CLASS 10 · MATHEMATICS · CHAPTER 9

Some Applications of Trigonometry - Exercise 9.1

Exercise 9.1 with independently verified solutions.

CHAPTER	RESOURCE	SOURCE
Some Applications of Trigonometry	NCERT Exercises	NCERT Mathematics, Reprint 2026-27

PART 1

Verified NCERT questions and solutions

Verified NCERT questions and solutions

Solutions are checked independently and follow the supplied NCERT chapter edition.

QUESTION

Question 1

circus rope · pole height

A circus artist is climbing a 20 m long rope, tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole if the rope makes an angle of 30° with the ground.

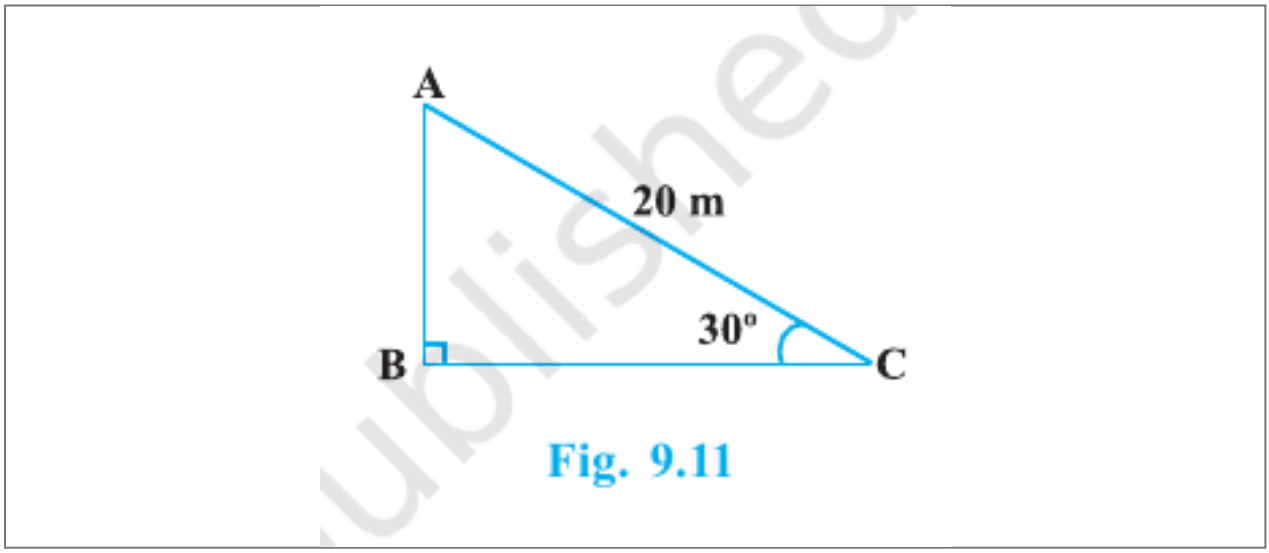


Figure 9-11 from the supplied NCERT chapter.

Solution

Board-exam working:

In right triangle ABC, AC = 20 m and ∠ACB = 30°.

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

$$\frac{1}{2} = \frac{AB}{20}$$

$$AB = 10 \text{ m}$$

Final answer

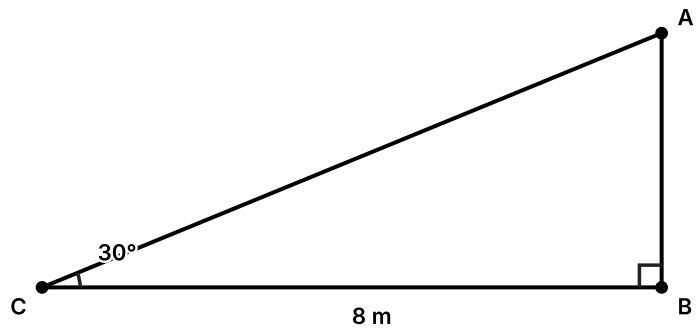
The pole is 10 m high.

QUESTION

Question 2

broken tree · right triangle

A tree breaks due to a storm and the broken part bends so that its top touches the ground, making an angle of 30° with it. The distance from the foot of the tree to the point where the top touches the ground is 8 m. Find the original height of the tree.



Broken tree — explanatory sketch (not to scale).

Solution

Board-exam working:

Let AB be the remaining upright part, AC the broken part and BC = 8 m.

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

$$\frac{1}{\sqrt{3}} = \frac{AB}{8}$$

$$AB = \frac{8}{\sqrt{3}}\ \text{m}$$

$$\cos 30^\circ = \frac{BC}{AC}$$

$$\frac{\sqrt{3}}{2} = \frac{8}{AC}$$

$$AC = \frac{16}{\sqrt{3}}\ \text{m}$$

$$\text{Original height} = AB + AC$$

$$= \frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}} = \frac{24}{\sqrt{3}} = 8\sqrt{3}\ \text{m}$$

Final answer

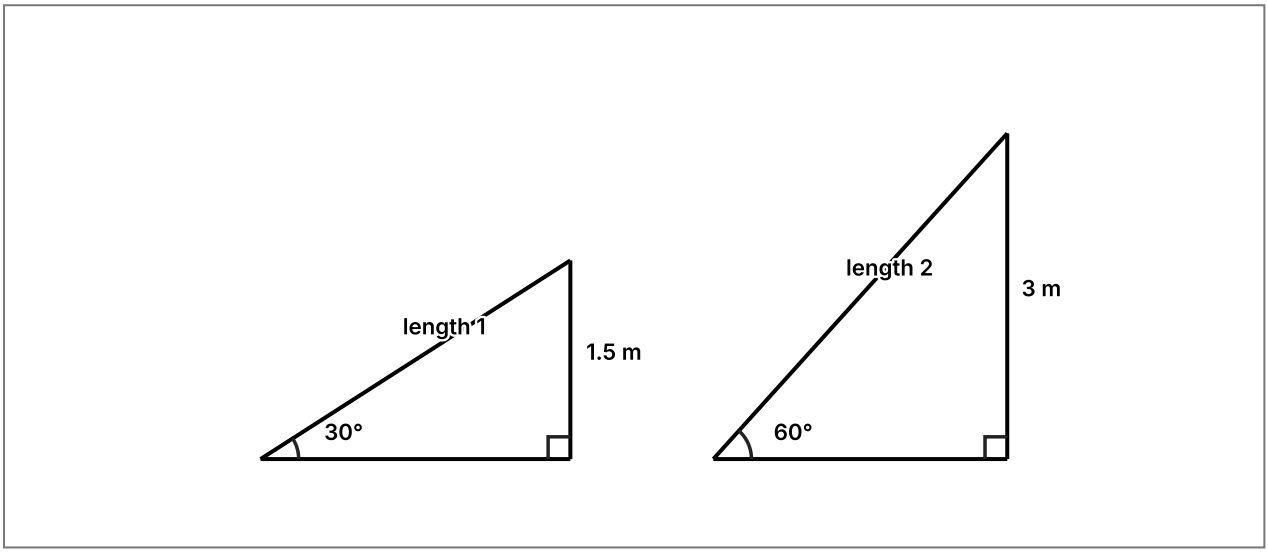
The original height of the tree was 8√3 m.

QUESTION

Question 3

slides · length

A contractor plans two slides. One has a height of 1.5 m and is inclined at 30° to the ground; the other has a height of 3 m and is inclined at 60°. Find the length of each slide.



Two playground slides — explanatory sketch (not to scale).

Solution

Board-exam working:

(i) Slide for younger children:

$$\sin 30^\circ = \frac{1.5}{L_1}$$

$$\frac{1}{2} = \frac{1.5}{L_1}$$

$$L_1 = 3 \text{ m}$$

(ii) Slide for older children:

$$\sin 60^\circ = \frac{3}{L_2}$$

$$\frac{\sqrt{3}}{2} = \frac{3}{L_2}$$

$$L_2 = \frac{6}{\sqrt{3}} = 2\sqrt{3}\ \text{m}$$

Final answer

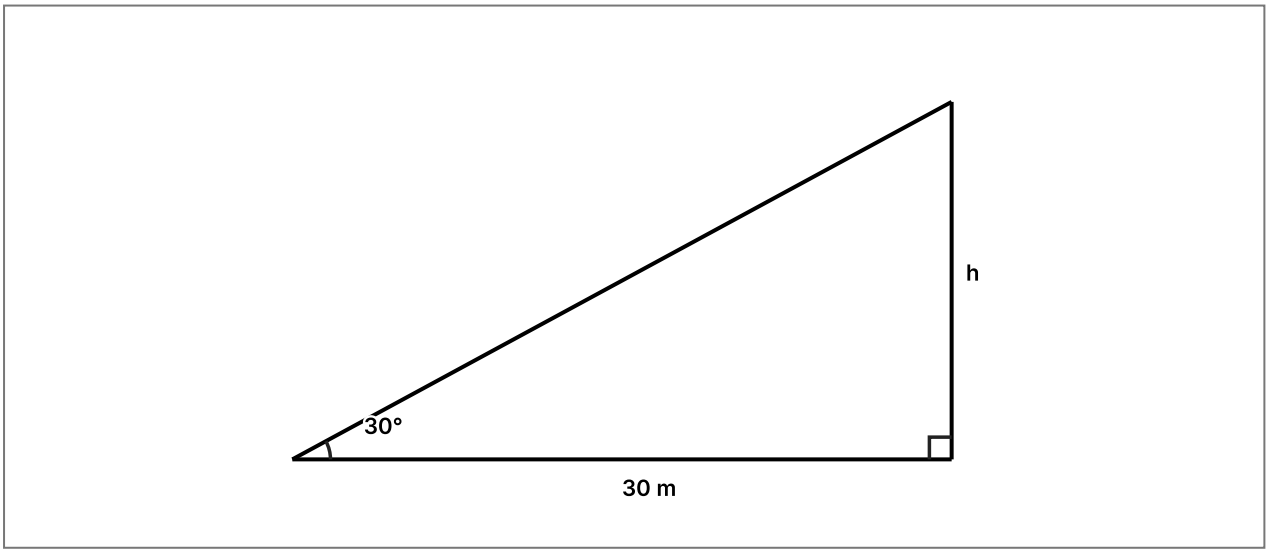
The slide lengths are 3 m and 2√3 m.

QUESTION

Question 4

tower · angle of elevation

The angle of elevation of the top of a tower from a point 30 m away from its foot is 30°. Find the height of the tower.



Tower seen from 30 metres — explanatory sketch (not to scale).

Solution

Board-exam working:

Let h be the height of the tower.

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

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

$$h = \frac{30}{\sqrt{3}} = 10\sqrt{3}\ \text{m}$$

Final answer

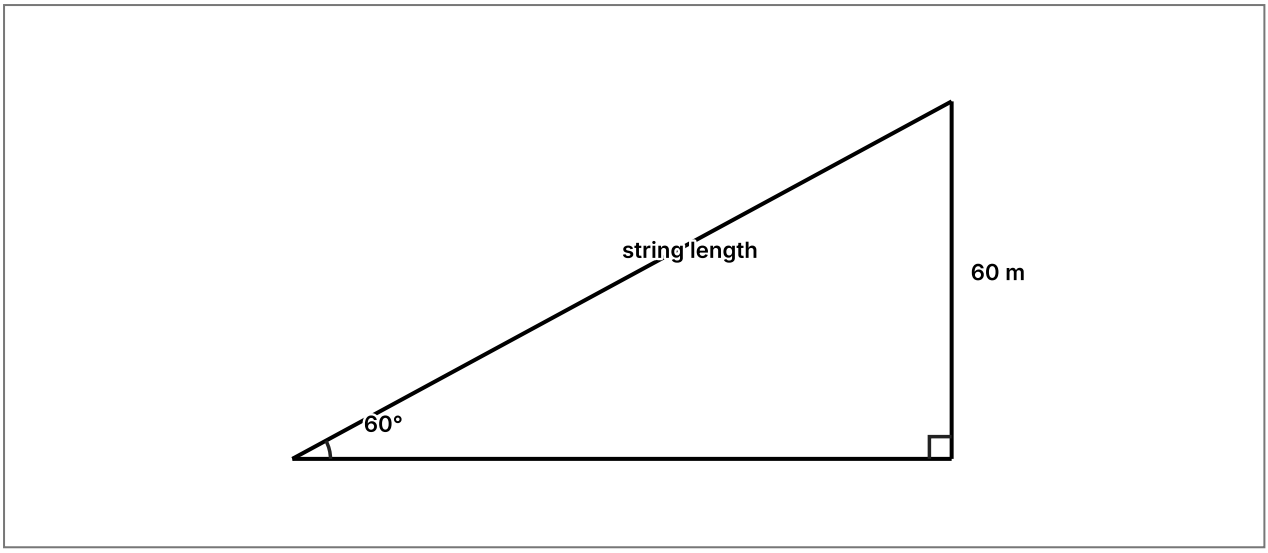
The tower is 10√3 m high.

QUESTION

Question 5

kite · string length

A kite is flying at a height of 60 m above the ground. Its string is inclined at 60° to the ground. Find the length of the string, assuming there is no slack.



Kite and taut string — explanatory sketch (not to scale).

Solution

Board-exam working:

Let L be the string length.

$$\sin 60^\circ = \frac{60}{L}$$

$$\frac{\sqrt{3}}{2} = \frac{60}{L}$$

$$L = \frac{120}{\sqrt{3}} = 40\sqrt{3}\ \text{m}$$

Final answer

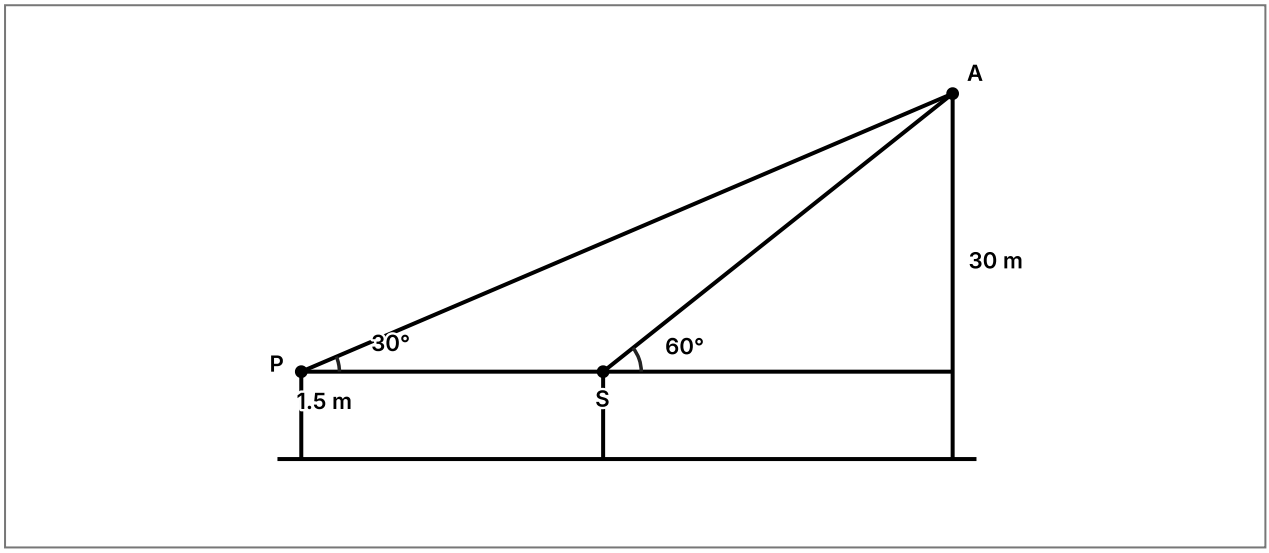
The string is 40√3 m long.

QUESTION

Question 6

walking distance · two observation points

A 1.5 m tall boy stands at some distance from a 30 m building. The angle of elevation from his eyes to the top increases from 30° to 60° as he walks towards the building. Find the distance he walked.



Boy walking towards a building — explanatory sketch (not to scale).

Solution

Board-exam working:

Height of the building above the boy's eyes:

$$30 - 1.5 = 28.5 \text{ m}$$

Let the initial distance be x m.

$$\tan 30^\circ = \frac{28.5}{x}$$

$$\frac{1}{\sqrt{3}} = \frac{28.5}{x}$$

$$x = 28.5\sqrt{3} \text{ m}$$

Let the final distance be y m.

$$\tan 60^\circ = \frac{28.5}{y}$$

$$\sqrt{3} = \frac{28.5}{y}$$

$$y = \frac{28.5}{\sqrt{3}} = 9.5\sqrt{3}\ \text{m}$$

$$\text{Distance walked} = x - y$$

$$= 28.5\sqrt{3} - 9.5\sqrt{3} = 19\sqrt{3}\ \text{m}$$

Final answer

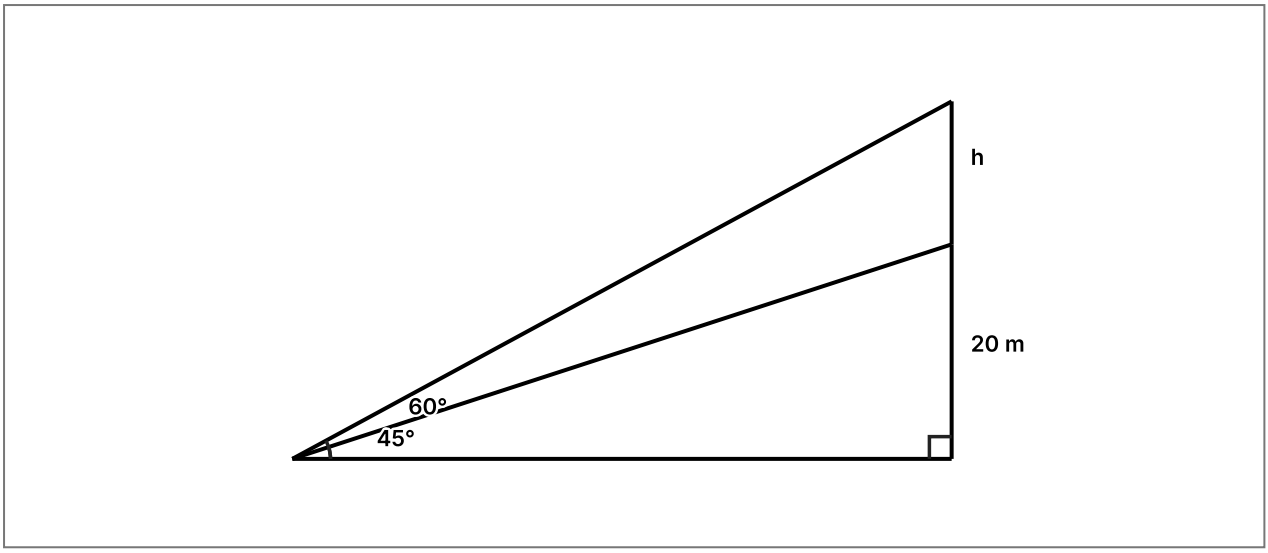
The boy walked 19√3 m.

QUESTION

Question 7

transmission tower · building

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



Transmission tower on a building — explanatory sketch (not to scale).

Solution

Board-exam working:

Let x be the horizontal distance and h be the transmission tower height.

Using the bottom of the tower:

$$\tan 45^\circ = \frac{20}{x}$$

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

Using the top of the tower:

$$\tan 60^\circ = \frac{20 + h}{20}$$

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

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

$$h = 20(\sqrt{3} - 1) \text{ m}$$

Final answer

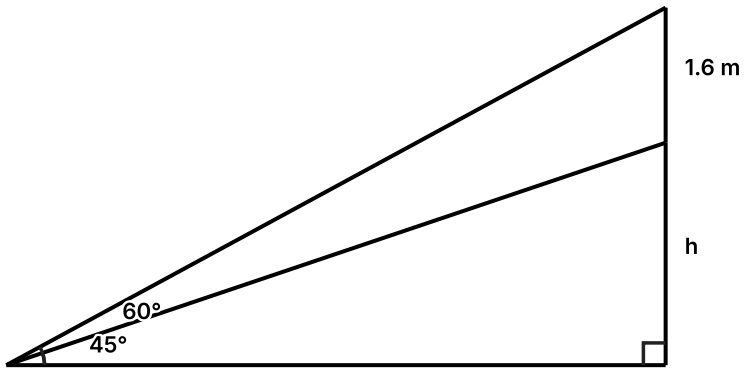
The transmission tower is 20(√3 − 1) m high.

QUESTION

Question 8

statue · pedestal

A statue 1.6 m tall stands on a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and that of the top of the pedestal is 45°. Find the height of the pedestal.



Statue on a pedestal — explanatory sketch (not to scale).

Solution

Board-exam working:

Let the pedestal height be h m and the horizontal distance be x m.

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

$$x = h$$

Using the top of the statue:

$$\tan 60^\circ = \frac{h + 1.6}{x}$$

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

$$h(\sqrt{3} - 1) = 1.6$$

$$h = \frac{1.6}{\sqrt{3} - 1}$$

$$h = \frac{1.6(\sqrt{3} + 1)}{2} = 0.8(\sqrt{3} + 1)\ \text{m}$$

Final answer

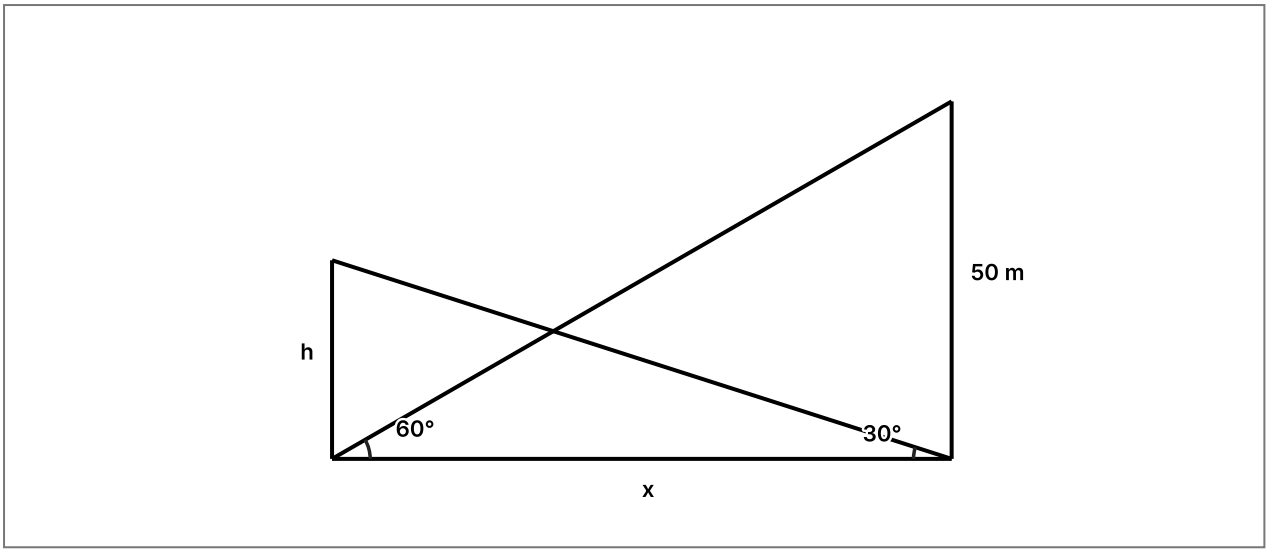
The pedestal is 0.8(√3 + 1) m high.

QUESTION

Question 9

building and tower · reciprocal angles

The angle of elevation of the top of a building from the foot of a 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, find the height of the building.



Building and tower viewed from each other's feet — explanatory sketch (not to scale).

Solution

Board-exam working:

Let the distance between the building and tower be x m and the building height be h m.

Using the 50 m tower:

$$\tan 60^\circ = \frac{50}{x}$$

$$\sqrt{3} = \frac{50}{x}$$

$$x = \frac{50}{\sqrt{3}}\ \text{m}$$

Using the building:

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

$$\frac{1}{\sqrt{3}} = \frac{h}{50/\sqrt{3}}$$

$$h = \frac{50}{3}\ \text{m}$$

Final answer

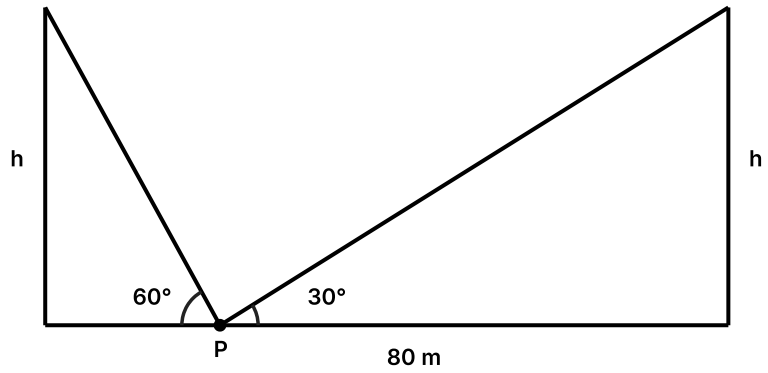
The building is 50/3 m high.

QUESTION

Question 10

equal poles · road width

Two poles of equal heights stand opposite each other on either side of an 80 m wide road. From a point between them, the angles of elevation of their tops are 60° and 30°. Find the height of the poles and the distances of the point from them.



Equal poles across an 80 metre road — explanatory sketch (not to scale).

Solution

Board-exam working:

Let the pole height be h m and the distance from the pole seen at 60° be x m. The other distance is 80 − x.

$$\tan 60^\circ = \frac{h}{x}$$

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

$$\tan 30^\circ = \frac{h}{80 - x}$$

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

$$80 - x = h\sqrt{3} \qquad (2)$$

Substitute h = x√3 in (2):

$$80 - x = 3x$$

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

$$80 - x = 60 \text{ m}$$

$$h = 20\sqrt{3} \text{ m}$$

Final answer

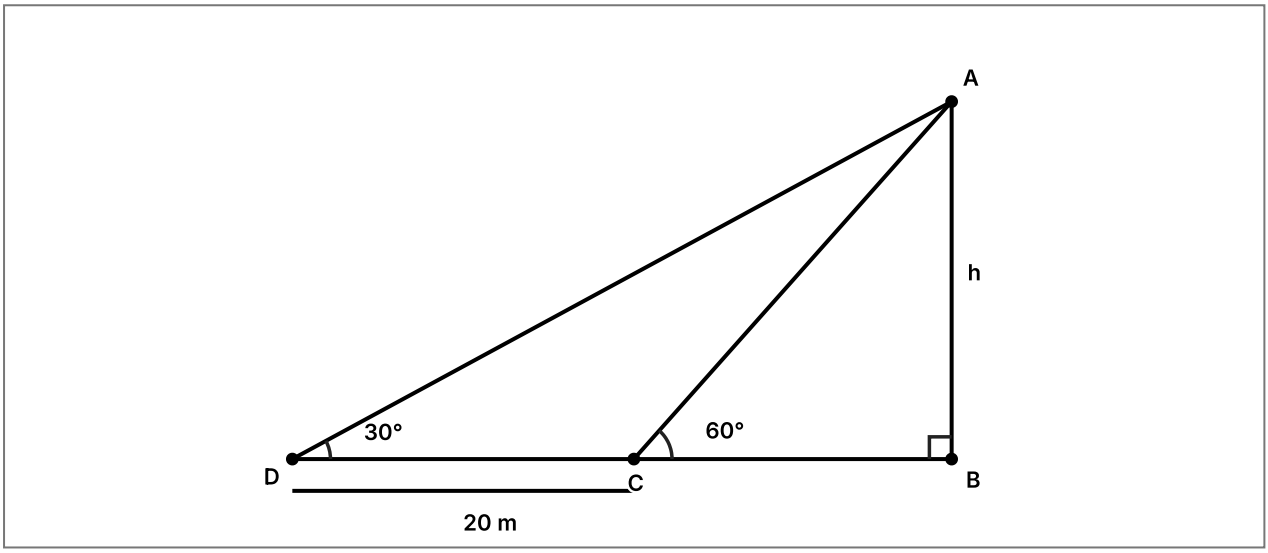
Each pole is 20√3 m high; the point is 20 m and 60 m from the poles.

QUESTION

Question 11

canal · two observation points

A TV tower stands vertically on a bank of a canal. From a point on the opposite bank directly opposite the tower, the angle of elevation is 60°. From another point 20 m farther away on the same line, the angle is 30°. Find the height of the tower and the width of the canal.



TV tower across a canal — complete redraw of the supplied NCERT figure (not to scale).

Solution

Board-exam working:

Let the canal width BC = x m and the tower height AB = h m. Then DB = x + 20 m.

From point C:

$$\tan 60^\circ = \frac{h}{x}$$

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

From point D:

$$\tan 30^\circ = \frac{h}{x + 20}$$

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

$$x + 20 = h\sqrt{3} \qquad (2)$$

Substitute (1) in (2):

$$x + 20 = 3x$$

$$x = 10 \text{ m}$$

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

Final answer

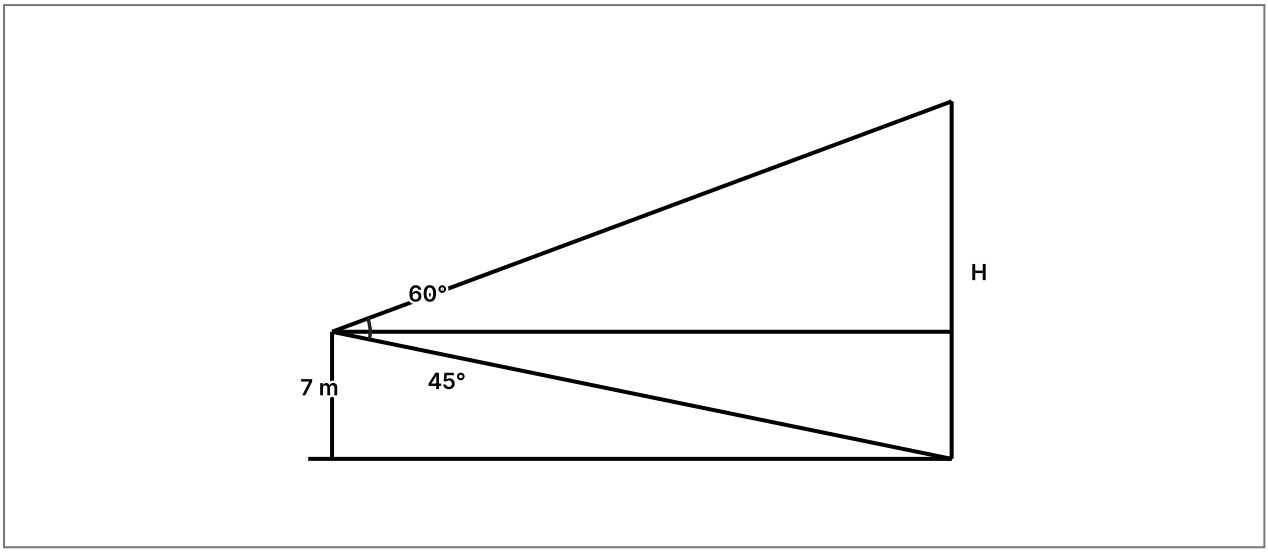
The canal is 10 m wide and the tower is 10√3 m high.

QUESTION

Question 12

cable tower · elevation and depression

From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Find the height of the tower.



Cable tower viewed from a building — explanatory sketch (not to scale).

Solution

Board-exam working:

Let x be the horizontal distance. The observer is 7 m above ground.

$$\tan 45^\circ = \frac{7}{x}$$

$$x = 7 \text{ m}$$

Let h be the part of the tower above the observer's level.

$$\tan 60^\circ = \frac{h}{7}$$

$$\sqrt{3} = \frac{h}{7}$$

$$h = 7\sqrt{3} \text{ m}$$

$$\text{Tower height} = 7 + h$$

$$= 7 + 7\sqrt{3} = 7(1 + \sqrt{3}) \text{ m}$$

Final answer

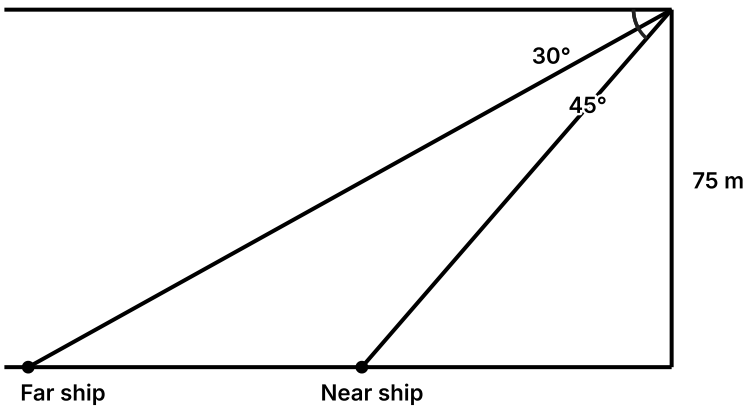
The cable tower is 7(1 + √3) m high.

QUESTION

Question 13

lighthouse · ships

From the top of a 75 m lighthouse, the angles of depression of two ships on the same side are 30° and 45°. One ship is exactly behind the other. Find the distance between the ships.



Two ships viewed from a lighthouse — explanatory sketch (not to scale).

Solution

Board-exam working:

Let the nearer ship be x m from the lighthouse and the farther ship be y m away.

For the nearer ship:

$$\tan 45^\circ = \frac{75}{x}$$

$$x = 75 \text{ m}$$

For the farther ship:

$$\tan 30^\circ = \frac{75}{y}$$

$$\frac{1}{\sqrt{3}} = \frac{75}{y}$$

$$y = 75\sqrt{3}\ \text{m}$$

$$\text{Distance between ships} = y - x$$

$$= 75\sqrt{3} - 75 = 75(\sqrt{3} - 1)\ \text{m}$$

Final answer

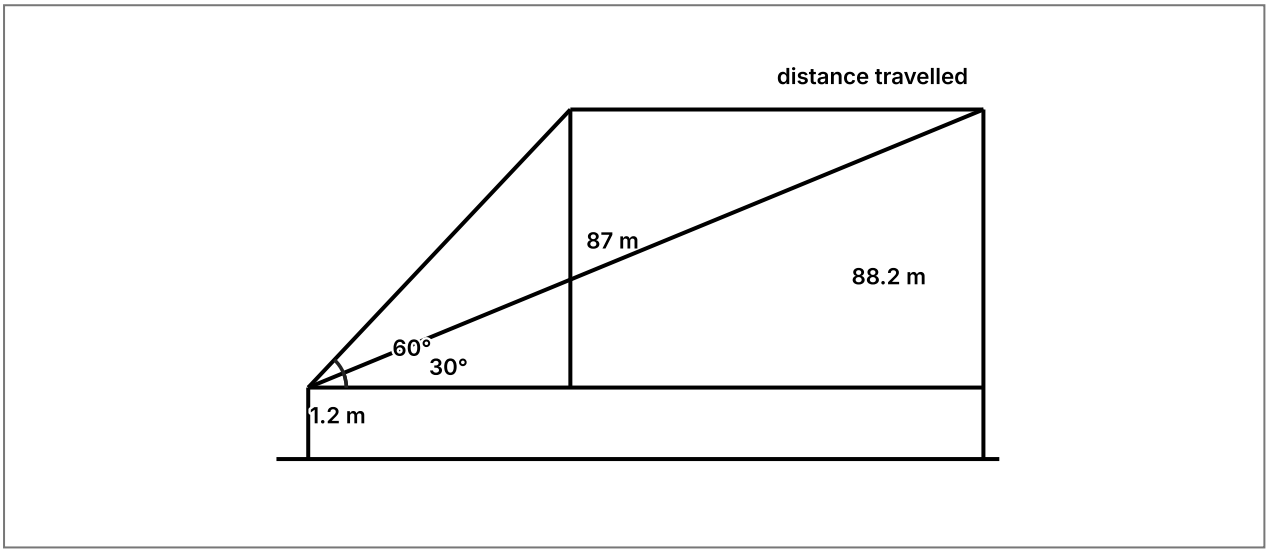
The ships are 75(√3 − 1) m apart.

QUESTION

Question 14

moving balloon · two angles of elevation

A 1.2 m tall girl spots a balloon moving horizontally at a height of 88.2 m. The angle of elevation from her eyes is initially 60° and later becomes 30°. Find the distance travelled by the balloon.



Balloon seen at two angles — complete redraw of the supplied NCERT figure (not to scale).

Solution

Board-exam working:

Vertical height of the balloon above the girl's eyes:

$$88.2 - 1.2 = 87 \text{ m}$$

Let the initial horizontal distance be x m.

$$\tan 60^\circ = \frac{87}{x}$$

$$x = \frac{87}{\sqrt{3}} = 29\sqrt{3} \text{ m}$$

Let the later horizontal distance be y m.

$$\tan 30^\circ = \frac{87}{y}$$

$$y = 87\sqrt{3}\ \text{m}$$

$$\text{Distance travelled} = y - x$$

$$= 87\sqrt{3} - 29\sqrt{3} = 58\sqrt{3}\ \text{m}$$

Final answer

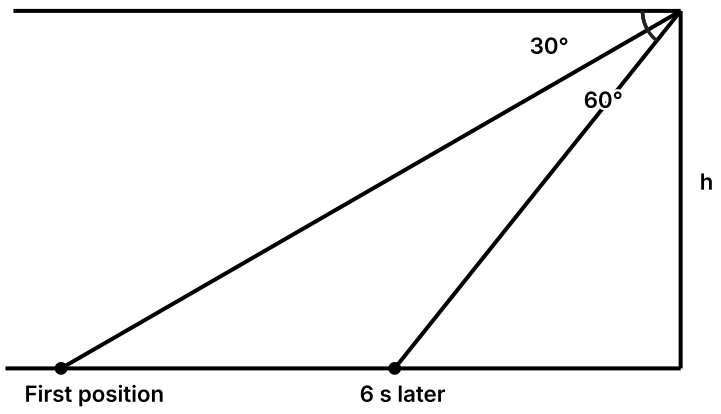
The balloon travelled 58√3 m.

QUESTION

Question 15

moving car · angle of depression

A straight highway leads to the foot of a tower. A man at the top observes a car approaching at an angle of depression of 30°. Six seconds later, the angle of depression is 60°. Find the time the car will take to reach the tower from this second point, assuming uniform speed.



Car approaching a tower — explanatory sketch (not to scale).

Solution

Board-exam working:

Let the tower height be h m. Let the car's initial and later distances from the tower be x m and y m.

At the first position:

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

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

At the second position:

$$\tan 60^\circ = \frac{h}{y}$$

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

Distance travelled in 6 seconds:

$$x - y = h\sqrt{3} - \frac{h}{\sqrt{3}} = \frac{2h}{\sqrt{3}}$$

The remaining distance is:

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

This is half the distance travelled in 6 seconds. At uniform speed, the time is also half.

$$\text{Required time} = \frac{6}{2} = 3 \text{ seconds}$$

Final answer

The car will reach the tower in 3 seconds.