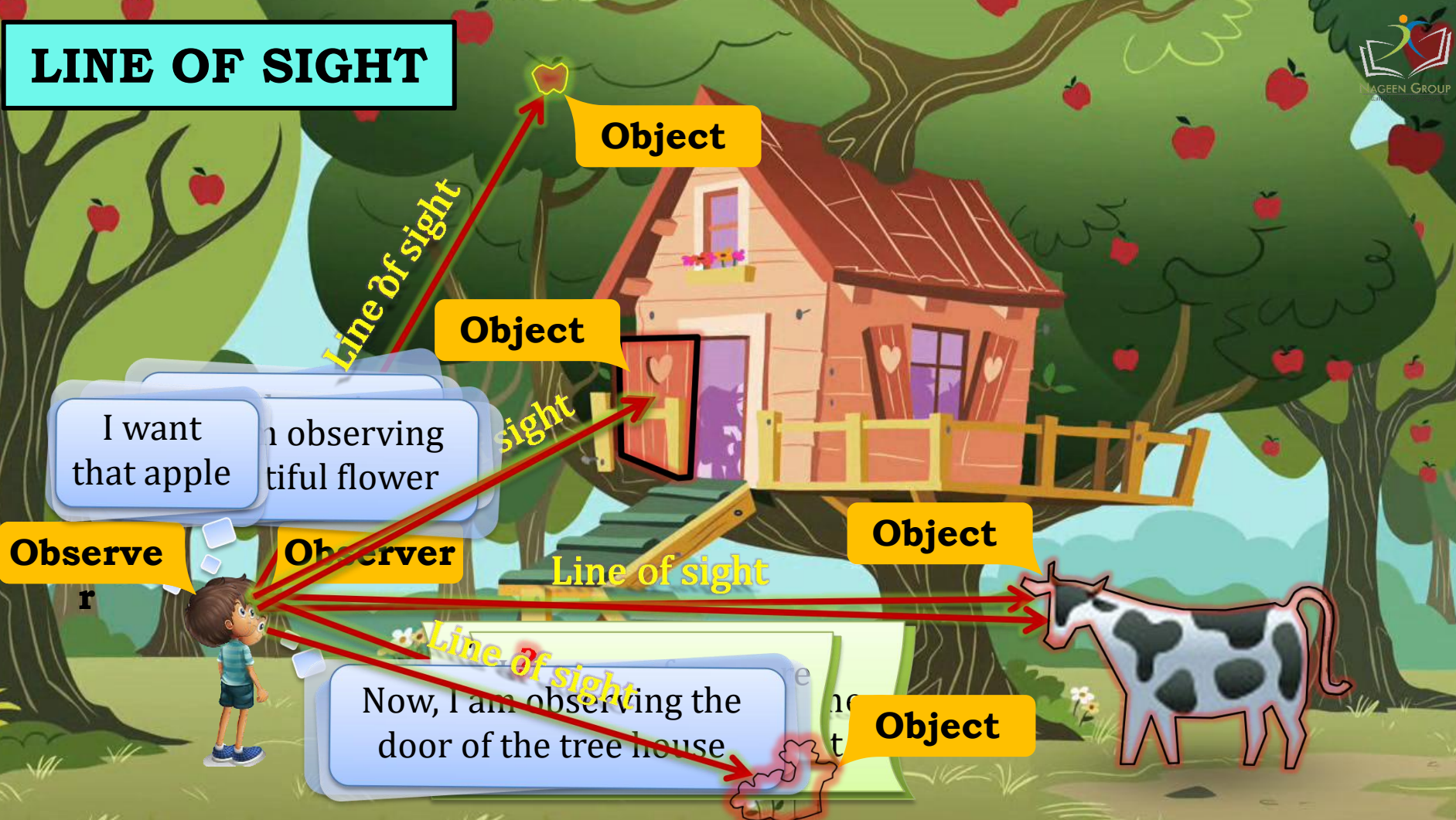
## **We need to learn few important terms :**

- 1. Line of sight**
- 2. Horizontal line**
- 3. Angle of Elevation**
- 4. Angle of Depression**

**I am going to explain you all the important terms.**



# LINE OF SIGHT



**Object**

**Object**

**Object**

**Object**

I want to observe that apple  
I am observing that beautiful flower

**Observe**

**Observer**

Now, I am observing the door of the tree house

# ANGLE OF ELEVATION

**: Remember :**

Angle of Elevation is formed, when the object is above the horizontal line.

I am observing the top of the tree.

**Observer**



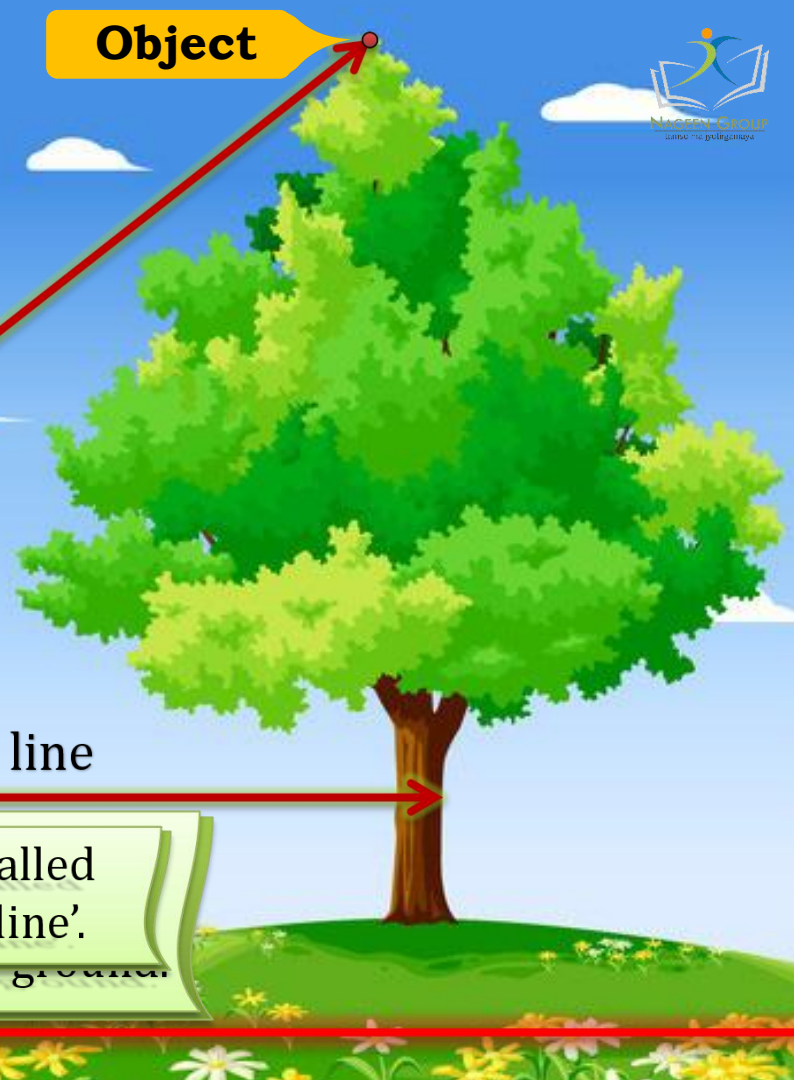
Line of sight

**Object**

Horizontal line

$\theta$

This line is called 'Horizontal line' and is parallel to the ground.



# ANGLE OF DEPRESSION

I am observing the flower on the ground.

**Observer**

Horizontal line

$\theta$

Line of sight

**Object**

**: Remember :**

Angle of Depression is formed, when the object is below the horizontal line.

This angle is called as 'Angle of Depression'.

Let us revise all the four terms.

I am observing the flower on the ground.

**Observer**

Line of sight

**Object**

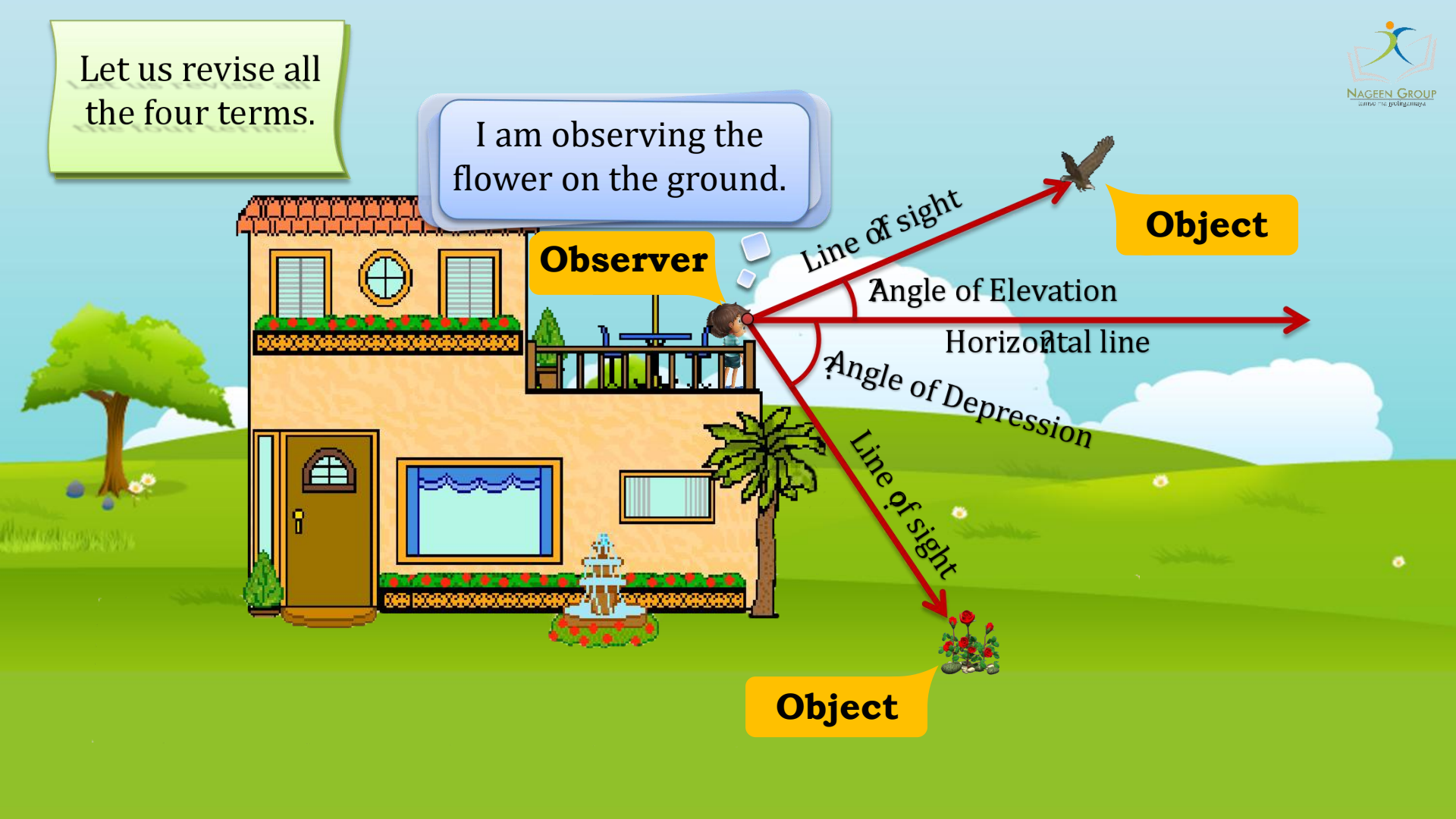
Angle of Elevation

Horizontal line

Angle of Depression

Line of sight

**Object**

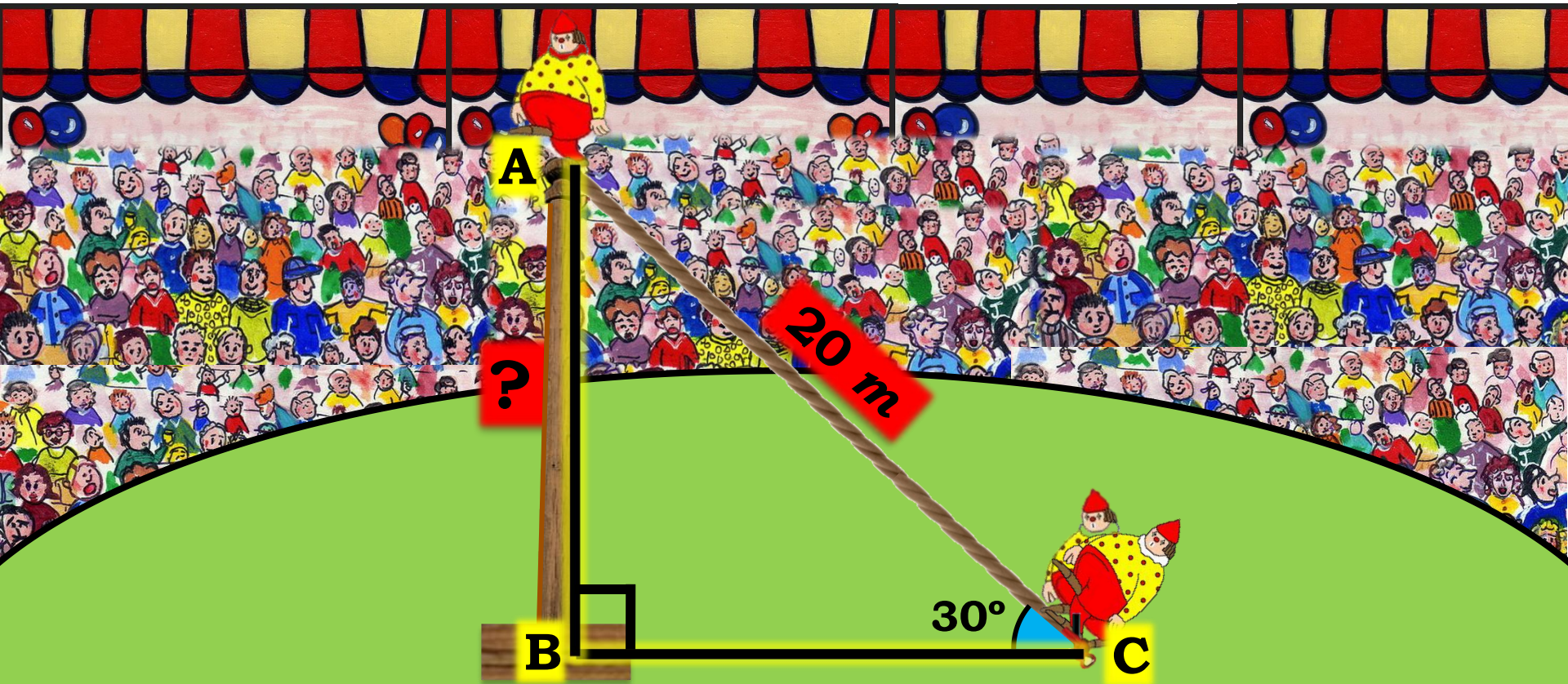


**Points to be remembered while drawing the figures to solve the problems :**

1. All the heights of objects such as towers, trees, buildings, etc. shall be considered as a 'line segment perpendicular to the ground'.
2. The height of the observer is neglected, if it is not given in the problem. It shall be considered as a 'point'.



- Q. A circus artist is climbing a 20m 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  $30^\circ$ .

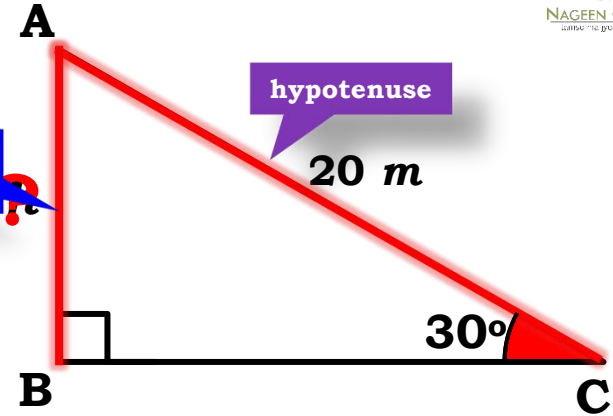


Q. A circle of radius 10 m is fixed to the top of a pole. The top of the pole is at the center of the circle. The angle subtended by the arc of the circle at the center is 30°. Find the height of the pole.

Ratio For ' $\angle C$ '  
Hypotenuse Opposite side  $\rightarrow$  AB  
Hypotenuse  $\rightarrow$  AC

Opposite side

is 30°.



Sol. Let the height of the pole be  $h$  m.  
Let the radius of the circle be  $r$  m.  
In right  $\triangle ABC$ ,

$$\sin 30^\circ = \frac{1}{2}$$

$$r = 20 \text{ m}$$

Let the height of the pole (AB) be ' $h$ ' m

$$\sin 30^\circ = \frac{AB}{AC}$$

$$\therefore \frac{1}{2} = \frac{h}{20}$$

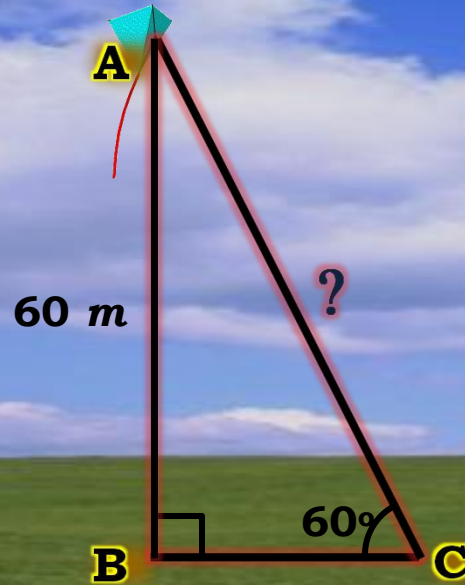
$$\therefore 2h = 20$$

$$\therefore h = \frac{20}{2}$$

$$\therefore h = 10$$

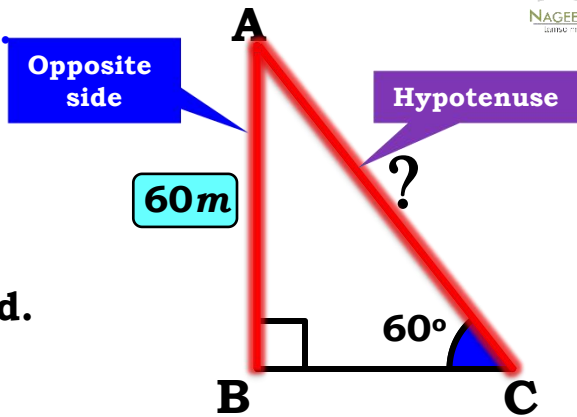
$\therefore$  Height of the pole is 10 m

- Q. A kite is flying at a height of 60m above the ground. The string attached to the kite is temporarily tied to the ground. The inclination of the string with the ground is  $60^\circ$ . Find the length of the string, assuming that there is no slack in the string.



Q. A kite is flying at a height of 60 m from the ground. The string is attached to the kite and is 120 m long. Find the distance of the kite from the ground, assuming the string is taut.

**Ratio**      **Now, let us**      **and**  
**Hypo**      **rationalise the**      **of**  
                  **denominator**      **string,**



Sol.

AB represents the distance of the kite from ground.

AB = 60 m

AC represents the length of the string.

$\angle ACB = 60^\circ$

In right  $\triangle ABC$ ,

$\sin 60^\circ = \frac{\sqrt{3}}{2}$

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

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

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

$\therefore AC = \frac{120}{\sqrt{3}}$

$\therefore AC = \frac{120}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$\therefore AC = \frac{120 \sqrt{3}}{3}$

$\therefore AC = 40 \sqrt{3}$

$\therefore AC = 40 \times 1.73$

$\therefore AC = 69.2 \text{ m}$

$\sqrt{3} = 1.73$

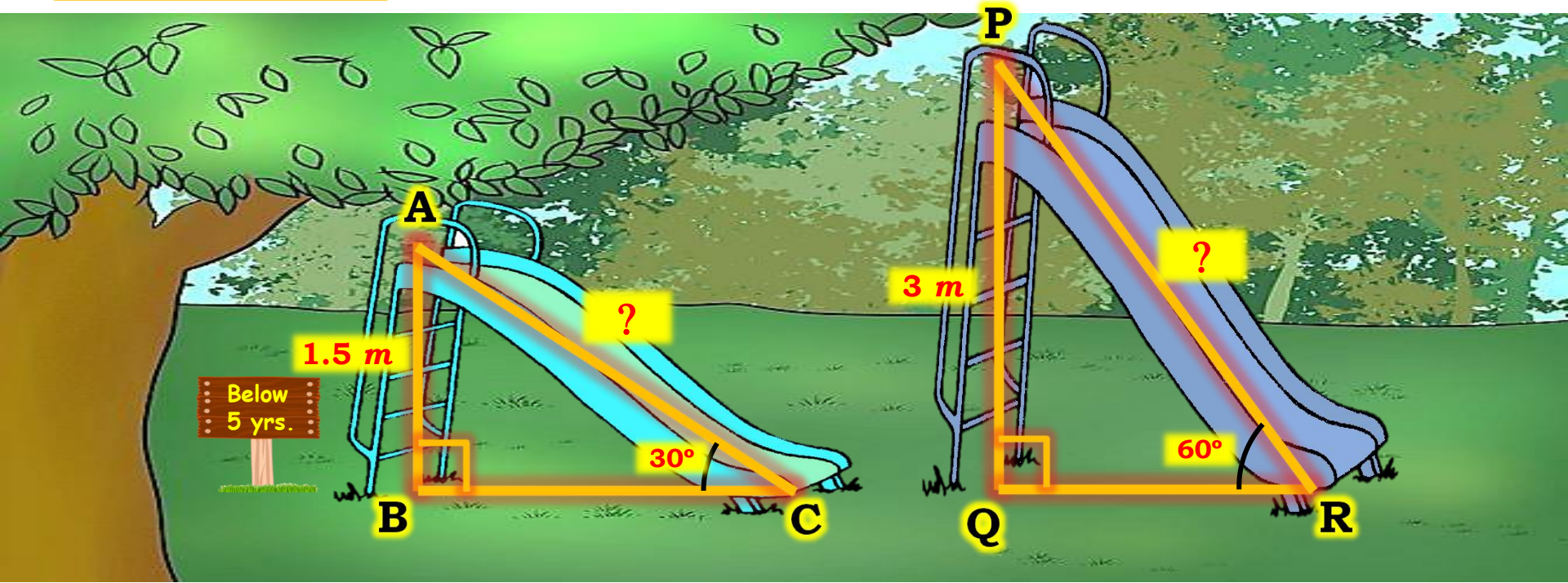
The length of the string is 69.2 m

**Q. A contractor plans to install two slides for the children to play in a park.**

**For the children below the age of 5 years, she prefers to have a slide whose top is at a height of 1.5 m, and is inclined at an angle of  $30^\circ$  to the ground,**

**whereas for elder children, she wants to have a steep slide at a height of 3m, and inclined at an angle of  $60^\circ$  to the ground.**

**What should be the length of the slide in each case?**



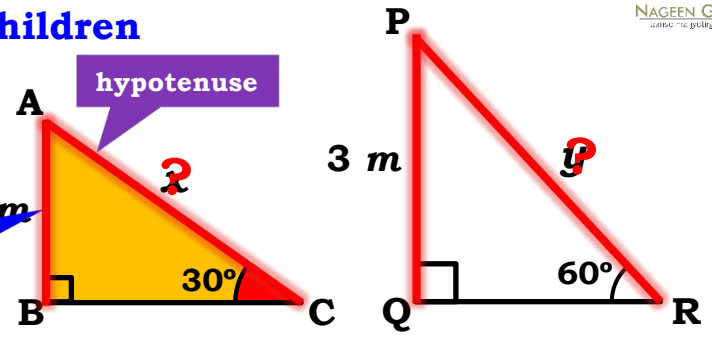
Q. A contractor plans to install two slides for the children

to play on a hill. The first slide is below the hill and is 1.5 m high and inclined at an angle of 30° to the ground. The second slide is 3 m high and inclined at an angle of 60° to the ground.

For ' $\angle C$ '  
Opposite side  $\rightarrow AB$   
Hypotenuse  $\rightarrow AC$

Opposite side

hypotenuse



What should be the length of the slide in each case?

Sol.

Let the length of slide for the children below 5 years (AC) be ' $x$ ' m

Length of slide for the elder children (PR) be ' $y$ ' m

Height of 1<sup>st</sup> slide (AB) = 1.5 m

Height of 2<sup>nd</sup> slide (PQ) = 3 m

$$\sin 30^\circ = \frac{1}{2}$$

Children :

In right  $\triangle ABC$ ,

$$\sin 30^\circ = \frac{AB}{AC}$$

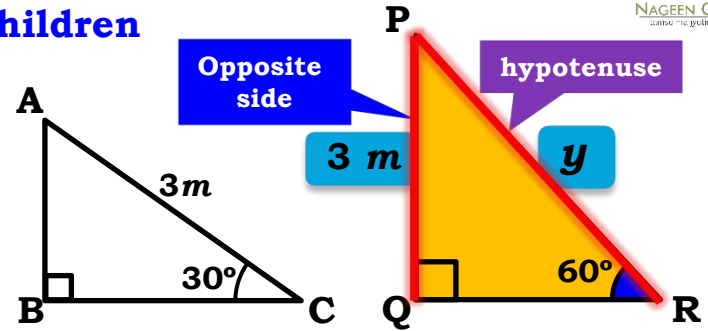
$$\therefore \frac{1}{2} = \frac{1.5}{x}$$

$$\therefore x = 1.5 \times 2$$

$$\therefore x = 3$$

Q. A contractor plans to install two slides for the children to play in a park. One slide is for children whose age is between 2 and 5 years. The top of the slide is at a height of 3 m and inclined at an angle of 30° to the ground. The other slide is for elder children. It is at a height of 6 m and inclined at an angle of 60° to the ground.

Ratio of opposite side and Hypotenuse reminds us of 'sin'



What is the length of the slide in each case?  
Sol.  $\sin 60^\circ = \frac{\sqrt{3}}{2}$  **Given :**

$$\sin 60^\circ = \frac{PQ}{PR}$$

$$\therefore \frac{\sqrt{3}}{2} = \frac{3}{y}$$

$$\therefore \sqrt{3}y = 3 \times 2$$

$$\therefore y = \frac{6}{\sqrt{3}}$$

$$\therefore y = \frac{6}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

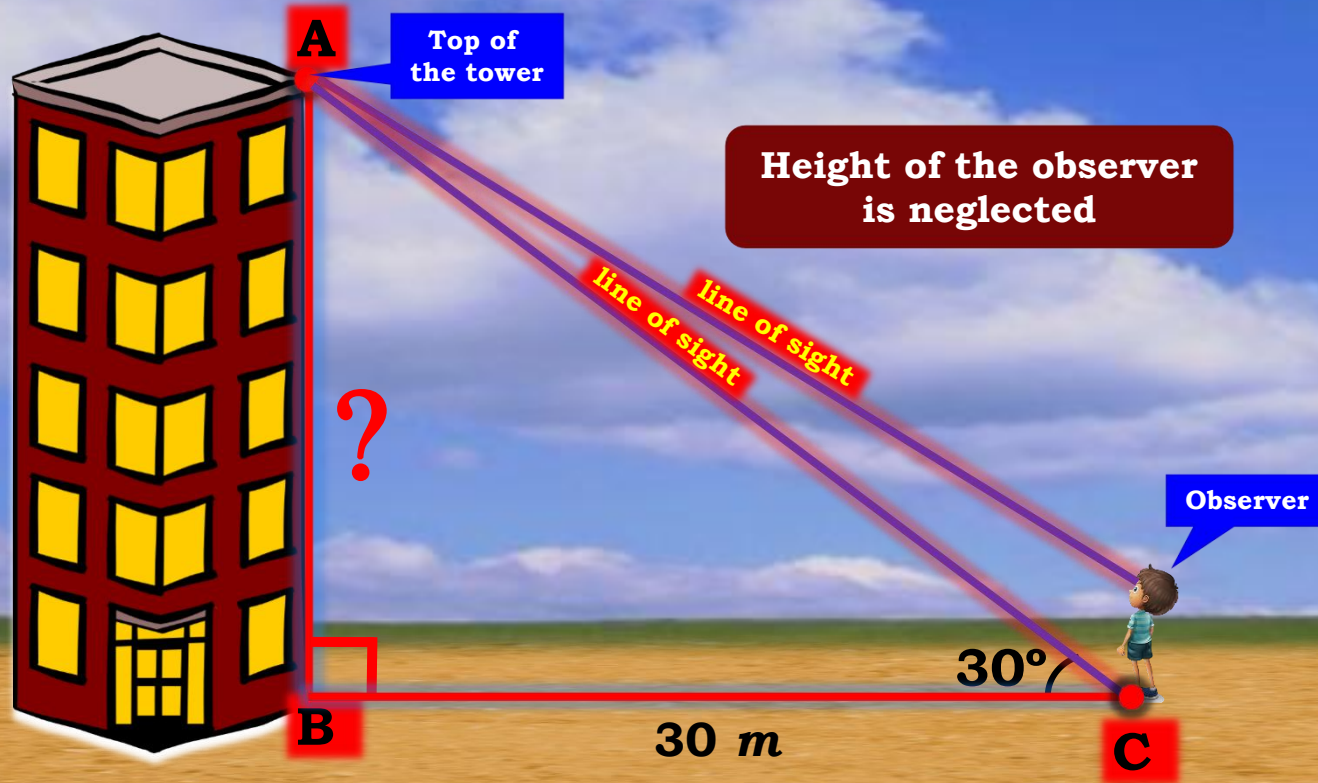
$$\therefore y = \frac{6\sqrt{3}}{3} = 2\sqrt{3}$$

$$\therefore y = 2\sqrt{3}$$

$$\therefore y = 2 \times 1.73 = 3.46$$

$\therefore$  Length of slide for children below 5 years is 3 m and length of slide for elder children is 3.46 m

Q. 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  **$30^\circ$** . Find the height of the tower.



Q. The angle of depression of a point on the ground from a point on the top of the tower is  $30^\circ$ . The distance of the point from the foot of the tower is 30 m. Find the height of the tower.

Sol. Distance

given

Let

In right  $\triangle ABC$ ,

$$\tan 30^\circ = \frac{h}{30}$$

Let height of tower (AB) be 'h'

$$\tan 30^\circ = \frac{AB}{BC}$$

$$\therefore \frac{1}{\sqrt{3}} = \frac{h}{30}$$

$$\therefore \sqrt{3} \times h = 30$$

$$\therefore h = \frac{30}{\sqrt{3}}$$

$$\therefore h = \frac{30}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

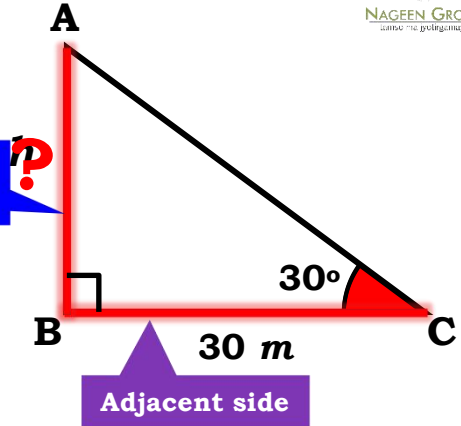
Rationalise the denominator

Now, let us rationalise the denominator

Distance of the point from the foot of the tower is 30 m

From a point on the top of the tower, the angle of depression of a point on the ground is  $30^\circ$ . The distance of the point from the foot of the tower is 30 m. Find the height of the tower.

Opposite side



$$\therefore h = \frac{10 \times \cancel{30} \sqrt{3}}{\cancel{3}}$$

$$\sqrt{3} = 1.73$$

$$\therefore h = 10 \sqrt{3}$$

$$\therefore h = 10 \times 1.73$$

$$\therefore h = 17.3$$

**Height of the tower is 17.3 m**

**Thank You**