UDAAN 2025

MATHS

Some Applications Of Trigonometry

DHA: 01

Q1 The length of shadow of a building, when the sun's altitude is 60°, is 20 m less than that it was when it was 45°. The height of the building is:
(A) 54.48 m (B) 47.32 m
(C) 64.32 m (D) 57.48 m

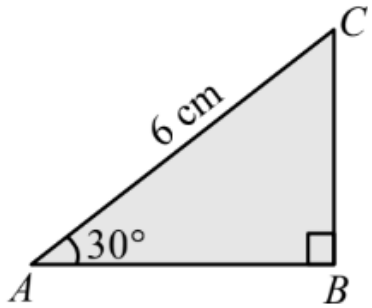
Q2 If a pole $15\ \mathrm{m}$ high casts a shadow $5\sqrt{3}\ \mathrm{m}$ long, then sun's elevation is:
(A) 60° (B) 45°
(C) 30° (D) 90°

Q3 An observer 1.5 m tall is 25.5 m away from a tower and the angle of elevation of the top of the tower from the eye of the observer is 45°. The height of the tower is:
(A) 27 m (B) 30 m
(C) 28.5 m (D) None of these

Q4 If the elevation of the sun changes from 30° to 60° then the difference between the lengths of shadows of a pole 15 m high, is:
(A) 7.5 m (B) 15 m
(C) $10\sqrt{3}m$ (D) $5\sqrt{3}m$

Q5 A circus artist is climbing a $20\ \mathrm{m}$ 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°:
(A) $10\sqrt{3}\ \mathrm{m}$
(B) $\frac{20}{\sqrt{3}}\ \mathrm{m}$
(C) $10\ \mathrm{m}$
(D) Can't be determined

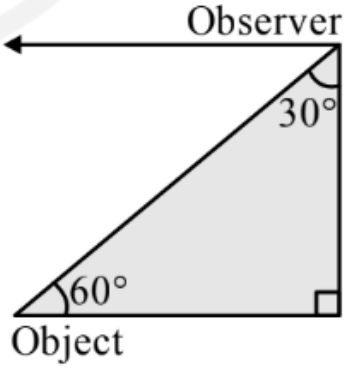
Q6 In this adjoining figure, the length of BC is:



(A) $2\sqrt{3}cm$ (B) $3\sqrt{3}cm$
(C) $4\sqrt{3}cm$ (D) 3 cm

Q7 The angle of elevation of the top of a tower at point on the ground is 30°.If on walking 20 metres toward the tower, the angle of elevation become 60°, then the height of the tower is:
(A) 10 metre (B) $\frac{10}{\sqrt{3}}$ metre
(C) $10\sqrt{3}$ metre (D) None of these

Q8 In the given figure, the positions of the observer and the object are mentioned, the angle of depression is:



(A) 30° (B) 90°
(C) 60° (D) 45°

Q9 The string of a kite is 100 m long and it makes an angle of 60° with the horizontal. If there is no slack in the string, the height of the kite from the ground is:

(A) $50\sqrt{3}m$ (B) $100\sqrt{3}m$
(C) $50\sqrt{2}m$ (D) 100 m

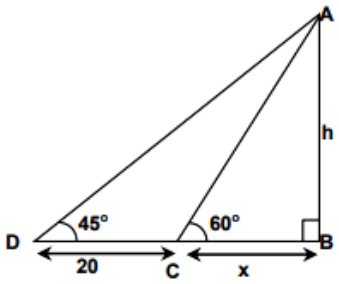
Q10 The tops of two towers of heights x and y, standing on a level ground subtend angles of 30° and 60° respectively at the centre of the line joining their feet. Then, x : y is:
(A) 1 : 2 (B) 2 : 1
(C) 1 : 3 (D) 3 : 1

Answer Key

Q1	(B)	Q6	(D)
Q2	(A)	Q7	(C)
Q3	(A)	Q8	(C)
Q4	(C)	Q9	(A)
Q5	(C)	Q10	(C)

Hints & Solutions

Q1 Text Solution:



$In\ \Delta\ ABC$

$\tan 60^0 = \frac{AB}{BC} = \frac{h}{x}$

$\Rightarrow \sqrt{3} = \frac{h}{x} \ldots\ldots\ldots (i)$

$Again$

$In\ \Delta\ ABD$

$\tan 45^0 = \frac{AB}{BD}$

$\Rightarrow\ 1\ = \frac{AB}{BC + CD}$

$\Rightarrow 1\ = \frac{h}{x+20}$

$\Rightarrow\ x\ +\ 20\ =\ h\ \ldots\ldots\ldots (ii)$

$from\ eq\ (i)\ and\ (ii)$

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

$\Rightarrow\ 20\ =\ h\ -\ \frac{h}{\sqrt{3}}$

$\Rightarrow\ 20\ = h\left(\ 1\ -\ \frac{1}{\sqrt{3}}\right)$

$\Rightarrow h\ =\ \frac{20\sqrt{3}}{\sqrt{3}-1}$

$\Rightarrow\ h\ =\ \frac{20\sqrt{3}\,(\sqrt{3}+1)}{2}$

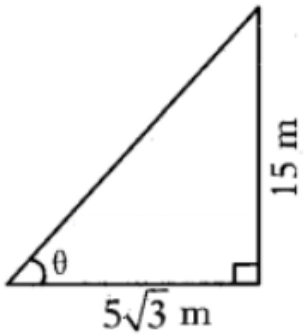
$\Rightarrow h\ =\ 10\left(\ 3\ +\sqrt{3}\right)$

$h\ =\ 10\ \left(\ 3\ +\ 1.732\right)$

$=\ 10\ \times 4.732\ =\ 47.32\ m$

Video Solution:

Q2 Text Solution:



Height of the pole = 15 m

Length of the shadow = 5√3 m

Let the angle of elevation be 'θ'.

Then from the figure, $\tan\theta = \frac{Perpendicular}{Base} = \frac{15}{5\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

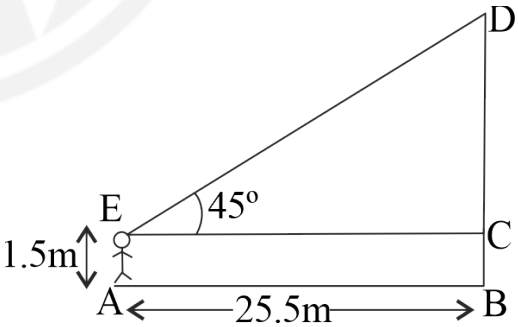
$\tan\theta = \sqrt{3}$

$\tan 60° = \sqrt{3}$

$\therefore \theta = 60°$

Video Solution:

Q3 Text Solution:



Height of tower = BD

BD = BC + CD

BD = 1.5 +CD

Now In

ΔECD

$\tan 45^0 = \frac{DC}{EC}$

$\Rightarrow 1 = \frac{DC}{EC}$

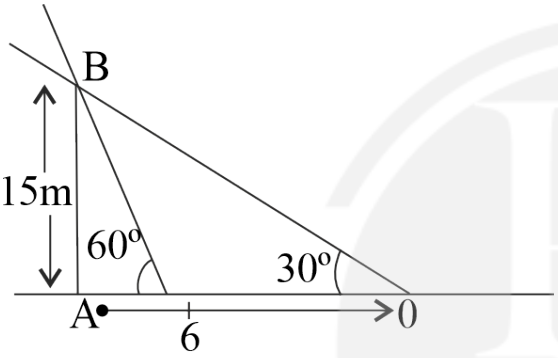
$\Rightarrow 1 = \frac{DC}{25.5}$

$DC = 25.5\ m$

Again BD = 1.5 + 25.5 = 27 m

Video Solution:

Q4 **Text Solution:**



Let AO = length of shadow (initial)

AO' = length of shadow (final)

Difference = AO - AO' = OO'

$In\ \Delta\ ABO$

$\tan 30^0 = \frac{AB}{AO} = \frac{15}{AO}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{15}{AO}$

$\Rightarrow AO = 15\sqrt{3}\ m$

$Again,$

$In\ \Delta\ ABO'$

$\tan 60^0 = \frac{AB}{AO'} = \frac{15}{AO'}$

$\Rightarrow \sqrt{3} = \frac{15}{AO'}$

$\Rightarrow AO' = \frac{15}{\sqrt{3}} = 5\sqrt{3}m$

Difference = OO' = $15\sqrt{3} - 5\sqrt{3} = 10\sqrt{3}m$

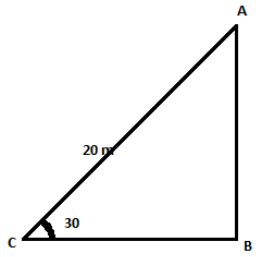
Video Solution:

Q5 **Text Solution:**

In ΔABC,

AB = height of pole

AC = Rope = 20 m



we have

$\sin 30^0 = \frac{height\ of\ pole}{20}$

$\Rightarrow \frac{1}{2} = \frac{height\ of\ pole}{20}$

⇒height of pole =10 m

Video Solution:

Q6 **Text Solution:**

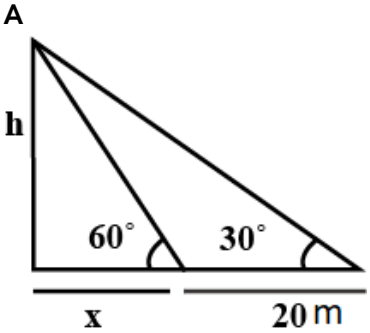
$\sin 30^0 = \frac{BC}{AC} = \frac{Perpendicular}{Hypotenuse}$

$\Rightarrow \frac{1}{2} = \frac{BC}{6}$

$\Rightarrow BC = 3cm$

Video Solution:

Q7 **Text Solution:**



B O O'

Let say h be the height of the tower, x be the initial distance and x+20 be the final distance away from the foot of the tower of the given point.

Now using trigonometry for the above triangles,

$\tan 60^0 = \frac{AB}{BO} = \frac{h}{x}$

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

$x = \frac{h}{\sqrt{3}}$

Also,

$\tan 30^0 = \frac{AB}{BO'}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+20}$

$\Rightarrow \sqrt{3}h = x + 20$

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

$\Rightarrow \sqrt{3}h - \frac{h}{\sqrt{3}} = 20$

$\Rightarrow h\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) = 20$

$\Rightarrow h\left(\frac{3-1}{\sqrt{3}}\right) = 20$

$\Rightarrow \frac{2h}{\sqrt{3}} = 20$

$\Rightarrow h = 10\sqrt{3}m$

Video Solution:

Q8 Text Solution:

The positions of the observer and the object are mentioned, the angle of depression is 60^0.

Video Solution:

Q9 Text Solution:

Let height of kite = perpendicular = h and hypotenuse = length of string = 100 m

$\sin\theta = \frac{Perpendicular}{hypotenuse}$

$\sin 60^0 = \frac{h}{100}$

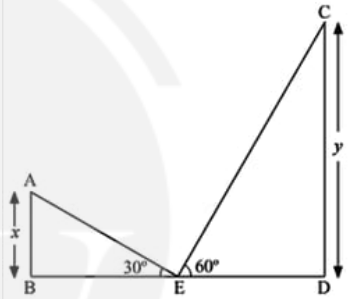
$\Rightarrow \frac{\sqrt{3}}{2} = \frac{h}{100}$

$\Rightarrow h = \frac{100\sqrt{3}}{2}$

$\Rightarrow h = 50\sqrt{3}m$

Video Solution:

Q10 Text Solution:



Let AB and CD be the two towers of heights x and y, respectively.

Suppose E is the centre of the line joining the feet of the two towers i.e. BD.

Now, in Δ ABE,

$\tan 30^0 = \frac{AB}{BE} = \frac{x}{BE}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{x}{BE}$

$\Rightarrow BE = \sqrt{3}x$ ..... (i)

Also,

In Δ CDE,

$\tan 60^0 = \frac{CD}{DE} = \frac{y}{DE}$

$\Rightarrow \sqrt{3} = \frac{y}{DE}$

$\Rightarrow DE = \frac{y}{\sqrt{3}}$ ..... (ii)

Now BE=DE ....(iii) (E is mid-point of BD)

So, from (i), (ii) and (iii) we get

$\sqrt{3}x=\frac{y}{\sqrt{3}}$

$\Rightarrow \frac{x}{y}=\frac{1}{3}$

Hence, the ratio of x and y is 1 : 3.

Video Solution: