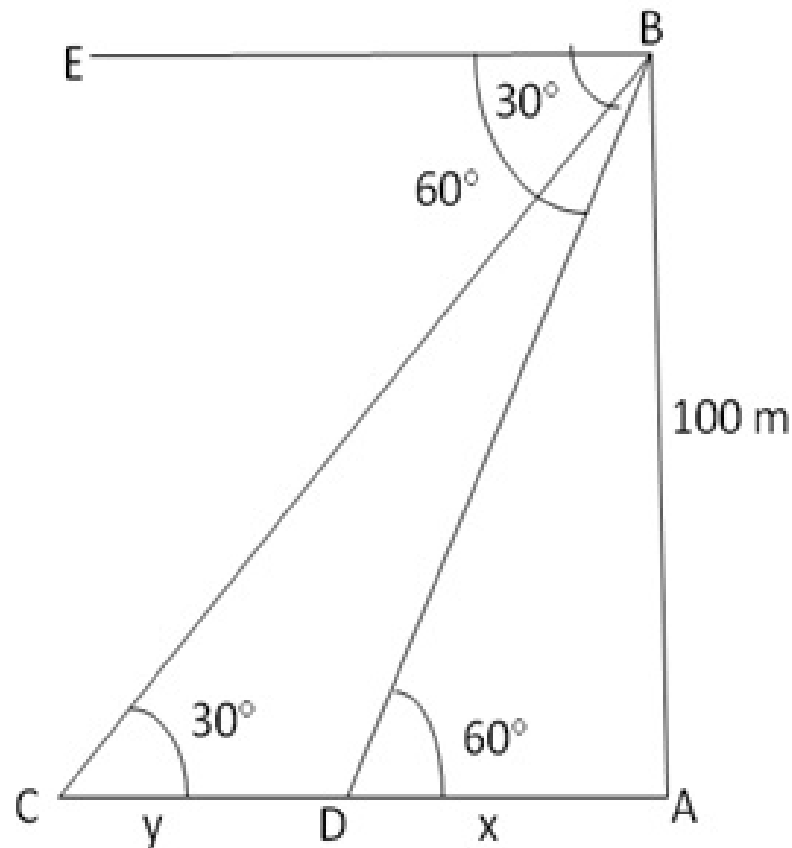




Question 19:

Let AB be the light house and let C and D be the positions of the ship.

Let AD = x, CD = y



In $\triangle BDA$,

$$\frac{x}{100} = \cot 60^\circ$$

$$x = \frac{100}{\sqrt{3}} \text{ m}$$

$$\text{Similarly in } \triangle BCA, \frac{x+y}{100} = \cot 30^\circ$$

$$\Rightarrow (x+y) = 100\sqrt{3} \text{ m}$$

$$y = (x+y) - x$$

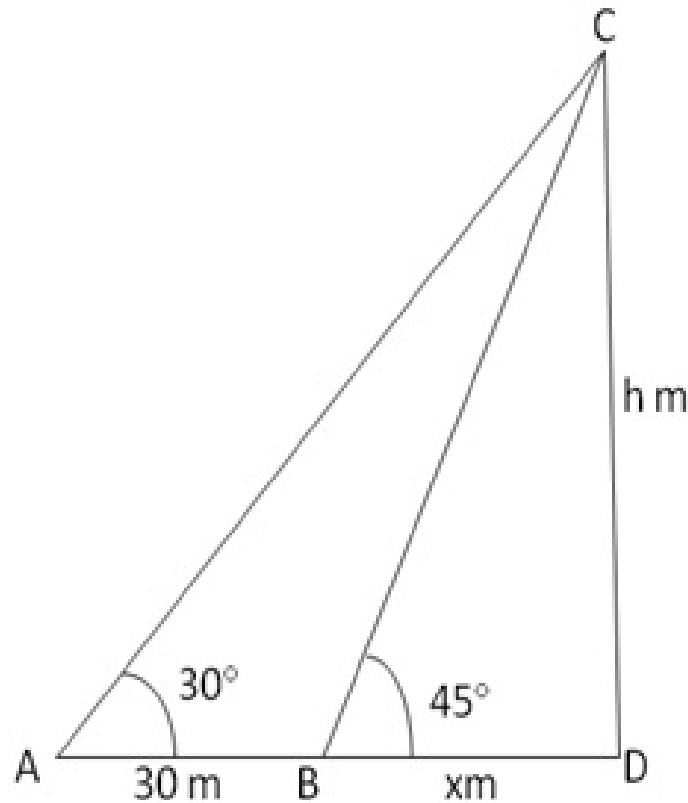
$$= \left(100\sqrt{3} - \frac{100}{\sqrt{3}} \right) \text{ m} = \left(\frac{200}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \right) \text{ m}$$

$$= 115.46 \text{ m}$$

The distance travelled by the ship during the period of observation
= 115.46 m

Question 20:

Let CD be the height of the building
 Then, $\angle CAB = 30^\circ$, $\angle CBD = 45^\circ$, $\angle ADC = 90^\circ$ and $AB = 30\text{m}$
 $CD = h$ metres and $BD = x$ metres.



From right $\triangle CAD$, we have

$$\frac{CD}{DA} = \tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$\frac{h}{30 + x} = \frac{1}{\sqrt{3}} \Rightarrow 30 + x = h\sqrt{3}$$

$$x = (h\sqrt{3} - 30)$$

From right $\triangle BCD$, we have

$$\frac{CD}{BD} = \tan 45^\circ = 1 \Rightarrow \frac{h}{x} = 1 \Rightarrow h = x \text{ --- (2)}$$

from (1) & (2), we get

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

$$\Rightarrow h = \frac{30}{(\sqrt{3} - 1)} \times \frac{(\sqrt{3} + 1)}{(\sqrt{3} + 1)} = \frac{30\sqrt{3} + 30}{3 - 1} = \frac{30(\sqrt{3} + 1)}{2}$$

$$\Rightarrow h = 15(1.732 + 1) = 15 \times 2.732 = 40.98$$

Putting $h = 40.98$ in (2), we get $x = 40.98$ m

Hence height of building = 40.98 m and Distance of its base from the point

$$A = AB = (30 + x) \text{ m}$$

$$= (30 + 40.98) \text{ m} = 70.98 \text{ m}$$

*****END*****