

Height & Distance - Solved Examples

Q 1 - From a point 375 meters away from the foot of a tower, the top of the tower is observed at an angle of elevation of 45° , then the height (in meters) of the tower is?

A - 375

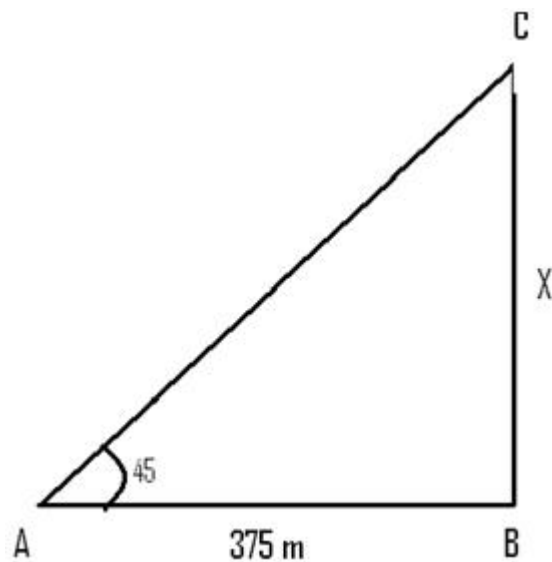
B - 450

C - 225

D - 250

Answer - A

Explanation



From the right angled triangle

$$\tan(45^\circ) = X/375$$

$$\Rightarrow X = 375 \text{ m}$$

Q 2 - The angle of elevation of a tower at a point 90 m from it is $\cot^{-1}(4/5)$. Then the height of the tower is

A - 45

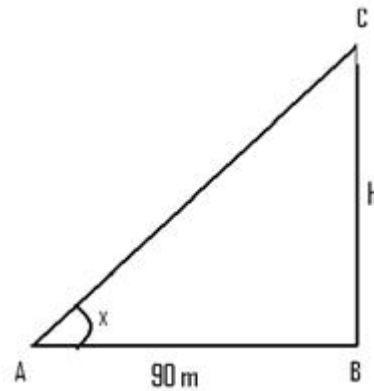
B - 90

C - 112.5

D - 150

Answer - C

Explanation



$$\text{Let } \cot^{-1}(4/5) = x$$

$$\Rightarrow \cot x = 4/5$$

$$\Rightarrow \tan(x) = 5/4$$

From the right angled triangle

$$\tan(x) = h/90$$

$$\Rightarrow h = 5/4 \times 90 = 112.5 \text{ m}$$

Q 3 - On the level ground, the angle of elevation of the top of a tower is 30° . on moving 20 meters nearer, the angle of elevation is 45° . Then the height of the tower is

A - 10

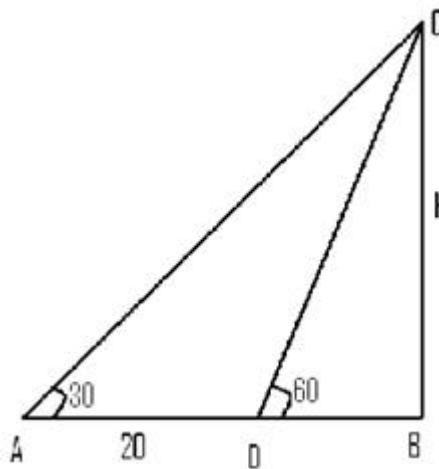
B - $\sqrt{3}$

C - $10\sqrt{3}$

D - $20\sqrt{3}$

Answer - C

Explanation



Let h be the height of tower

From figure.

$$20 = h (\cot 30^\circ - \cot 60^\circ)$$

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

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

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

Q 4 - The angles of elevation of the tops of two vertical towers as seen from the middle point of the lines joining the foot of the towers are 45° & 60° . The ratio of the height of the towers is

A - $\sqrt{3}:2$

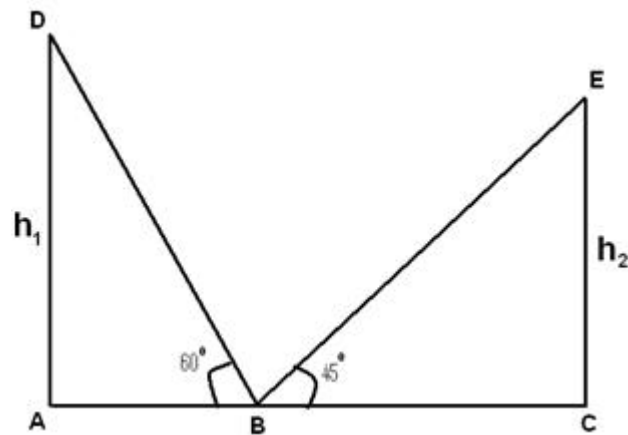
B - $\sqrt{3}:1$

C - $2:\sqrt{3}$

D - $2:1$

Answer - B

Explanation



$$\tan(60^\circ) = h_1 / AB$$

$$\Rightarrow h_1 = \sqrt{3}AB$$

$$\tan(45^\circ) = h_2 / BC$$

$$\Rightarrow h_2 = BC$$

$$h_1 / h_2 = \sqrt{3} / 1$$

$$\Rightarrow h_1 : h_2 = \sqrt{3} : 1$$

Q 5 - The heights of two towers are 90 meters and 45 meters. The line joining their tops make an angle 45° with the horizontal then the distance between the two towers is

A - 22.5 m

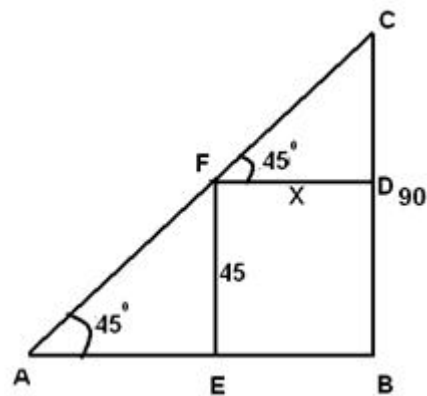
B - 45 m

C - 60 m

D - 30 m

Answer - B

Explanation



Let the distance between the towers be X

From the right angled triangle CFD

$$\tan(45) = \frac{90-45}{X}$$

$$\Rightarrow x = 45 \text{ meters}$$

Q 6 - From a point P on a level ground, the angle of elevation of the top tower is 60° . If the tower is 180 m high, the distance of point P from the foot of the tower is

A - $60\sqrt{3}$

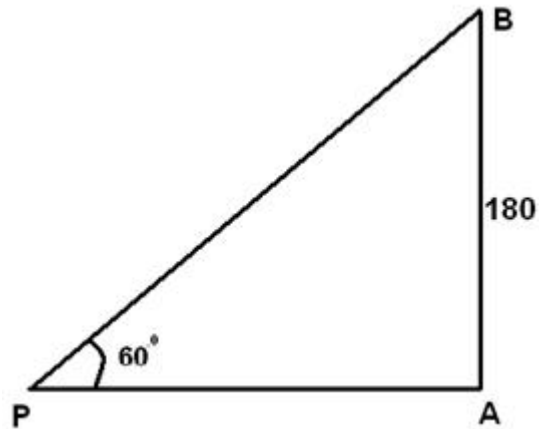
B - $40\sqrt{3}$

C - $30\sqrt{3}$

D - $20\sqrt{3}$

Answer - A

Explanation



From $\angle APB = 60^\circ$ and $AB = 180$ m.

$$AB/AP = \tan 60^\circ = \sqrt{3}$$

$$AP = AB/\sqrt{3} = 180/\sqrt{3} = 60\sqrt{3}$$

Q 7 - The Top of a 25 meter high tower makes an angle of elevation of 45° with the bottom of an electric pole and angle of elevation of 30° with the top of pole. Find the height of the electric pole.

A - $25\sqrt{3}$

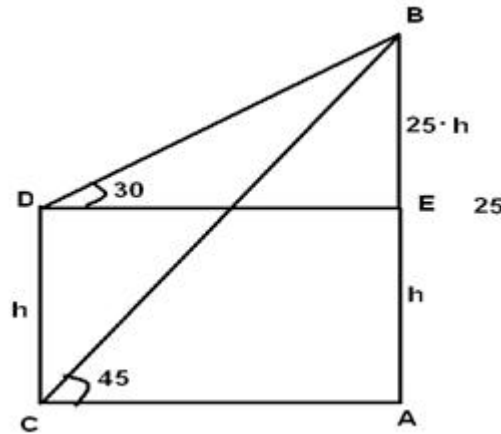
B - $25((\sqrt{3}-1)/\sqrt{3})$

C - $25/\sqrt{3}$

D - $25((1-\sqrt{3})/\sqrt{3})$

Answer - B

Explanation



Let AB be the tower and CD be the electric pole.

From the figure $CA = DE$

$$\Rightarrow 25 / (\tan(45)) = (25 - h) / (\tan(30))$$

$$\Rightarrow 25 \tan(30) = 25 - h$$

$$\Rightarrow h = 25 - 25 \tan(30)$$

$$= 25(1 - \tan(30))$$

$$= 25((\sqrt{3} - 1) / \sqrt{3})$$

Q 8 - An observer 1.4 m tall is $10\sqrt{3}$ away from a tower. The angle of elevation from his eye to the top of the tower is 60° . The heights of the tower is

A - 12.4 m

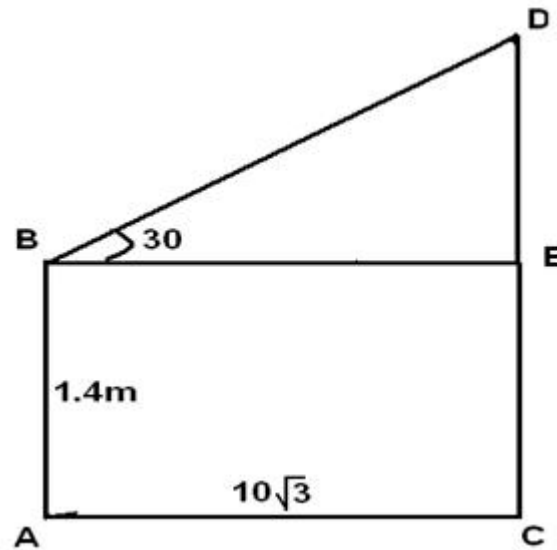
B - 6.2 m

C - $11.4\sqrt{3}$ m

D - 11.4 m

Answer - D

Explanation



Let AB be the observer and CD be the tower.

Then, $CE = AB = 1.4 \text{ m}$,

$BE = AC = 10\sqrt{3} \text{ m}$.

$DE/BE = \tan(30^\circ) = 1/\sqrt{3}$

$DE = 10\sqrt{3}/\sqrt{3} = 10$

$CD = CE + DE = 1.4 + 10 = 11.4 \text{ m}$

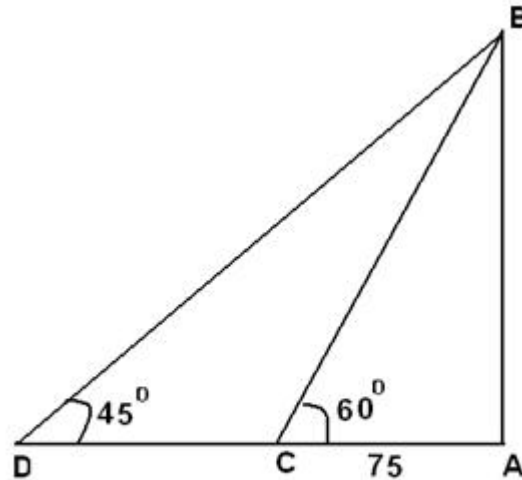
Q 9 - A man is watching from the top of the tower a boat speeding away from the tower. The boat makes the angle of depression of 60° with the man's eye when at a distance of 75 meters from the tower. After 10 seconds the angle of depression becomes 45° . What is the approximate speed of the boat, assuming that it is running in still water?

A - 54 kmph

B - 64 kmph

C - 24 kmph

D - 19.8 kmph

Answer - D**Explanation**

Let AB be the tower and C and D be the positions of the boat.

Distance travelled by boat = CD

From the figure $75 \tan(60^\circ) = (75 + CD) \tan(45^\circ)$

$$\Rightarrow 75\sqrt{3} = 75 + CD$$

$$\Rightarrow CD = 55 \text{ m}$$

$$\text{Speed} = \text{distance}/\text{time} = 55/10$$

$$= 5.5 \text{ m/sec} = 19.8 \text{ kmph}$$

Q 10 - The horizontal distance between two towers is 90 m. The angular depression of the top of the first as seen from the top of the second which is 180 m high is 45° . Then the height of the first is

A - $90\sqrt{3}$ m

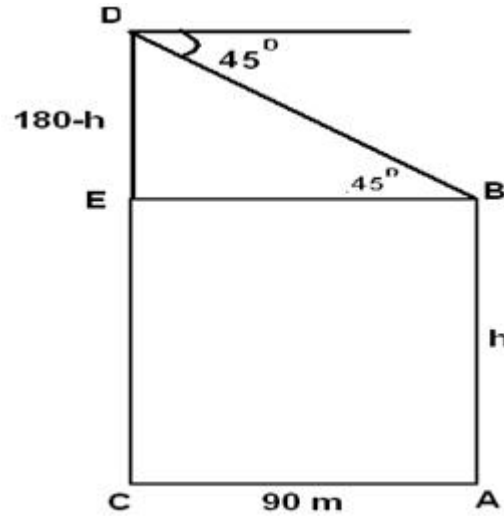
B - 45 m

C - 90 m

D - 150 m

Answer - C

Explanation



$$\Rightarrow (180-h)/90 = \tan(45)$$

$$\Rightarrow h = 90 \text{ m}$$