Previous Year Questions 2024

Q1: From a point on the ground, which is 30 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is found to be 60°. The height (in metres) of the tower is: (CBSE 2024)

(a) $10\sqrt{3}$

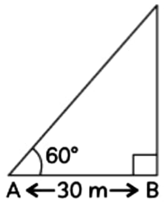
(b) $30\sqrt{3}$

(c) 60

(d) 30

Ans: (b)

Let BC be the tower and A be the observation point.



AB = 30 m

$\angle CAB = 60°$

Let, BC = h m

In ΔCBA,

$\tan 60° = BC/AB$

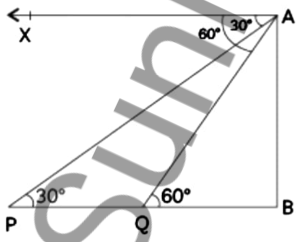
$\Rightarrow \sqrt{3} = h/30$

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

Q2: A man on a cliff observes a boat at an angle of depression of 30° which is approaching the shore to the point immediately beneath the observer with a uniform speed. Six minutes later, the angle of depression of the boat is found to be 60°. Find the time taken by the boat form here to reach the shore. (CBSE 2024)

Ans:

Let AB be the cliff and observer is at point A. Initially the boat is at P after 6 min. it reaches to Q.



$\angle XAP = \angle APB = 30°$

$\angle XAQ = \angle AQB = 60°$

Let the speed of boat be x m/min.

So, distance, PQ = speed × time

$= x \times 6$

= 6x meter

Let it takes t min to reach from Q to B. So distance

BQ = x × t

= tx meter.

In ΔAB P,

$$\tan 30° = \frac{AB}{PB}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{tx+6x}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{x(6+t)}$$

$$\Rightarrow AB = \frac{x(6+t)}{\sqrt{3}} \quad ...(i)$$

In ΔABQ.

$$\tan 60° = \frac{AB}{BQ}$$

$$\Rightarrow \sqrt{3} = \frac{AB}{xt} \quad ....(ii)$$

From (i) and (ii)

$$\frac{x(6+t)}{\sqrt{3}} = \frac{\sqrt{3}xt}{1}$$

$\Rightarrow$ x(6 + t) = 3xt

$\Rightarrow$ x(6 + t) = 3xt

$\Rightarrow$ t + 6 = 3t

$\Rightarrow$ 2t = 6

$\Rightarrow$ t = 3 min.

Previous Year Questions 2023

Q3: If a pole 6 m high casts a shadow 2√3 m long on the ground, then sun's elevation is (CBSE 2023)

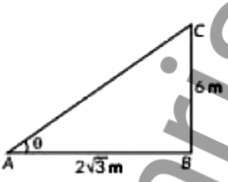
(a) 60°

(b) 45°

(c) 30°

(d) 90°

Ans: (a)



Let θ be the sun's elevation.

Then tanθ = BC/AB

$$\Rightarrow \tan\theta = \frac{6}{2\sqrt{3}} = \sqrt{3}$$

$$\Rightarrow \theta = 60°$$

Q4: A straight highway leads to the foot of a tower. A man standing on the top of the 75 m high observes two cars at angles of depression of 30° and 60° which are approaching the foot of the tower. If one car is exactly behind the other on the same side of the tower, find the distance between the two cars. (Use √3 = 1.73) (CBSE 2023)

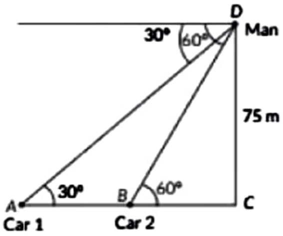
Ans: Let the tower be CD and points A and B be the positions of two cars on the highway.

Height of the tower CD = 75 m.

In ΔDCB,

$$\tan 60^\circ = \frac{DC}{BC}$$

$$\Rightarrow \sqrt{3} = \frac{75}{BC} \Rightarrow BC = \frac{75}{\sqrt{3}}$$



Now, In ΔACD,

$$\tan 30^\circ = \frac{DC}{AC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{75}{AC}$$

$$\Rightarrow \quad AC = 75\sqrt{3}$$

Now, the distance between two cars is

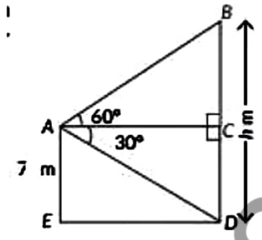
$AB = AC - BC$

$$= 75\sqrt{3} - \frac{75}{\sqrt{3}} = \frac{150}{\sqrt{3}} = 86.71 \text{m}$$

Q5: From the top of a 7 in high building the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 30°. Determine the height of the tower. (2023)

Ans: Let AE be the building with height 7 m and BD be the tower with height h m.

In ΔABC,



$$\tan 60^\circ = \frac{BC}{AC}$$

$$\Rightarrow \sqrt{3} = \frac{BC}{AC} \quad \text{---(i)}$$

$$\Rightarrow \quad BC = AC\sqrt{3}$$

In triangle ACD, $\tan 30^\circ = \frac{CD}{AC}$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{7}{AC} \Rightarrow AC = 7\sqrt{3} \quad \text{...(ii)}$$

From (i) and (ii). we get

BC = 7√3 x √3 = 21m

∴ Height of the tower = 8C + CD

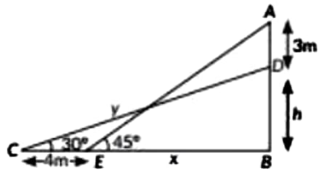
= 21 m + 7 m

= 28 m

Q6: A Ladder set against a wall at an angle 45° to the ground. If the foot of the ladder is pulled away from the wall through a distance of 4 m, its top slides a distance of 3 m down the wall making an angle 30° with the ground. Find the final height of the top of tire ladder from the ground and length of the ladder. (2023)

Ans: Let AE = CD = y be the length of the ladder and h be the final height of the top of the ladder from the ground.

In ΔABE, tan 45^{O} = AB/BE



$\Rightarrow \quad 1 = \frac{AB}{x} = \frac{3+h}{x}$

$\Rightarrow \quad x = (3+h)m$

In ΔDBC, $\tan 30° = \frac{DB}{BC}$

$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{4+x}$

$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{h}{4+3+h}$

$\Rightarrow \quad 7+h = \sqrt{3}h$

$\Rightarrow \quad \sqrt{3}h - h = 7$

$\Rightarrow \quad h(\sqrt{3}-1) = 7$

$\Rightarrow \quad h = \frac{7}{\sqrt{3}-1} = \frac{7}{1.732-1} = 9.56m$

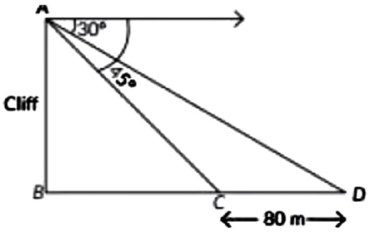
Now, $\sin 45° = \frac{AB}{AE}$

$\Rightarrow \quad \frac{1}{\sqrt{2}} = \frac{3+h}{y}$

$\Rightarrow \quad y = (3+h)\sqrt{2} = (3+9.56)1.414 = 17.76m$

Previous Year Questions 2022

Q7: Two boats are sailing in the sea 80 m apart from each other towards a cliff AB. The angles of depression of the boats from the top of the cliff are 30° and 45° respectively, as shown in the figure. Find the height of the cliff. (2022)



Ans: Let assume that AB be the cliff of height h m and Let the boats are at C and D. Now, it is given that the angle of depression from B to C and D are 30° and 45° respectively.

It is also given that CD = 80 m

Let assume that BD = x m

Now, In right-angle triangle ABD

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

$$1 = \frac{h}{x}$$

$$\Longrightarrow \quad \mathbf{x = h - - - (1)}$$

Now, In right-angle triangle ABC

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

$$\frac{1}{\sqrt{3}} = \frac{h}{80 + x}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{80 + h}$$

$$80 + h = \sqrt{3}h$$

$$80 = \sqrt{3}h - h$$

$$80 = (\sqrt{3} - 1)h$$

$$h = \frac{80}{\sqrt{3} - 1}$$

$$h = \frac{80}{\sqrt{3} - 1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$h = \frac{80(\sqrt{3} + 1)}{(\sqrt{3})^2 - (1)^2}$$

$$h = \frac{80(\sqrt{3} + 1)}{3 - 1}$$

$$h = \frac{80(\sqrt{3} + 1)}{2}$$

$h = 40(\sqrt{3} + 1)$

$h = 40(1.732 + 1)$

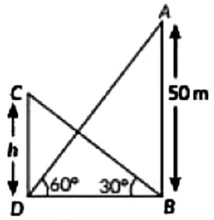
$h = 40 \times 2.732$

$\Rightarrow h = 109.28$ m

Q8: The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, then find the height of the building. (2022)

Ans: Let AB be the tower of height 50m and CD be the building of height h m.

Now, in ΔABD,



$$\frac{AB}{BD} = \tan 60°$$

$$\Rightarrow \quad \frac{50}{BD} = \sqrt{3} \Rightarrow BD = \frac{50}{\sqrt{3}} \quad ...(i)$$

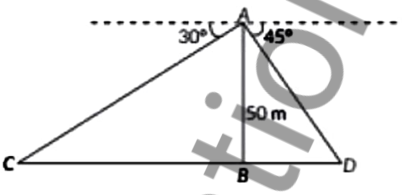
Now, in ΔBDC,

$$\frac{CD}{BD} = \tan 30° \Rightarrow \frac{h}{BD} = \frac{1}{\sqrt{3}} \Rightarrow h = \frac{1}{\sqrt{3}} BD$$

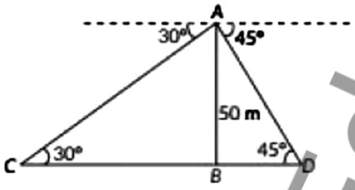
$$\Rightarrow \quad h = \frac{1}{\sqrt{3}} \times \frac{50}{\sqrt{3}} = \frac{50}{3} = 16.67 \qquad \text{[Using (i)]}$$

Thus the height of the building in 16.67m

Q9: In figure, AB is tower of height 50 m. A man standing on its top, observes two cars on the opposite sides of the tower with angles of depression 30° and 45° respectively. Find the distance between the two cars. (2022)



Ans: C and D be the position of two cars.



In ΔABD, we have

$$\tan 45° = \frac{AB}{BD}$$

$$\Rightarrow 1 = \frac{50}{BD}$$

$\Rightarrow$ BD = 50 m ...(i)

In ΔABC, we have

$$\tan 30° = \frac{AB}{BC}$$

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

$\Rightarrow$ BC = AB$\sqrt{3}$ = 50$\sqrt{3}$ m ...(ii)

From equations (i) and (ii), we get

CD = BC + BD

= (50$\sqrt{3}$ + 50) m

= 50 ($\sqrt{3}$ + 1) m

$= 50(1.732 + 1)$

$= 50 \times 2.732$

$= 136.6$ m

Thus, the distance between two cars is 136.6 m.

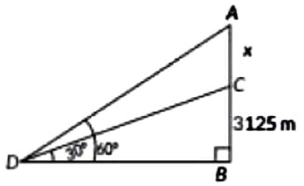
Q10: An aeroplane when flying at a height of 3125 in from the ground passes vertically below another plane at an instant when the angles of elevation of the two planes from the same point on the ground are 30° and 60° respectively. Find the distance between the two planes at that instant. (2022)

Ans: Let A and C be the position of two aeroplanes. Let distance between the two aeroplanes be x m.

In ΔCBD, we have

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

$$\frac{3125}{BD} = \frac{1}{\sqrt{3}} \Rightarrow BD = 3125\sqrt{3}\,m$$



In ΔABD, we have

$$\frac{AB}{BD} = \tan 60^\circ$$

$$\frac{x+3125}{BD} = \sqrt{3}$$

$$\Rightarrow \frac{x+3125}{3125\sqrt{3}} = \sqrt{3} \Rightarrow x+3125 = 3125 \times 3$$

$\Rightarrow x + 3125 = 9375$

$\Rightarrow x = 6250$

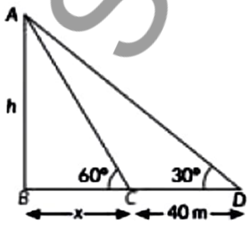
∴ The distance between to planes at that instant in 6250m

Q11: The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it is 60°. Find the height of the tower. (2022)

Ans: Let AB be the tower of height b m and let shadow of tower when sun's altitude is 60° is x i.e. BC = x In ΔABC. we have

$$\frac{AB}{BC} = \tan 60^\circ \Rightarrow \frac{h}{x} = \sqrt{3}$$

$$\Rightarrow \quad x = \frac{h}{\sqrt{3}} \qquad \text{...(i)}$$



In ΔABD. we have

In ΔABD. we have

$$\frac{AB}{BD} = \tan 30^\circ \Rightarrow \frac{h}{x+40} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow \quad x+40 = \sqrt{3}h$$

$$\Rightarrow \quad \frac{h}{\sqrt{3}} + 40 = \sqrt{3}h \quad \text{[From (i)]}$$

$$\Rightarrow \quad \frac{h+40\sqrt{3}}{\sqrt{3}} = \sqrt{3}h \Rightarrow h+40\sqrt{3} = 3h$$

$$\Rightarrow \quad 2h = 40\sqrt{3} \Rightarrow h = 20\sqrt{3}$$

Thus, the height of the tower is $20\sqrt{3}$m.

Q12: The tops of two poles of heights 20 m and 28 m are connected with a wire. The wire is Inclined to the horizontal at an angle of 30°. Find the length of the wire and the distance between the two poles (2022)

Ans: Let length of the wire be BD and the distance between the two poles be BE Le.. AC = x m

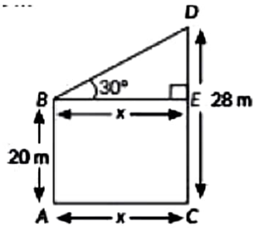
Here, height of the larger pole. CD = 28 m

Height of smaller pole, AB = 20 m

DE = CD - CE

⇒ DE = 28 - 20

= 8 m



In ΔBDE, we have $\sin 30^\circ = \frac{DE}{BD}$

$$\Rightarrow \quad \frac{1}{2} = \frac{8}{BD}$$

$$\Rightarrow \quad BD = 16 \text{ m}$$

$\therefore$ Length of the wire = 16 m

In ΔBDE, $\cos 30^\circ = \frac{BE}{BD}$

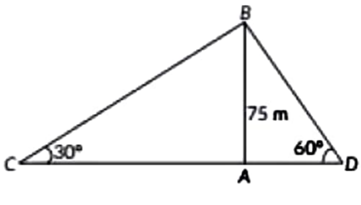
$$\Rightarrow \quad \frac{\sqrt{3}}{2} = \frac{x}{16} \Rightarrow x = \frac{16\sqrt{3}}{2} = 8\sqrt{3}$$

= 8 x 1.73

= 13.84

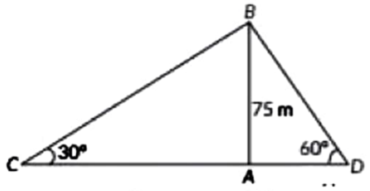
∴ The distance between two planes , BE is 13.84 m.

Q13: Two men on either side of a cliff 75 m high observe the angles of elevation of the top of the cliff to be 30° and 60°. Find the distance between the two men. (2022)



Ans: Given, AB = 75 m be the cliff and C, D be the positions of two men.

Now, in ΔABD,



$$\tan 60^\circ = \frac{AB}{AD} \Rightarrow \sqrt{3} = \frac{75}{AD}$$

$$\Rightarrow AD = \frac{75}{\sqrt{3}} \text{ m} = 25\sqrt{3} \text{ m}$$

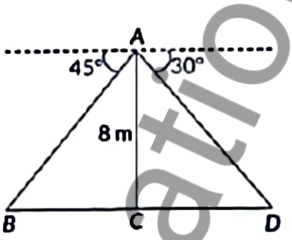
In ΔABC, $\tan 30^\circ = \frac{AB}{AC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{75}{AC}$

$$\Rightarrow AC = 75\sqrt{3} \text{ m}$$

$\therefore$ Distance between the two men $= AC + AD$

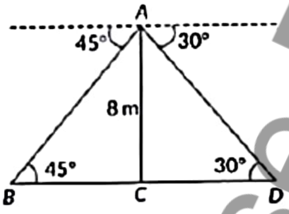
$$= 75\sqrt{3} + 25\sqrt{3} = 100\sqrt{3} = 100 \times 1.73 = 173 \text{ m}$$

Q14: From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are 30° and 45°. If the bridge is at a height of 8 m from the banks, then find the width of the river. (2022)



Ans: We have, B and D represents points on the bank on opposite sides of the river. Therefore, BD is the width of the river.

Let A be a point on the bridge at a height of 8 m.



In ΔABC, $\tan 45^\circ = \frac{AC}{BC}$

$$\Rightarrow 1 = \frac{8}{BC}$$

$$\Rightarrow BC = 8 \text{ m}$$

In ΔACD, $\tan 30^\circ = \frac{AC}{CD}$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{8}{CD} \Rightarrow CD = 8\sqrt{3} \text{ m}$$

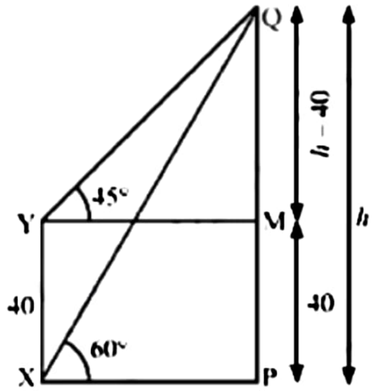
$\therefore$ Width of the river, $BD = BC + CD$

$$\Rightarrow BD = 8 + 8\sqrt{3} = 8(1 + \sqrt{3})$$

$$= 8(1 + 1.73) = 8 \times 2.73 = 21.84 \text{ m}$$

Q15: The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60°. From a point Y, 40 m vertically above X, the angle of elevation of the top Q of tower is 45°. Find the height of the tower PQ and the distance PX. (Use √3 = 1.73) (2022)

Ans:



We have

XY = 40m,∠PXQ = 60° and ∠MYQ = 45°

Let PQ = h

Also, MP = XY = 40m, MQ = PQ - MP = h - 40

In ΔMYQ,

$$\tan 45^\circ = \frac{MQ}{MY}$$

$$\Rightarrow 1 = \frac{h-40}{MY}$$

⇒ MY = H - 40

⇒ PX = MY = h - 40 ....(1)

Now , in ΔMXQ,

$$\tan 60^\circ = \frac{PQ}{PX}$$

$$\Rightarrow \sqrt{3} = \frac{h}{h-40}$$ [From (i)]

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

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

$$\Rightarrow h\left(\sqrt{3}-1\right) = 40\sqrt{3}$$

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

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

$$\Rightarrow h = \frac{40\sqrt{3}\left(\sqrt{3}+1\right)}{(3-1)}$$

$$\Rightarrow h = \frac{40\sqrt{3}\left(\sqrt{3}+1\right)}{2}$$

⇒ h = 20√3 (√3 + 1)

⇒ h = 60 + 20√3

⇒ h = 60 + 20 × 1.73

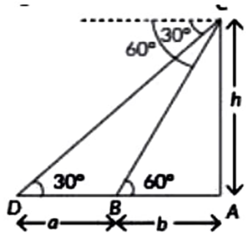
$\Rightarrow h = 60 + 34.6$

$\therefore h = 94.6m$

So, the height of the tower PQ is 94. 6 m.

Q16: The straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°. which is approaching the foot of the tower with a uniform speed. Ten seconds later the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point. (2022)

Ans: Let h be the height of the tower and D be the initial position of car and let DB = a, AB = b



Now, in ΔCAD,

$$\tan 30° = \frac{AC}{AD} = \frac{h}{a+b}$$

$$\Rightarrow h = \frac{a+b}{\sqrt{3}} \quad ...(i)$$

$$\left[\because \tan 30° = \frac{1}{\sqrt{3}}\right]$$

In ΔABC, $\tan 60° = \frac{AC}{AB} = \frac{h}{b}$

$$\Rightarrow h = b\sqrt{3} \quad ...(ii)$$

Eliminating h, from (i) and (ii). we have

$$\sqrt{3}b = \frac{a+b}{\sqrt{3}} \Rightarrow 3b = a + b \Rightarrow 2b = a$$

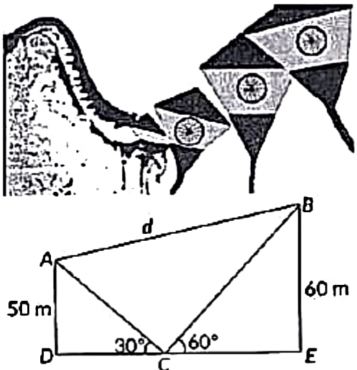
As the car covers distance **a** i.e.. 2b in 10 seconds.

So. it will take 5 seconds to reach the foot of the tower as covering b distance.

Q17: Case Study: Kite Festival (2022)

Kite festival is celebrated in many countries at different times of the year. In India, every year 14th January is celebrated as International Kite Day. On this day many people visit India and participate in the festival by flying various kinds of kites.

The picture given below shows three kites flying together



In Fig. the angles of elevation of two kites (Points A and B) from the hands of a man (Point C) are found to be 30° and 60° respectively. Taking AD = 50 m and BE = 60 m, find

(i) the lengths of strings used (take them straight) for kites A and B as shown in figure.

(ii) the distance 'd' between these two kites

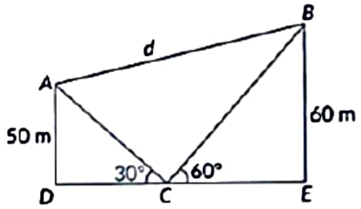
Ans: (i) : Given , AD = 50 m. BE = 60 m

Let the lengths of strings used for kite A be AC and for kite B be BC

Now , in ΔADC, $\sin 30° = \frac{AD}{AC}$

$$\Rightarrow \frac{1}{2} = \frac{50}{AC}$$

$$\Rightarrow \quad AC = 100 \text{ m}$$



In ΔBEC,

$$\sin 60° = \frac{BE}{BC}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{60}{BC}$$

$$\Rightarrow BC = \frac{120}{\sqrt{3}} = 40\sqrt{3} \text{ m.}$$

Hence, AC = 100 m and BC = $40\sqrt{3}$ m

(ii) Since, the distance between these two kites is d.

ΔABC is a right angle triangle ($\because \angle ACB = 90°$)

Now, in ΔABC, by using Pythagoras theorem, we have

$BA^2 = BC^2 + AC^2$

$$\Rightarrow BA^2 = (40\sqrt{3})^2 + (100)^2 \Rightarrow BA^2 = 4800 + 10000 = 14800$$

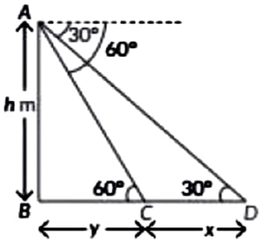
$$\Rightarrow BA = \sqrt{14800} = 121.65 \text{ m}$$

Hence, the distance between these two kites is 121.65 m.

Previous Year Questions 2021

Q18: A man on the top of a vertical tower observes a car moving at a uniform speed coming directly towards it. If it takes 18 minutes for the angle of depression to change from 30° to 60°. How soon after this will the car reach the tower? (2021)

Ans: Let AB be the tower of height h m and D be the initial position of the car and C be the position of car after 18 minutes.



Let CD = x and BC = y

In ΔABD, we have

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

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

$$\Rightarrow \quad h = \frac{x+y}{\sqrt{3}} \qquad \text{...(i)}$$

In ΔABC, we have

$$\frac{AB}{BC} = \tan 60^\circ \Rightarrow \frac{h}{y} = \sqrt{3} \Rightarrow h = \sqrt{3}y \qquad \text{...(ii)}$$

On comparing (i) and (ii), we have

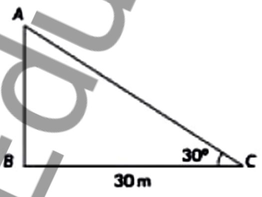
$$\frac{x+y}{\sqrt{3}} = \sqrt{3}y \Rightarrow x + y = 3y \Rightarrow x = 2y$$

Distance x is covered by car in 18 minutes. Distance 2y is covered by car in 18 minutes.

Hence, Distance y is covered by car in 9 minutes.

Previous Year Questions 2020

Q19: In figure, the angle of elevation of the top of a tower from a point C on the ground, which is 30m away from the foot of the tower, is 30° Find the height of the tower. (2020)



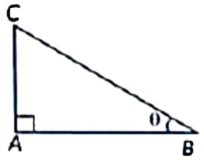
Ans: Here, AB is the tower.

$$\text{In } \Delta ABC,\ \tan 30^\circ = \frac{AB}{BC}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{AB}{30} \Rightarrow AB = \frac{30}{\sqrt{3}} = 10\sqrt{3} \text{ m}$$

Q20: The ratio of the length of a vertical rod and the length of its shadow is 1: √3. Find the angle of elevation of the Sun at that moment. (2020)

Ans: Let AC be the length of vertical rod, AB be the length of its shadow and 0 be the angle of elevation of the sun.



In ΔABC, $\tan\theta = \dfrac{AC}{AB}$

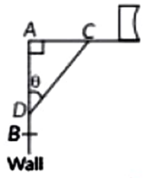
$\Rightarrow \quad \tan\theta = \dfrac{1}{\sqrt{3}}$ (Given)

$\Rightarrow \quad \tan\theta = \tan 30° \Rightarrow \theta = 30°$

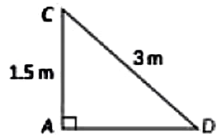
Q21: The rod AC of a TV disc antenna is fixed at right angles to the wall AB and a rod CD is supporting the disc as shown in the figure. If AC = 1.5 m long and CD = 3 m, then find

(i) tanθ

(ii) secθ + cosecθ (2020)



Ans:



In ΔACD, $\angle CAD = 90°$ $AD^2 = CD^2 - AC^2$ [By Pythagoras theorem]

$= (3)^2 - (1.5)^2 = 9 - 2.25 = 6.75\ m^2$

$\therefore \quad AD = \sqrt{6.75} = \dfrac{3\sqrt{3}}{2} m$

(i) $\tan\theta = \dfrac{AC}{AD} = \dfrac{1.5}{3\sqrt{3}} \times \dfrac{2}{1} = \dfrac{1}{\sqrt{3}}$

(ii) $\sec\theta + \operatorname{cosec}\theta = \dfrac{CD}{AD} + \dfrac{CD}{AC}$

$$= 3\left[\frac{2}{3\sqrt{3}} + \frac{1}{1.5}\right] = 6\left[\frac{1+\sqrt{3}}{3\sqrt{3}}\right] = \frac{2(\sqrt{3}+1)}{\sqrt{3}}$$

Q22: From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower

(Use √3 = 1.73) (2020)

Ans: Let P be the point of observation. AB is the building of height 20 m and AC is the transmission tower.

In ΔABP, $\dfrac{AB}{BP} = \tan 45°$

$\Rightarrow \dfrac{20}{BP} = 1 \Rightarrow BP = 20\ m$

In ΔCBP, $\frac{CB}{BP} = \tan 60^\circ$

$\Rightarrow \frac{AB + AC}{BP} = \sqrt{3} \Rightarrow \frac{20 + AC}{20} = \sqrt{3}$

$\Rightarrow$ 20+AC = 20√3

$\Rightarrow$ AC = 20√3 - 20 = 20(√3 -1)

$\Rightarrow$ AC=20(1.73 - 1)= 20 x 0.73

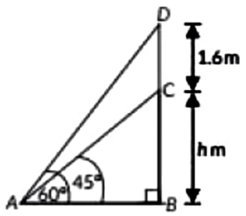
$\Rightarrow$ AC= 14.6 m

Thus, the height of the tower is 14.6 m.

Q23: A statue 1.6 m tall, stands on the top of a pedestal. From a point on the ground the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal. (Use √3 = 1.73) (CBSE 2020)

Ans: In the figure, A represents the point of observation, DC represents the statue and BC represents the pedestal.

Now, in right ΔABC, we have



$\frac{AB}{BC} = \cot 45^\circ = 1$

$\Rightarrow \frac{AB}{h} = 1 \Rightarrow AB = h$ m

Now in right ΔABD, we have

$\frac{BD}{AB} = \tan 60^\circ = \sqrt{3}$

$\Rightarrow BD = \sqrt{3} \times AB = \sqrt{3} \times h$

$\Rightarrow h + 1.6 = \sqrt{3} h$

$\Rightarrow h(\sqrt{3} - 1) = 1.6 \Rightarrow h = \frac{1.6}{0.73} = 2.19$

Thus , the height of the pedestal is 2.19 m.