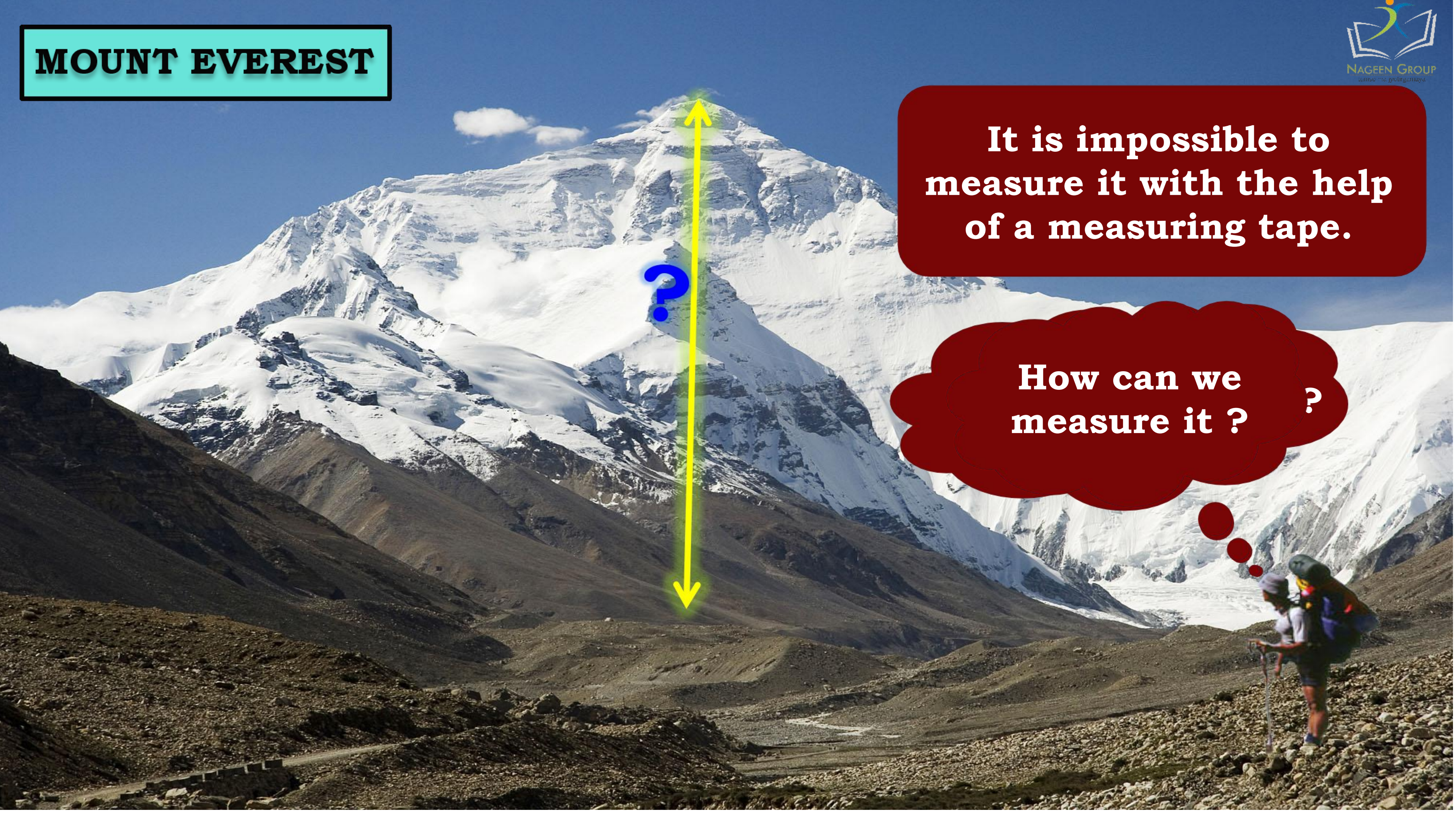
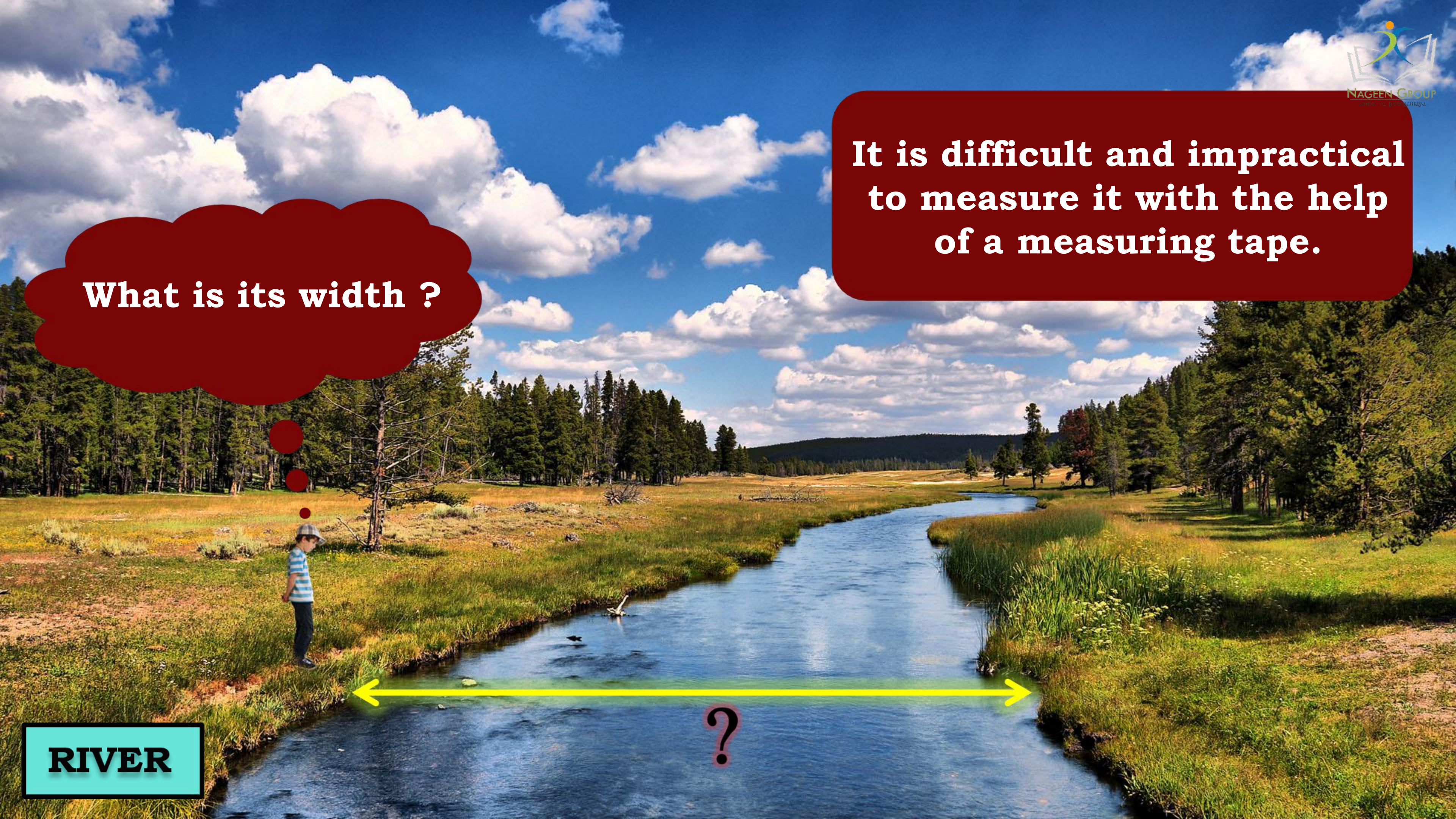
TOPIC

- 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 ?
?
NAGEEN GROUP


What is its width ?
It is difficult and impractical to measure it with the help of a measuring tape.
?
RIVER


EIFFEL TOWER
It is impossible to measure it with the help of a measuring tape.
Hey...Its looking beautiful.
Yes
at is its height ?
NAGEEN GROUP

Such Heights and Distances can be found

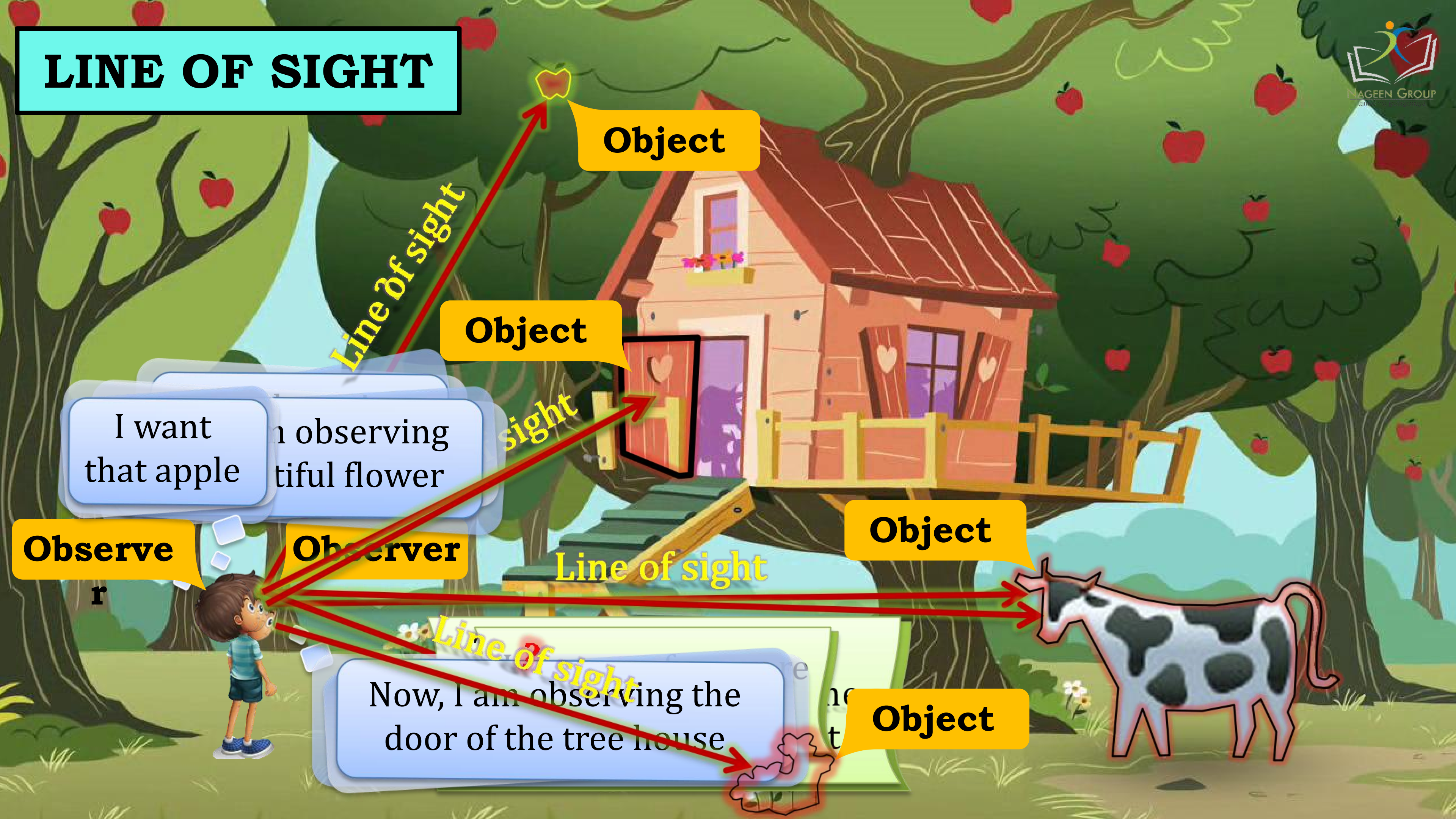
by Applying TRIGONOMETRY.

We need to learn few important terms :

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

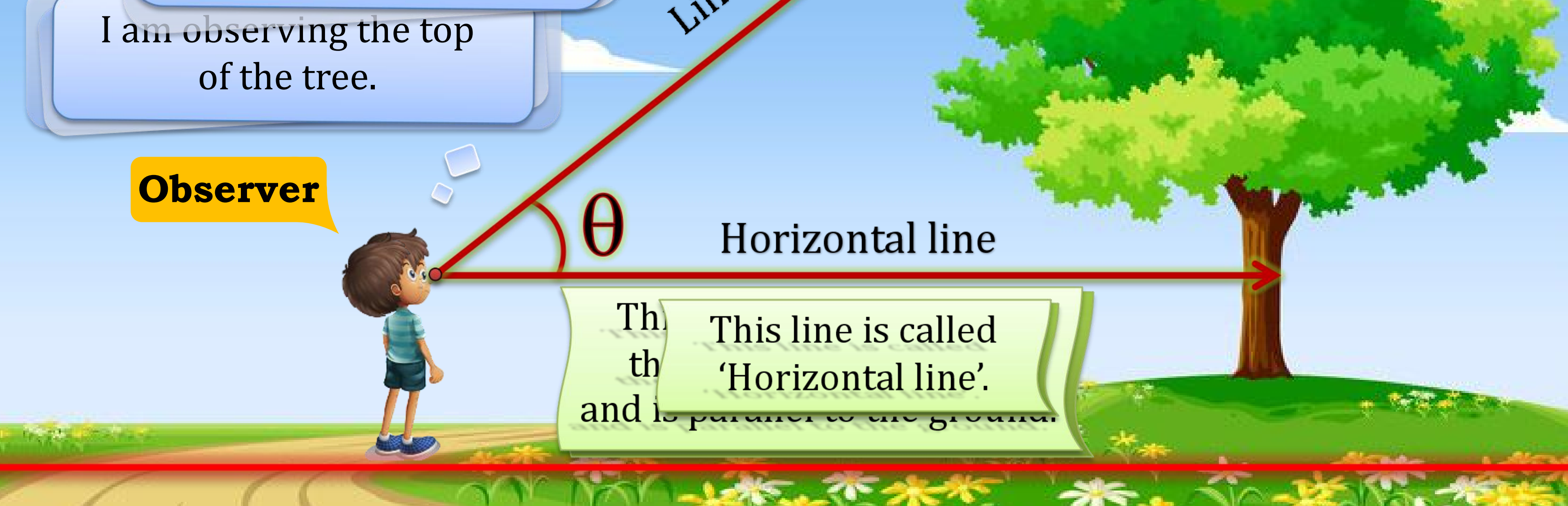
I am going to explain you all the important terms.

LINE OF SIGHT



ANGLE OF ELEVATION

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



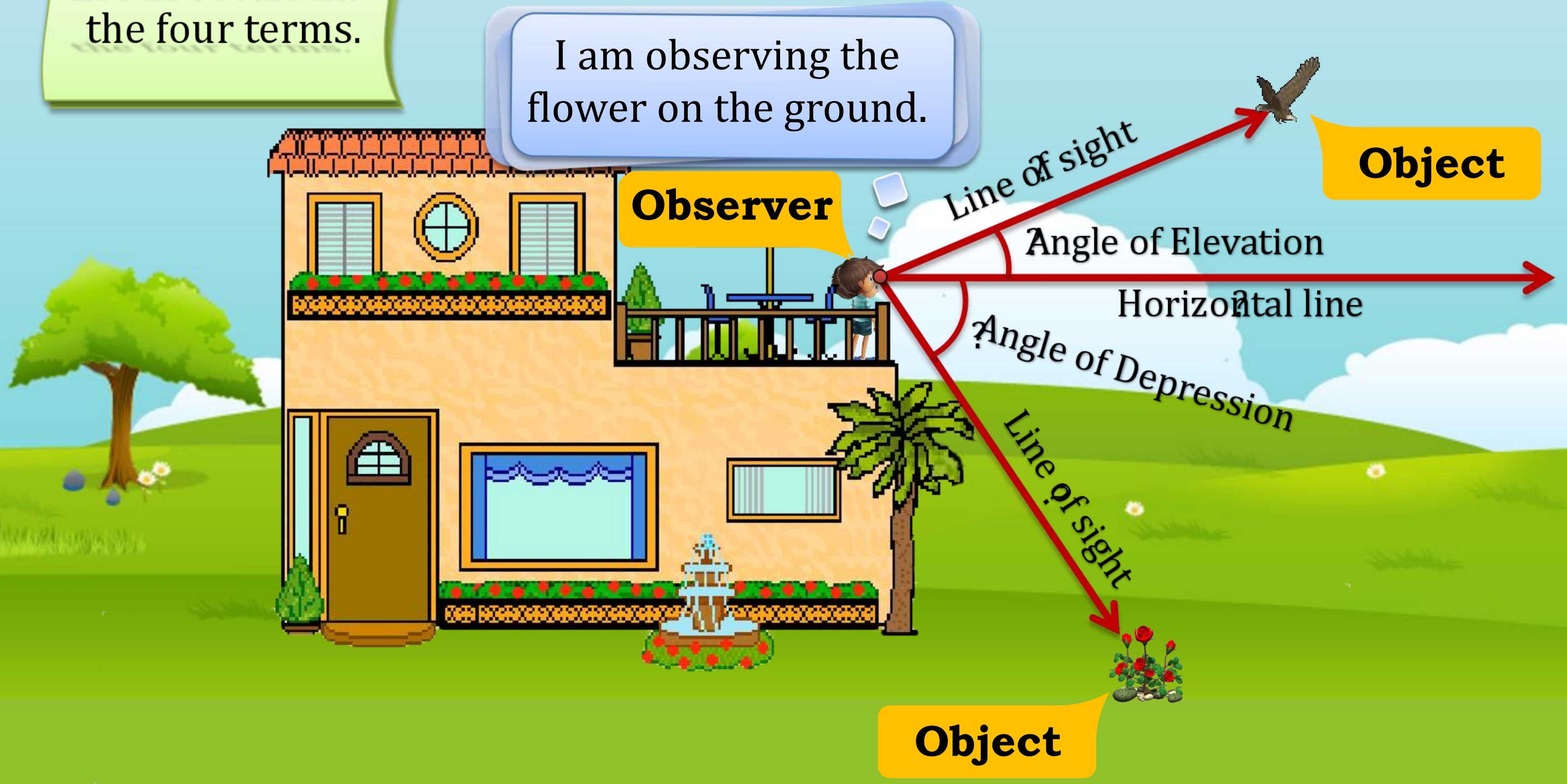
ANGLE OF DEPRESSION

I am observing the flower on the ground.

: Remember :
Angle of Depression is formed, when the obje
below the horizontal l

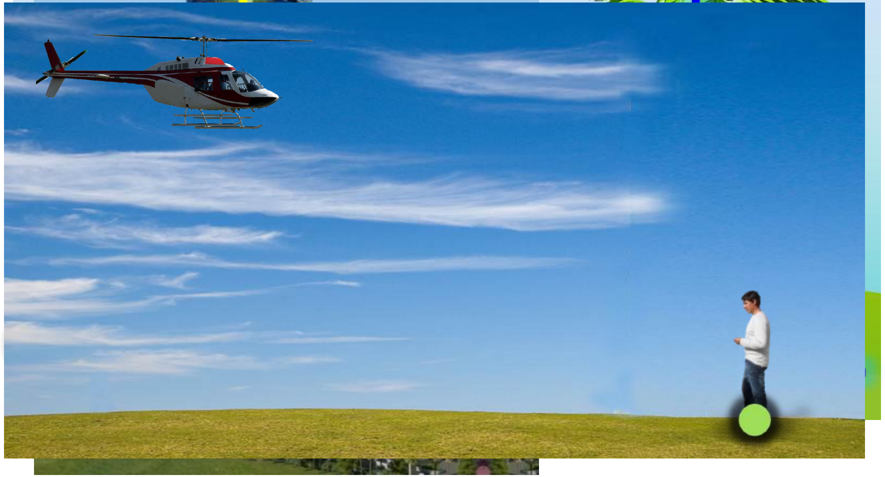
This angle i
called as
'Angle of Depression'.

Let us revise all the four terms.

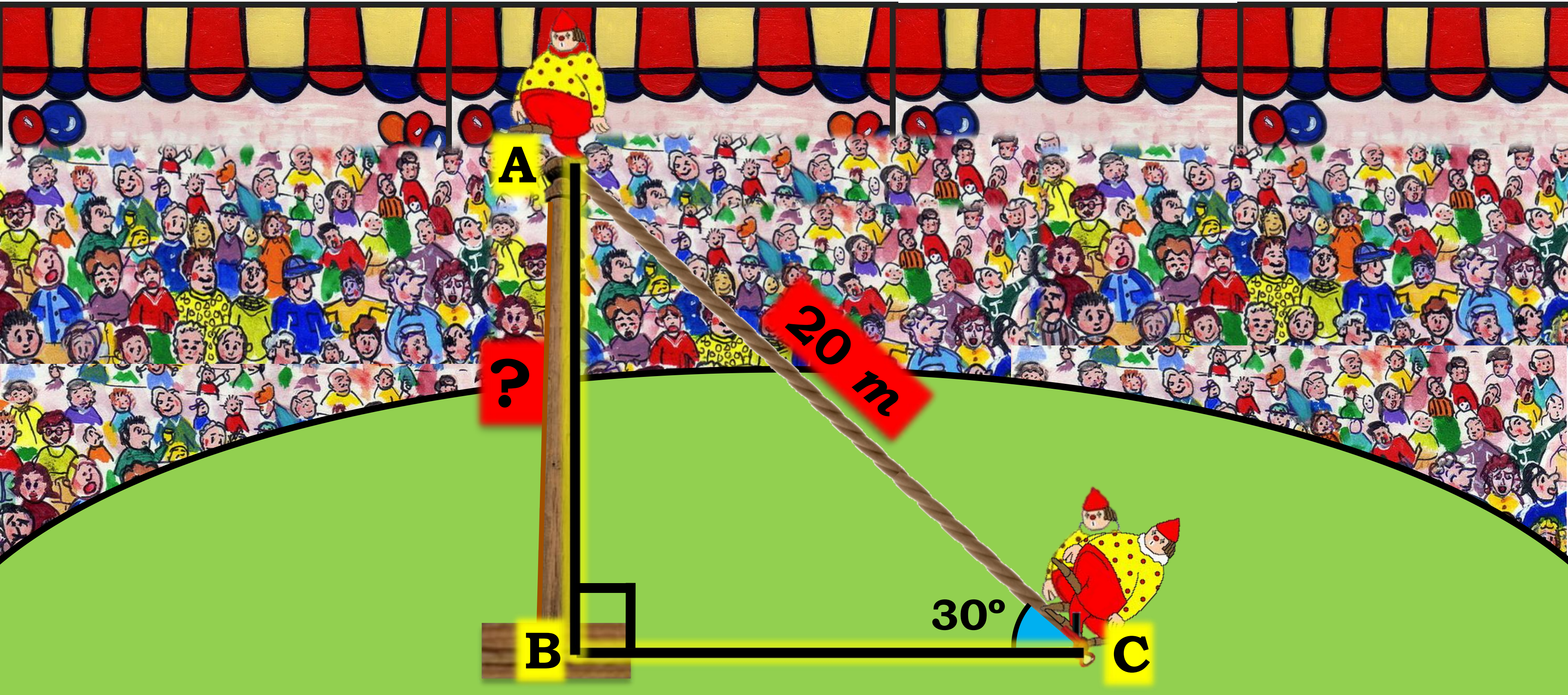


Points to be remembered while drawing the figures to solve the problems :

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°.



Q. A circ… ope, which … the top of … Find t… made … is 30°.

Ratio … Hypo…

For '∠C'

Opposite side → AB

Hypotenuse → AC

Sol. L…) = 20 m

L… ole (AB) be 'h' m

In r… ΔABC,

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

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

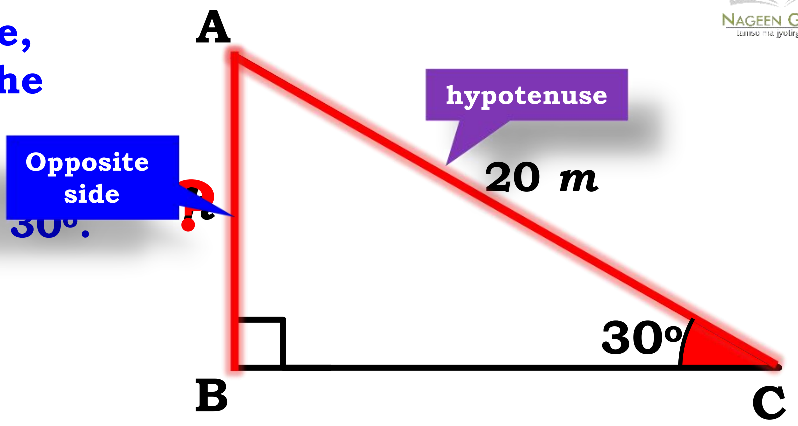
$$\therefore \quad \frac{1}{2} = \frac{h}{20}$$

$$\therefore \quad 2h = 20$$

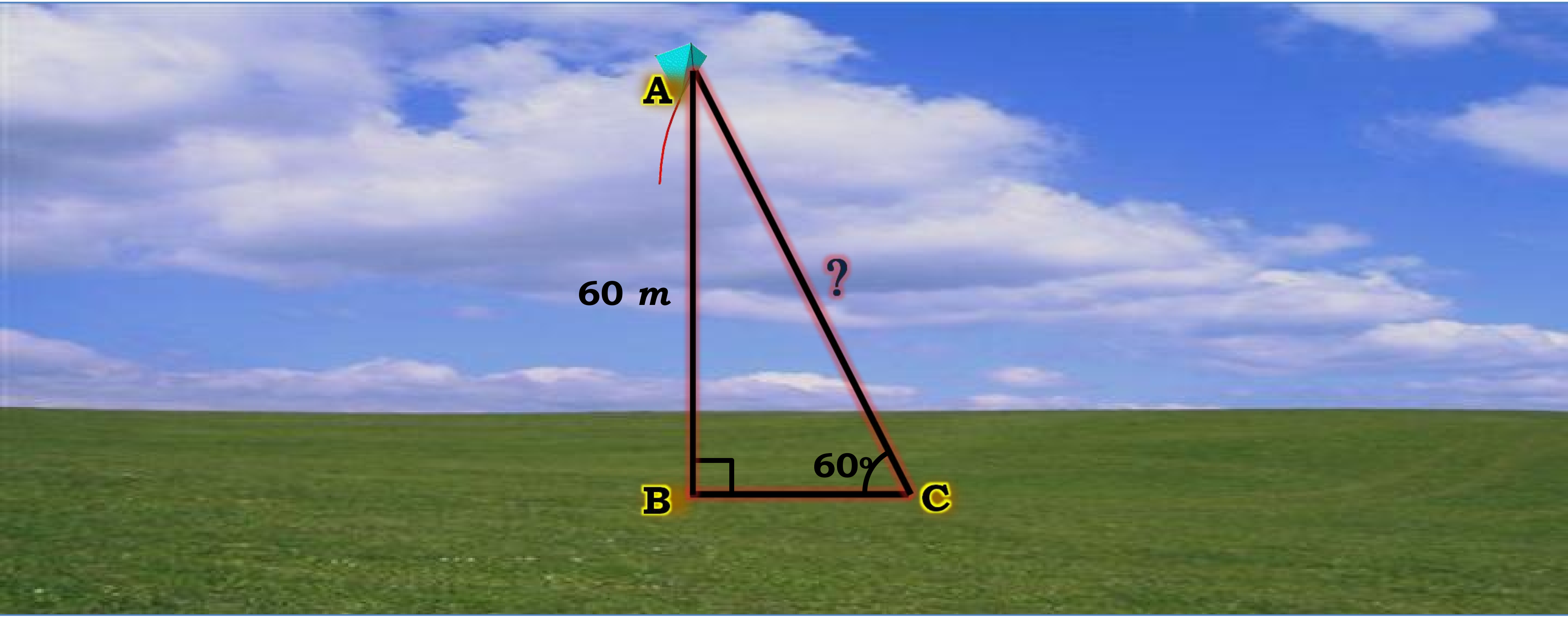
$$\therefore \quad h = \frac{20}{2}$$

$$\therefore \quad h = 10$$

∴ **Height of the pole is 10 m**



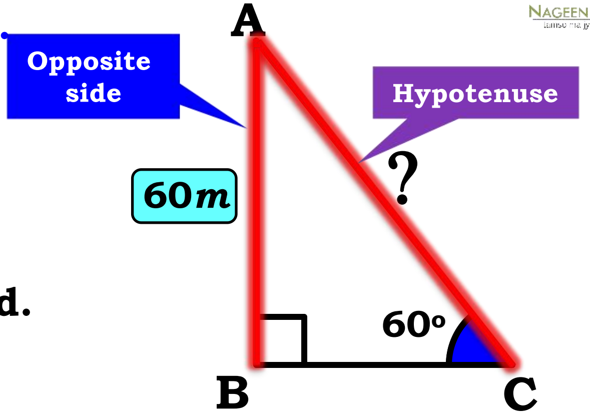
Q. A kite is flying at a height of 60m above the ground. The string attached to the kite is temporarily tied to the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.



Q. A kite is fl… the ground.
The string… and …rily tied
to the gro… of …g with
the groun… string,
assuming … …ing.

Ratio … Hypo…

Now, let us rationalise the denominator



Sol.

AB represents the distance of the kite from ground.

AB = 60 *m*.

AC rep… …th of the string.

∠ACB …

In righ… …

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

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

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

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

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

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

$\therefore AC = \frac{\overset{40}{\cancel{120}}\sqrt{3}}{\cancel{3}}$

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

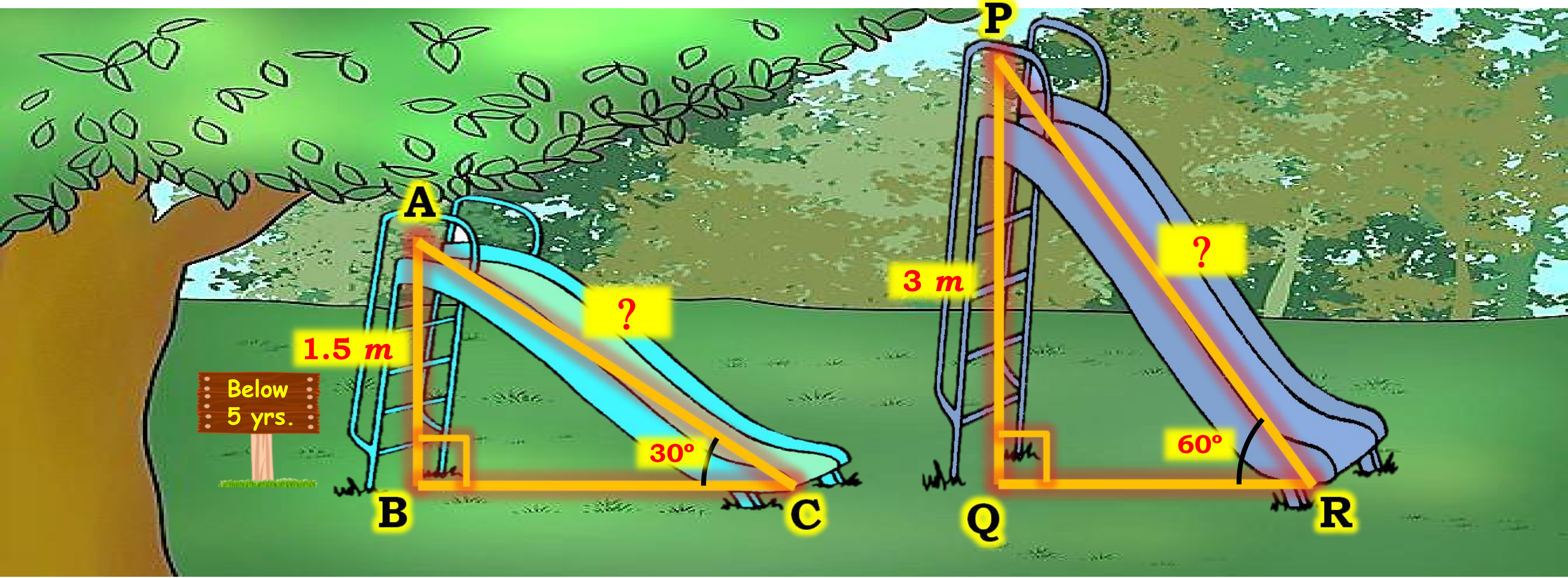
$\sqrt{3} = 1.73$

$\therefore AC = 40 \times 1.73$

$\therefore AC = 69.2\ m$

$\therefore$ 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° 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° 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

t... below the

... slide whose

... and ... clined at

... us of ... eas for ... 1.5 m

... stee...

s... d at an

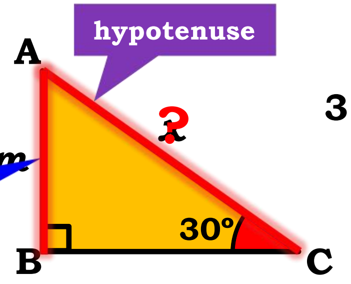
angle of 60° to the ground.

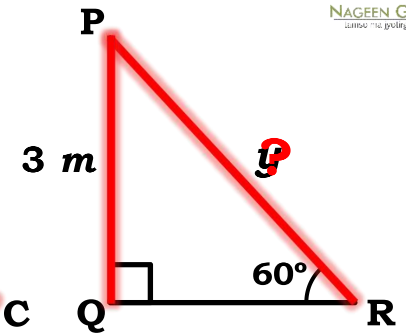
What should be the length of the slide in eac...

For '∠C'

Opposite side → AB

Hypotenuse → AC





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 1st slide (AB) = 1.5 m

Height of 2nd slide (PQ) = 3 m

$\sin 30° = \frac{1}{2}$

...dren :

In ri... ΔABC,

$$\sin 30° = \frac{AB}{AC}$$

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

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

$$\therefore \quad x = 3$$

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

to play ... the

age of ... whose

top is ... at

an ang...

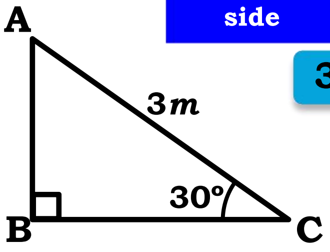
elder c...

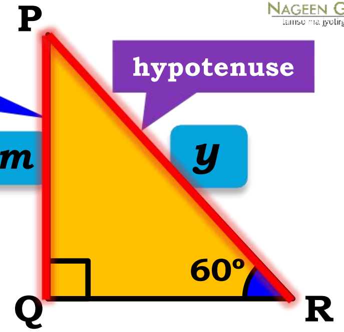
slide at a height of 3m, and inclined at an

angle of 60° to the ground.

Wh... ength of the slide in each case?

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





Sol. ... en :

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

In right ΔPQR,

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

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

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

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

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

$$\therefore \quad y = \ldots$$

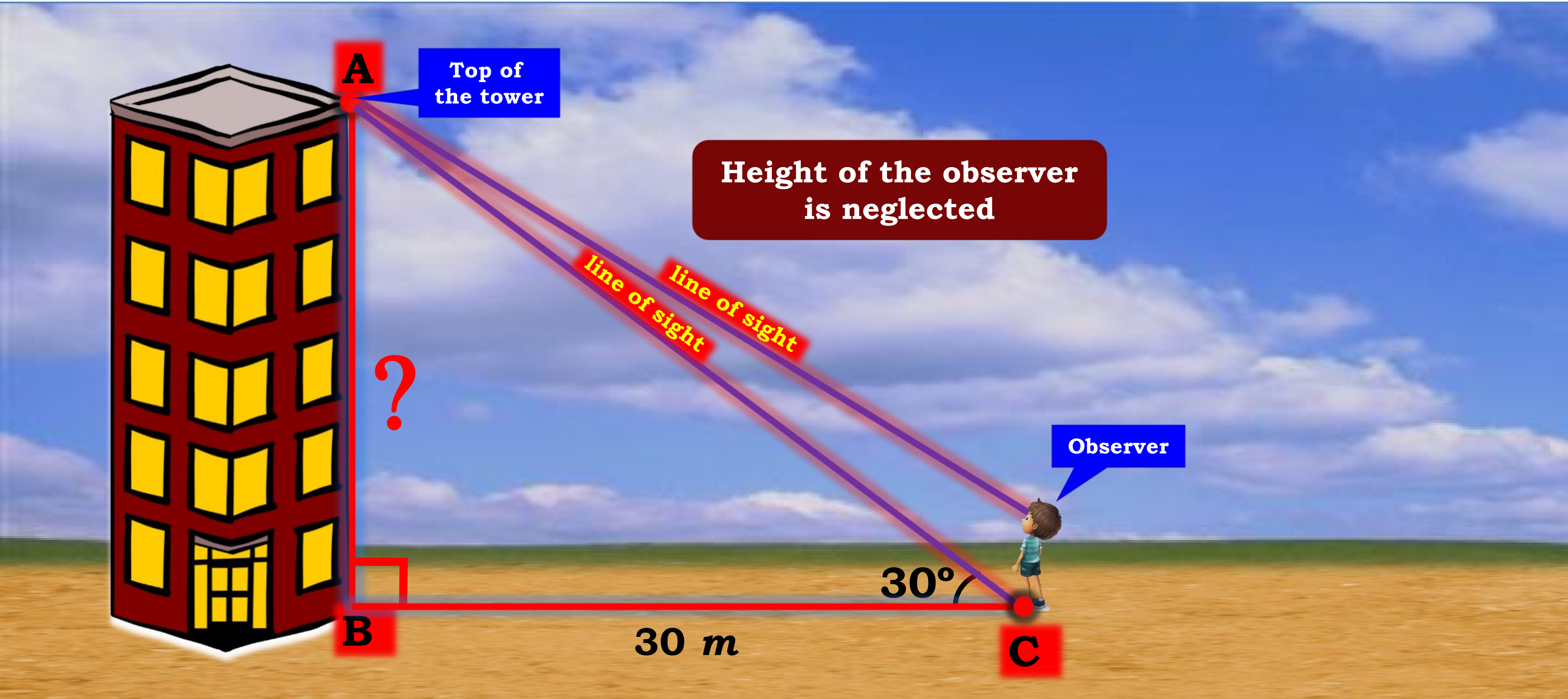
$\sqrt{3} = 1.73$

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

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

$\therefore$ **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°. Find the height of the tower.



Q. The angle ... **wer from a point on** ... **y from the foot of th** ... **t of the tower**

Sol. Distanc ... **a point** ...

gr ...

Le ... **ole (AB) be 'h'**

In ri ... **ΔABC,**

Ra ... d
adj ... B of
... C

Now, let us rationalise the denominator

$\tan 30^\circ = \frac{1}{\sqrt{3}}$

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

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

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

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

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

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

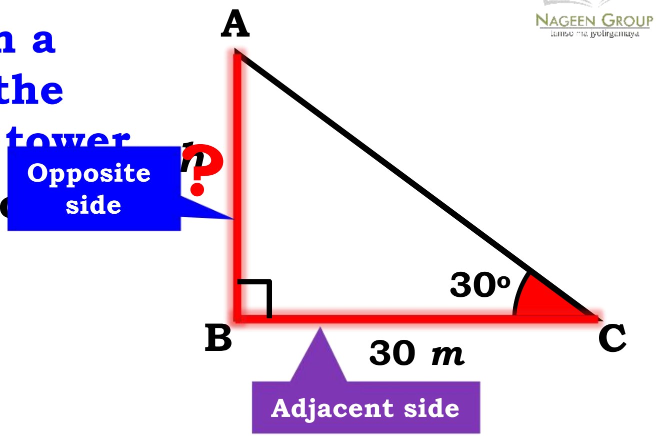
$$\therefore \quad h = 10\sqrt{3}$$

$\sqrt{3} = 1.73$

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

$$\therefore \quad h = 17.3$$

$\therefore$ **Height of the tower is 17.3 m**



Thank You