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Jars Education

Shop no. 2,3,4 hendre pada Badlapur west thane

Time : 1 Hour 30 Minute

STD 10 Maths
Chapter Based Test

Total Marks : 50

Section A

* Choose the right answer from the given options. [1 Marks Each] [7]

1. Two persons are a metres apart and the height of one is double that of the other. If from the middle point of the line joining their feet, an observer finds the angular elevation of their tops to be complementary, then the height of the shorter post is:

(A) $\frac{a}{4}$ (B) $\frac{a}{\sqrt{2}}$ (C) $a\sqrt{2}$ (D) $\frac{a}{2\sqrt{2}}$

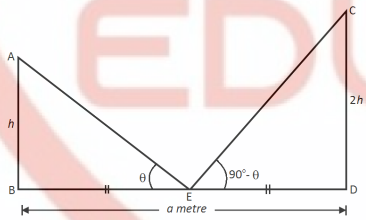
Ans. :

d. $\frac{a}{2\sqrt{2}}$

Solution: Let AB and CD be the two persons such that AB < CD.

Then, let AB = h so that CD = 2h

Now, the given information can be represented as,



Here, E is the midpoint of BD.

We have to find height of the shorter person.

So we use trigonometric ratios.

In triangle ECD,

$$\tan\angle CED = \frac{CD}{ED}$$

$$\Rightarrow \quad \tan(90^\circ - \theta) = \frac{2h}{\left(\frac{a}{2}\right)}$$

$$\Rightarrow \quad \cot\theta = \frac{4h}{a} \ldots.(1)$$

Again in triangle ABE,

$$\tan\angle AEB = \frac{AB}{BE}$$

$$\Rightarrow \quad \tan\theta = \frac{h}{\left(\frac{a}{2}\right)}$$

$$\Rightarrow \quad \frac{1}{\cot\theta} = \frac{2h}{a}$$

$$\Rightarrow \quad \frac{a}{4h} = \frac{2h}{a}$$

$$\Rightarrow \quad a^2 = 8h^2$$

$\Rightarrow\ h = \frac{a}{2\sqrt{2}}$

2. A balloon moving in a straight line passes vertically above two points A and B on horizontal plane 1000 ft apart. When above A it has an altitude of 60° as seen from B. When above B it has an altitude of 45° as seen from A. The distance of B from the point at which it will touch the plane is:

(A) $500(\sqrt{3}+1)\text{ft}$ (B) 1500 ft (C) $500(3+\sqrt{3})\text{ ft}$ (D) 500 ft

Ans. :

a. $500(\sqrt{3}+1)\text{ft}$

Solution:

$\tan 60 = \frac{h}{1000}$

$h = 1000\sqrt{3}$

$\frac{1000\sqrt{3}}{1000+x} = \frac{1000}{4}$

$x^2 = \frac{1000}{(\sqrt{3}-1)}$

$x^2 = 500(\sqrt{3}+1)$

3. The horizontal distance between two towers is 60m and angular depression of the top of the first as seen from the second, which is 150m in height, is 30°. The height of the first tower is:

(A) $\left(150+20\sqrt{3}\right)\text{m}$ (B) $\left(150+15\sqrt{3}\right)\text{m}$ (C) $\left(150-20\sqrt{5}\right)\text{m}$ (D) $\left(150-20\sqrt{3}\right)\text{m}$

Ans. :

d. $\left(150-20\sqrt{3}\right)\text{m}$

4. From a light house the angles of depression of two ships on opposite sides of the light house are observed to be 30° and 45°. If the height of the light house is h metres, the distance between the ships is:

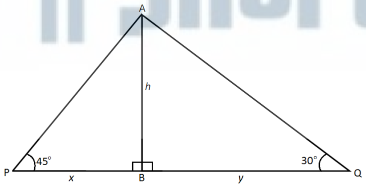
(A) $(\sqrt{3}+1)\text{h meters}$ (B) $(\sqrt{3}-1)\text{h meters}$ (C) $\sqrt{3}\text{h meters}$ (D) $1 + \left(1 + \frac{1}{\sqrt{3}}\right)\text{h meters}$

Ans. :

a. $(\sqrt{3}+1)\text{h meters}$

Solution: Let AB be light house and P and Q are two ships on its opposite sides which form angle of elevation of A as 45° and 30° respectively AB = h.

Let PB = x and QB = y



Now in right $\triangle APB$,

$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{AB}{PB}$

$\Rightarrow\ \tan 45^\circ = \frac{h}{x} \Rightarrow\ 1 = \frac{h}{x}$

$\Rightarrow\ x = h \ldots\ldots (i)$

Similarly in right $\triangle AQB$,

$\tan 30^\circ = \frac{AB}{QB} = \frac{h}{y}$

$\Rightarrow\ \frac{1}{\sqrt{3}} = \frac{h}{y}$

$\Rightarrow\ y = \sqrt{3}h \ldots\ldots (ii)$

Adding (i) and (ii)

$PQ = x + y = h + \sqrt{3}h$

$(\sqrt{3} + 1)h$ meters

5. A pole casts a shadow of length $2\sqrt{3}m$ on the ground when the sun's elevation is 60°. The height of the pole is:

(A) $6m$ (B) $4\sqrt{3}m$ (C) $12m$ (D) $3m$

Ans. :

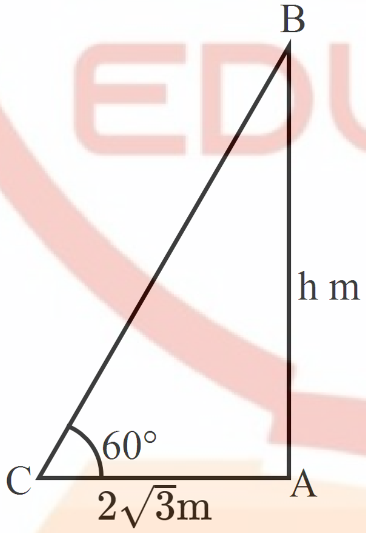
a. $6m$

Solution:

Let the height of the pole be h metres.

Then, $\frac{h}{2\sqrt{3}} = \tan 60^\circ = \sqrt{3}$

$\Rightarrow h = (2\sqrt{3} \times \sqrt{3}) = 6.$



6. If the altitude of the sum is at 60°, then the height of the vertical tower that will cast a shadow of length 30m is:

(A) $30\sqrt{3}m$ (B) $15m$ (C) $\frac{30}{\sqrt{3}}m$ (D) $15\sqrt{2}m$

Ans. :

a. $30\sqrt{3}m$

Solution: Let h be the height of vertical tower AB.

Given that: altitude of sun is 60° and shadow of length BC = 30 meters.

Here, we have to find the height of tower.

So we use trigonometric ratios.

In a triangle ABC,

$$\Rightarrow \ \tan \mathrm{C} = \frac{\mathrm{AB}}{\mathrm{BC}}$$

$$\Rightarrow \ \tan 60^\circ = \frac{\mathrm{AB}}{\mathrm{BC}}$$

$$\Rightarrow \ \sqrt{3} = \frac{\mathrm{h}}{30}$$

$$\Rightarrow \ \mathrm{h} = 30\sqrt{3}$$

7. If the angle of elevation of a tower from a distance of 100 metres from its foot is 60°, then the height of the tower is:

(A) $100\sqrt{3}\mathrm{m}$ (B) $\frac{100}{\sqrt{3}}\mathrm{m}$ (C) $50\sqrt{3}$ (D) $\frac{200}{\sqrt{3}}\mathrm{m}$

Ans. :

a. $100\sqrt{3}\mathrm{m}$

Solution: Let AB be the tower and a point P at a distance of 100m from its foot, angle of elevation of the top of the tower is 60°.

Let height of the tower = h

Then in right $\triangle \mathrm{APB}$,

$$\tan \theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{\mathrm{AB}}{\mathrm{PB}}$$

$$\Rightarrow \ \tan 60^\circ = \frac{\mathrm{h}}{100} \Rightarrow \ \sqrt{3} = \frac{\mathrm{h}}{100}$$

$$\Rightarrow \ \mathrm{h} = 100\sqrt{3}$$

$\therefore$ Height of tower $= 100\sqrt{3}\mathrm{m}$

*** A statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.** **[2]**

8. **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R).Mark the correct choice as:

Assertion: If the length of shadow of a vertical pole is equal to its height, then the angle of elevation of the sun is 45°

Reason: According to pythagoras theorem, $h^2 = l^2 + b^2$ where h = hypotenuse, l = length and b = base

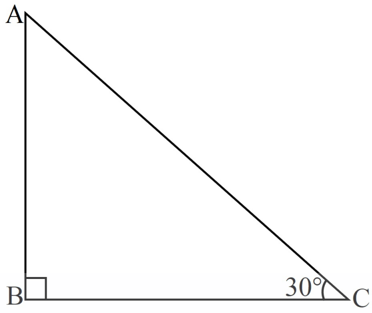
a. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
b. Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
c. Assertion (A) is true but reason (R) is false.
d. Assertion (A) is false but reason (R) is true.

Ans. :

b. Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

9. **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

Assertion: In the figure, if BC = 20m, then height AB is 11.56m.



Reason: $\tan\theta = \frac{AB}{BC} = \frac{\text{perpendicular}}{\text{base}}$ where θ is the $\angle ACB$

a. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

b. Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

c. Assertion (A) is true but reason (R) is false.

d. Assertion (A) is false but reason (R) is true.

Ans. :

a. Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Solution:

Both the assertion and reason are correct, reason is the correct explanation of the assertion.

$\tan 30^\circ = \frac{AB}{BC} = \frac{AB}{20}$

$AB = \frac{1}{\sqrt{3}} \times 20 = \frac{20}{1.73} = 11.56\text{m}$

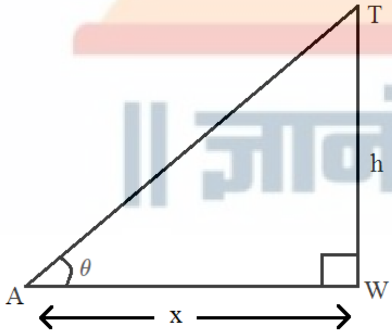
* State whether the following sentences are True or False. [1 Marks Each] [4]

10. Write 'True' or 'False' and justify your answer.

If the height of a tower and the distance of the point of observation from its foot, both, are increased by 10%, then the angle of elevation of its top remains unchanged.

Ans. : True.

Let height h of tower TW makes an angle of elevation to observer at A and the distance from foot of tower to the observer is x.



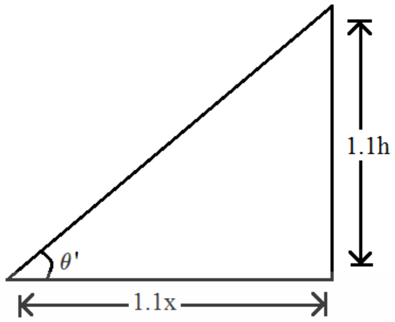
$\therefore \ \tan\theta = \frac{h}{x}$

Now, h and increases by 10%

$\therefore \ h' = h + 10\% \text{ of } h = h + \frac{10}{100} \times h = h + 0.1h$

⇒ h' = 1.1h

Similarly, x' = 1.1x



$\therefore \quad \tan\theta' = \frac{1.1h}{1.1x} = \frac{h}{x} \quad (II)$

From (I) and (II), we get

$\tan\theta = \tan\theta'$

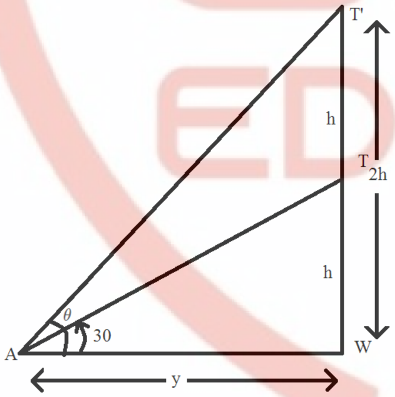
$\Rightarrow \quad \theta = \theta'$

Hence, the given statement is true.

11. Write ‘True’ or ‘False’ and justify your answer.
The angle of elevation of the top of a tower is 30°. If the height of the tower is doubled, then the angle of elevation of its top will also be doubled.

Ans. : False.

Let the height of the tower is h. For the observer at A the angle of elevation is equal to 30º.



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

$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{y}$

$\Rightarrow \quad y = h\sqrt{3}$

Now, the height of the tower increases to 2h.

Now, let the new angle of elevation at A becomes θ then

$\tan\theta = \frac{2h}{y}$

$\Rightarrow \quad \tan\theta = \frac{2h}{h\sqrt{3}}$

$\Rightarrow \quad \tan\theta = \frac{2}{\sqrt{3}}$

But, $\tan 60^\circ = \sqrt{3}$

$\Rightarrow \quad \tan 60^\circ = \sqrt{3} \neq \frac{2}{\sqrt{3}}$

So, $\theta \neq 60^\circ$

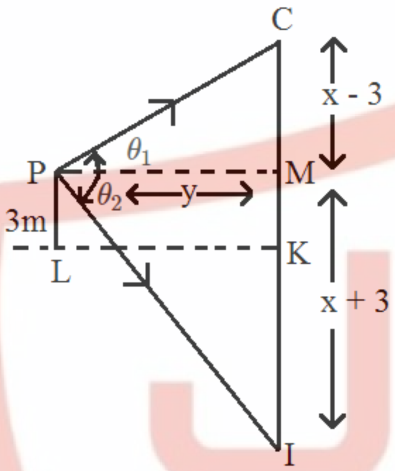
Hence, angle of elevation will not be doubled or the given statement is false.

12. Write 'True' or 'False' and justify your answer.

If a man standing on a platform 3 metres above the surface of a lake observes a cloud and its reflection in the lake, then the angle of elevation of the cloud is equal to the angle of depression of its reflection.

Ans. : False.

The observer is at the platform (P) 3m above the surface LK of the lake. He observes the angle of elevation of cloud C from P and its reflection image in the lake is formed at I. The observer measures in the angle of depression of image (I) θ_2. Draw PM $\perp$ on the vertical line passing through the cloud and its image.



CK = KI = x by the prop. of reflection.

CM = CK - MK = x - 3

MI = KI + MK = x + 3

Now, $\tan\theta_1 = \frac{x-3}{y}$ and $\tan\theta_2 = \frac{x+3}{y}$

$\Rightarrow \; y = \frac{x-3}{\tan\theta_1}$ and $y = \frac{x+3}{\tan\theta_2}$

$\Rightarrow \; \frac{x+3}{\tan\theta_2} = \frac{x-3}{\tan\theta_1}$

$\Rightarrow \; \tan\theta_2 = \left(\frac{x+3}{x-3}\right)\tan\theta_1$

$\Rightarrow \; \tan\theta_1 \neq \tan\theta_2$

or $\theta_1 \neq \theta_2$

Alternate Answer

By the property of image formation, the distance of image and the object are equal from the reflecting surface.

So, $KC = KI$

$\Rightarrow \; MI \neq MC$

$\Rightarrow \; \triangle MPC \neq \triangle MPI$

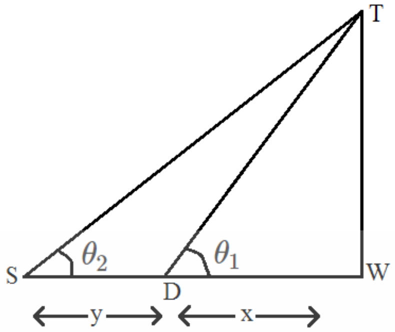
So $\theta_1 \neq \theta_2$

13. Write 'True' or 'False' and justify your answer.

If the length of the shadow of a tower is increasing, then the angle of elevation of the sun is also increasing.

Ans. : False.

The shadow of a tower on the ground increases from x to (x + y) when angle of elevation of the sun change from θ_1 to θ_2.



$\therefore$ θ_1 is the exterior angle of $\triangle TSD$

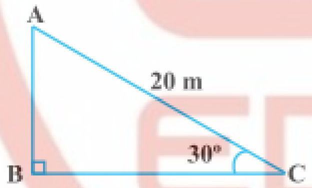
So $\theta_1 > \theta_2$

So, on increasing the length of shadow the angle of elevation decreases.

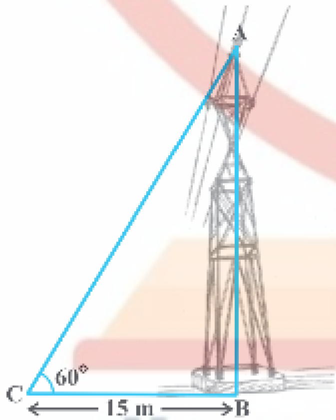
Hence, the given statement is false.

* **Answer the following questions in one sentence. [1 Marks Each]** **[1]**

14. A circus artist is climbing a 20 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°.



Ans. :



First, let us draw a simple diagram to represent the problem. Here AB represents the tower, CB is the distance of the point from foot of the tower and $\angle$ ACB is the angle of elevation. We need to determine the height of the tower, i.e., AB. Also, ACB is a triangle, right-angled at B. To solve the problem, we choose the trigonometric ratio tan 60° (or cot 60°), as the ratio involves AB and BC.

Now, tan 60° = $\frac{AB}{BC}$

i.e., $\sqrt{3} = \frac{AB}{15}$

i.e., AB = $15\sqrt{3}$

Hence, the height of the tower is $15\sqrt{3}$ m

Section B

* **Given section consists of questions of 2 marks each.** **[10]**

1. Find the angle of elevation of the sum (sun's altitude) when the length of the shadow of a vertical pole is equal to its height.

Ans. :

Let θ be the angle of elevation of sun. Let AB be the vertical pole of height h and BC be the shadow of equal length h.

Here we have to find angle of elevation of sun.

We have the corresponding figure as follows,

So we use trigonometric ratios to find the required angle.

In a triangle ABC,

$$\Rightarrow \tan\theta = \frac{\mathrm{AB}}{\mathrm{BC}}$$

$$\Rightarrow \tan\theta = \frac{\mathrm{h}}{\mathrm{h}}$$

$$\Rightarrow \tan\theta = 1$$

$$\Rightarrow \theta = 45^{\circ}$$

Hence the angle of elevation of sun is 45°.

2. A ladder 15m long just reaches the top of a vertical wall. If the ladders makes an angle of 60° with the wall, then find the height of the wall.

Ans. :

Given that, the height of the ladder = 15m

Let the height of the vertical wall = h

and the ladder makes an angle of elevation 60° with the wall i.e., $\theta = 60^{\circ}$.

In $\triangle \mathrm{QPR},\ \cos 60^{\circ} = \frac{\mathrm{PR}}{\mathrm{PQ}} = \frac{\mathrm{h}}{15}$

$$\Rightarrow \frac{1}{2} = \frac{\mathrm{h}}{15}$$

$$\Rightarrow \mathrm{h} = \frac{15}{2}\mathrm{m} = 7.5\mathrm{m}$$

Hence, the required heigth of the wall 7.5m.

3. What is the angle of elevation of the Sun when the length of the shadow of a vetical pole is equal to its height?

Ans. :

Let height of a vertical pole = h

Then its shadow = x

$\therefore$ h = x

Let θ be the angle of elevation of the sun

Then, $\tan\theta = \frac{\mathrm{AB}}{\mathrm{BC}} = \frac{\mathrm{h}}{\mathrm{x}} = \frac{\mathrm{h}}{\mathrm{h}}$

$\Rightarrow \ \tan\theta = 1 = \tan 45^\circ \ (\because \ \tan 45^\circ = 1)$

$\Rightarrow \ \theta = 45^\circ$

4. An observer, 1.5m tall, is 28.5m away from a 30m high tower. Determine the angle of elevation of the top of the tower from the eye of the observer.

Ans. :

Let AB = 1.5m be the observer and CD = 30m be the tower.

Let the angle of elevation of the top of the tower be α.

CD = CE + ED

⇒ CD = CE + AB

⇒ 30 = CE + 1.5

⇒ CE = 30 - 1.5 = 28.5m

In $\triangle\mathrm{CEB}$,

$\tan\alpha = \frac{\mathrm{CE}}{\mathrm{BE}} = \frac{28.5}{28.5}$

$\Rightarrow \ \tan\alpha = 1$

$\Rightarrow \ \tan\alpha = \tan 45^\circ$

$\Rightarrow \ \alpha = 45^\circ$

5. B is a pole of height 6m standing at a point B and CD is a ladder inclined at angle of 60° to the horizontal and reaches upto a point D of pole. If AD = 2.54m, find the length of the ladder. $(\mathrm{Use}\ \sqrt{3} = 1.73)$

Ans. :

BD = AB - AD = 6 - 2.54 = 3.46m

In rt., $\triangle\mathrm{DBC}$,

$\sin 60^\circ = \frac{\mathrm{BD}}{\mathrm{DC}}$

$\Rightarrow \ \frac{\sqrt{3}}{2} = \frac{3.46}{\mathrm{DC}}$

$\Rightarrow \ \sqrt{3}\mathrm{DC} = 3.46 \times 2$

$\Rightarrow \ \mathrm{DC} = \frac{3.46 \times 2}{1.73} = 4\mathrm{m}$

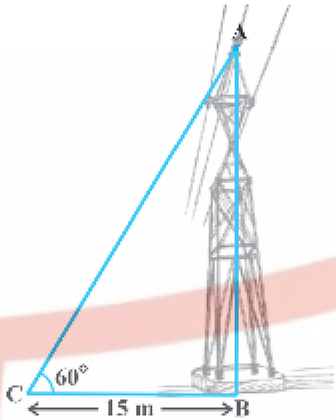
Length of the ladder, DC = 4

Section C

* **Given section consists of questions of 3 marks each.** **[12]**

1. A tower stands vertically on the ground. From a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 60°. Find the height of the tower.

Ans. :



First, let us draw a simple diagram to represent the problem. Here AB represents the tower, CB is the distance of the point from foot of the tower and $\angle$ ACB is the angle of elevation. We need to determine the height of the tower, i.e., AB. Also, ACB is a triangle, right-angled at B. To solve the problem, we choose the trigonometric ratio tan 60° (or cot 60°), as the ratio involves AB and BC.

Now, tan 60° = $\frac{AB}{BC}$

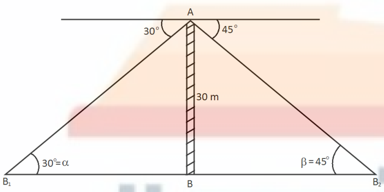
i.e., $\sqrt{3} = \frac{AB}{15}$

i.e., AB = $15\sqrt{3}$

Hence, the height of the tower is $15\sqrt{3}$ m

2. From a point on a bridge across a river the angles of depression of the banks on opposite side of the river are 30° and 45° respectively. If bridge is at the height of 30m from the banks, find the width of the river.

Ans. :



Height of the bridge [AB] = 30m

Angle of depression of bank 1 i.e., $[B_1]\ \alpha = 30^\circ$

Angle of depression of bank 2 i.e., $[B_2]\ \beta = 45^\circ$

Given banks are on opposite sides,

Distance between banks $B_1B_2 = B_1B + BB_2$

The above information is represented is the form of figure as shown in right angle triangle if one of the included angle is O then,

$$\tan\theta = \frac{\text{Opposite side}}{\text{Adjacent side}}$$

In $\triangle \mathrm{ABB}_1$

$\tan \alpha = \frac{\mathrm{AB}}{\mathrm{B_1B}}$

$\tan 30^\circ = \frac{30}{\mathrm{B_1B}}$

$\mathrm{B_1B} = 30\sqrt{3}\mathrm{m}$

In $\triangle \mathrm{ABB}_2$

$\tan \beta = \frac{\mathrm{AB}}{\mathrm{BB_2}}$

$\tan 45^\circ = \frac{30}{\mathrm{BB_2}}$

$\mathrm{BB_2} = 30\mathrm{m}$

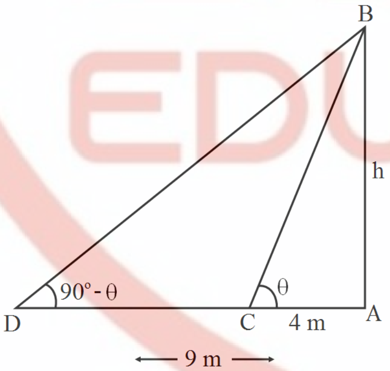
$\mathrm{B_1B_2} = \mathrm{B_1B} + \mathrm{BB_2}$

$= 30\sqrt{3} + 30$

$= 30(\sqrt{3} + 1)$

Distance between banks $= 30(\sqrt{3} + 1)\mathrm{m}.$

3. The angles of elevation of the top of a tower from two points at distances of 4m and 9m from the base of the tower and in the same straight line with it are complementary. Show that the height of the tower is 6 metres.



Ans. :

Let one angle of elevation be θ.

Since the angle are comlementary, the other angle is $(90^\circ - \theta)$.

From right $\triangle \mathrm{CAB}$, we have

$\frac{\mathrm{AB}}{\mathrm{AC}} = \tan \theta$

$\Rightarrow \frac{\mathrm{h}}{4} = \tan \theta$

$\Rightarrow \mathrm{h} = 4 \tan \theta \ldots \text{(i)}$

From right $\triangle \mathrm{CAB}$, we have

$\frac{\mathrm{AB}}{\mathrm{AD}} = \tan(90^\circ - \theta)$

$\Rightarrow \frac{\mathrm{h}}{9} = \tan(90^\circ - \theta)$

$\Rightarrow \mathrm{h} = 9 \tan(90^\circ - \theta)$

Multiplying (i) and (ii) we get

$\mathrm{h}^2 = 36 \tan \theta \times \tan(90^\circ - \theta)$

$\Rightarrow \mathrm{h}^2 = 36 \tan \theta \times \cot \theta$

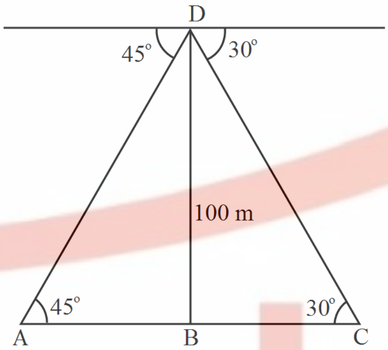
$\Rightarrow h^2 = 36$

$\Rightarrow h = 6m$

Thus, the height of the tower is 6m.

Hence proved.

4. From the top of a tower 100m high, a man observes two cars on the opposite sides of the tower and in same straight line with its base, with angles of depression 30° and 45° respectively. Find the distance between the cars. $\left[\text{Take} \sqrt{3} = 1.732\right]$



Ans. :

Let the distance between the cars = AC

Height of the tower = 100m

In right $\triangle ABD$,

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

$\Rightarrow 1 = \frac{100}{AB}$

$\Rightarrow AB = 100m$

In right $\triangle CBD$,

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

$\Rightarrow \frac{100}{BC} = \frac{1}{\sqrt{3}}$

$\Rightarrow BC = 100\sqrt{3}m$

$AC = AB + BC$

$= 100 + 100\sqrt{3}$

$= 100(1 + \sqrt{3})m$

$= 273.2m$

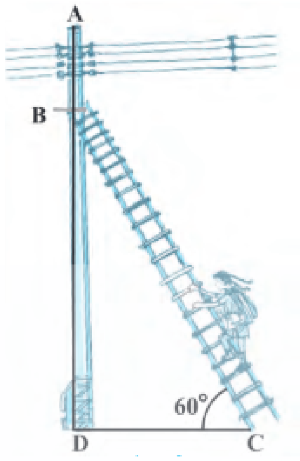
$\therefore$ The distance between the cars is 273.2m.

Section D

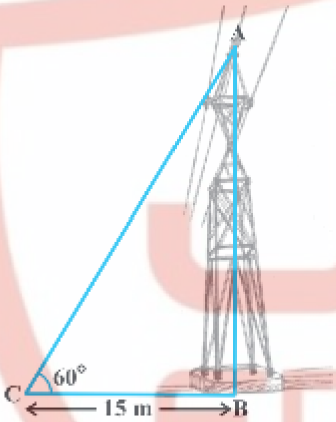
*** Given section consists of questions of 5 marks each. [10]**

1. An electrician has to repair an electric fault on a pole of height 5 m. She needs to reach a point 1.3m below the top of the pole to undertake the repair work. What should be the length of the ladder that she should use which, when inclined at an angle of 60° to the horizontal, would enable her to reach the required position? Also, how far from the foot of

the pole should she place the foot of the ladder? (You may take $\sqrt{3}$ = 1.73)



Ans. :



First, let us draw a simple diagram to represent the problem. Here AB represents the tower, CB is the distance of the point from foot of the tower and $\angle$ ACB is the angle of elevation. We need to determine the height of the tower, i.e., AB. Also, ACB is a triangle, right-angled at B. To solve the problem, we choose the trigonometric ratio tan 60° (or cot 60°), as the ratio involves AB and BC.

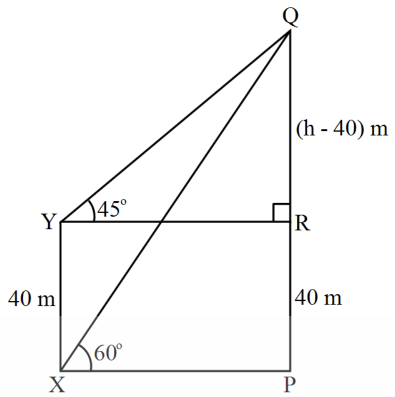
Now, tan 60° = $\frac{\mathrm{AB}}{\mathrm{BC}}$

i.e., $\sqrt{3} = \frac{\mathrm{AB}}{15}$

i.e., AB = $15\sqrt{3}$

Hence, the height of the tower is $15\sqrt{3}$ m

2. The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60°. At a point Y, 40m vertically above X, the angle of elevation is 45°. Find the height of tower. $\left[\mathrm{Take}\sqrt{3} = 1.732\right]$



Ans. :

Given that PQ is a vertical tower.

Let h be the height of the tower.

In right $\triangle \mathrm{QPX}$,

$\tan 60^\circ - \frac{\mathrm{PQ}}{\mathrm{XP}}$

$\Rightarrow \sqrt{3} = \frac{\mathrm{h}}{\mathrm{XP}}$

$\Rightarrow \mathrm{XP} = \frac{\mathrm{h}}{\sqrt{3}}\mathrm{m} \ldots \mathrm{(i)}$

In right $\triangle \mathrm{QRY}$,

$\tan 45^\circ = \frac{\mathrm{QR}}{\mathrm{YR}}$

$\Rightarrow 1 = \frac{(\mathrm{h}-40)}{\mathrm{YR}}$

$\Rightarrow \mathrm{YR} = (\mathrm{h}-40)\mathrm{m} \ldots \mathrm{(ii)}$

Since XP = YR, From (i) and (ii), we have

$\frac{\mathrm{h}}{\sqrt{3}} = \mathrm{h} - 40$

$\Rightarrow \mathrm{h} = \sqrt{3}\mathrm{h} - 40\sqrt{3}$

$\Rightarrow \sqrt{3}\mathrm{h} - \mathrm{h} = 40\sqrt{3}$

$\Rightarrow \mathrm{h} = \frac{40\sqrt{3}}{(\sqrt{3}-1)}$

On rationalising we get,

$\mathrm{h} = \frac{40\sqrt{3}}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$

$\Rightarrow \mathrm{h} = \frac{120+40\sqrt{3}}{2}$

$= 40\left(\frac{3+\sqrt{3}}{2}\right)$

$= 20(3+\sqrt{3}) = 94.6$

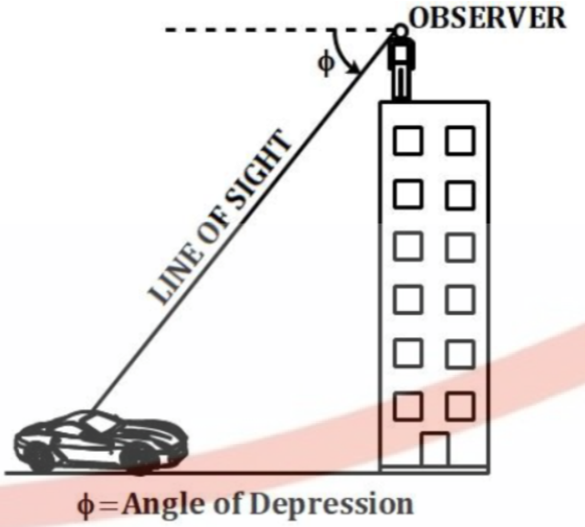
Hence, the height of the tower is 94.6m.

Section E

*	**Case study based questions**	**[4]**

1. Rahul is driving a car. On his way, he approaches a tall building and observes that Rajesh is

standing at the top of that building. A signboard beside the building read - Angle of depression =60°. The distance from the building at which Rahul stops his car is 50cm.



(i) Is the angle of elevation from Rahul's car to the top of building, where Rajesh is standing the same as the angle of depression ?

(ii) What is the length of the line of sight ?

OR

What is the height of the tower ?

(iii) Will the angle of elevation increase or decrease as the car approaches the building ?

Ans. : (i) YES

(ii) 100 cm or 50 3 cm

(iii) Increase

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