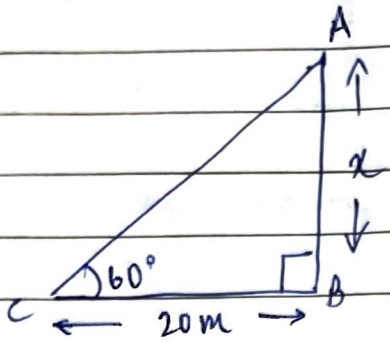
Ch-12

Exercise 12.1

Q.1



BC = distance of point from tower
= 20 m

$\angle ACB = 60°$

Let the height of the tower be x.

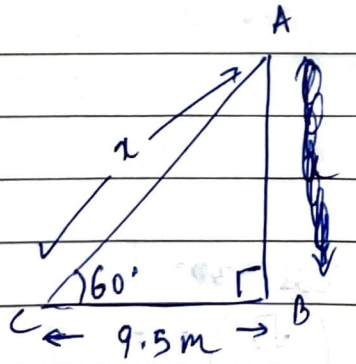
In right $\triangle ABC$,

$$\tan 60° = \frac{AB}{BC}$$

$$\sqrt{3} = \frac{x}{20}$$

$$\boxed{x = 20\sqrt{3}\ m}$$

Q.2



Let the height of the ladder be x.

Distance of ladder from wall = 9.5m
$\angle ACB = 60°$

In right ΔABC,

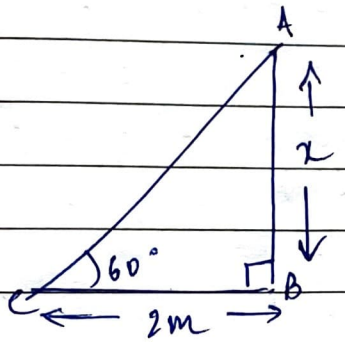
$$\cos 60° = \frac{BC}{AC}$$

$$\frac{1}{2} = \frac{9.5}{x}$$

$$x = 9.5 \times 2$$

$$\boxed{x = 19\ m}$$

Q.3



Let the height of the wall be x.
Distance of ladder from wall = 2m
$\angle ACB = 60°$

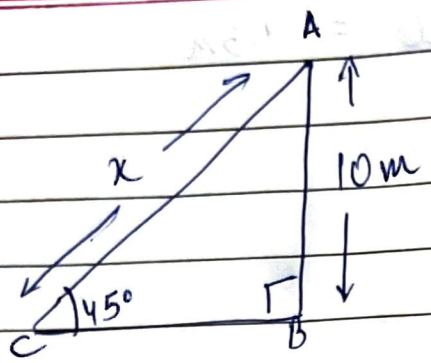
In right ΔABC

$$\tan 60° = \frac{AB}{BC}$$

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

$$\boxed{x = 2\sqrt{3}\ m}$$

Q.4



Let the length of the wire be x.
Height of electric pole = 10 m
$\angle ACB = 45°$

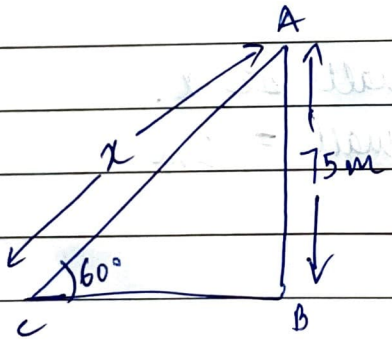
In right $\triangle ABC$

$$\sin 45° = \frac{AB}{AC}$$

$$\frac{1}{\sqrt{2}} = \frac{10}{x}$$

$$\boxed{x = 10\sqrt{2}\ m}$$

Q.5



Let the length of the string be x.
Height of kite flying = 75m
$\angle ACB = 60°$

In right $\triangle ABC$,

$$\sin 60° = \frac{AB}{AC}$$

$$\frac{\sqrt{3}}{2} = \frac{75}{x}$$

$$x = \frac{75 \times 2}{\sqrt{3}}$$

$$x = \frac{150}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

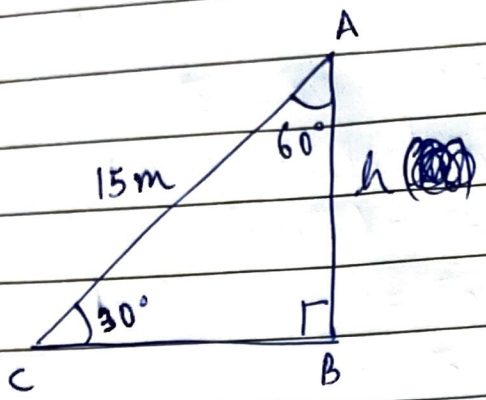
$$x = \frac{150^{50}\sqrt{3}}{\cancel{3}}$$

$$\boxed{x = 50\sqrt{3}\ m}$$

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Ch-12
Exercise 12.1

Q.6



Let the height of wall be h

Height of ladder = 15 m

$\angle CAB = 60°$

$\angle A + \angle B + \angle C = 180°$ (Angle sum prop. of Δ)

$\angle C = 180° - (60° + 90°)$

$\angle C = 180° - 150°$

$\angle C = 30°$

In right Δ ABC,

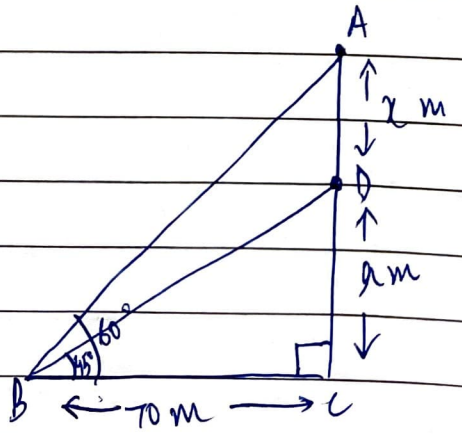
$\sin 30° = \frac{AB}{AC}$

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

$h = \frac{15}{2}$

$\boxed{h = 7.5 \text{ m}}$

Q.7



Let the height of tower be a and the height of the flag staff be x.

In right ΔDCB,

$$\tan 45^\circ = \frac{DC}{BC}$$

$$1 = \frac{a}{70}$$

$$\boxed{a = 70\ m}$$

In right ΔACB,

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

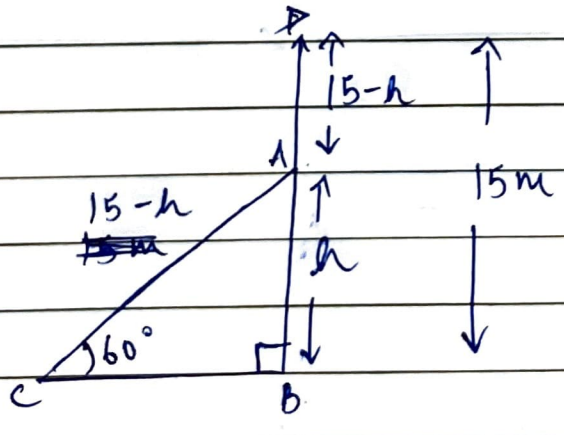
$$\sqrt{3} = \frac{x + a}{70}$$

$$70\sqrt{3} = x + 70$$

$$x = 70\sqrt{3} - 70$$

$$\boxed{x = 70(\sqrt{3} - 1)\ m}$$

Q.8



Height of tree = 15 m

Let the height of broken tree be h.

∴ Height of upper broken part = 15 - h

In right ΔABC,

$$\sin 60^\circ = \frac{AB}{AC}$$

$$\frac{\sqrt{3}}{2} = \frac{h}{15-h}$$

$$15\sqrt{3} - \sqrt{3}h = 2h$$

$$2h + \sqrt{3}h = 15\sqrt{3}$$

$$h(2+\sqrt{3}) = 15\sqrt{3}$$

$$h = \frac{15\sqrt{3}}{2+\sqrt{3}}$$

$$h = \frac{(15\sqrt{3})}{(2+\sqrt{3})} \times \frac{(2-\sqrt{3})}{(2-\sqrt{3})}$$

$$h = \frac{30\sqrt{3} - 45}{(2)^2 - (\sqrt{3})^2}$$

$$h = \frac{30\sqrt{3} - 45}{4-3}$$

$$h = \frac{30\sqrt{3} - 45}{1}$$

$$\boxed{h = 15(2\sqrt{3} - 3)\ m}$$

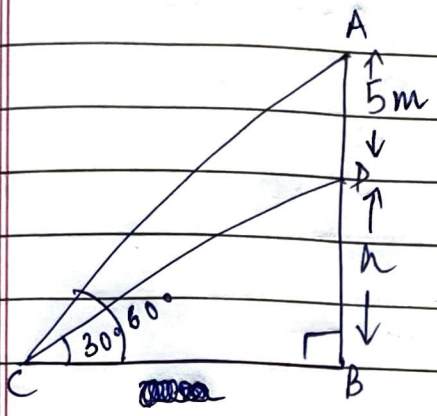
10/03/2021

classmate
Date
Page

Ch-12

Exercise 12.1

Q.9



$AD = 5m$

$\angle DCB = 30°$

$\angle ACB = 60°$

Let the height of the tower be h.

In right $\triangle DBC$,

$$\tan 30° = \frac{DB}{CB}$$

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

$$CB = \sqrt{3}h \quad \text{—①}$$

In right $\triangle ABC$

$$\tan 60° = \frac{AB}{CB}$$

$$\sqrt{3} = \frac{5+h}{\sqrt{3}h} \quad \text{(Putting ①)}$$

$$3h = 5 + h$$

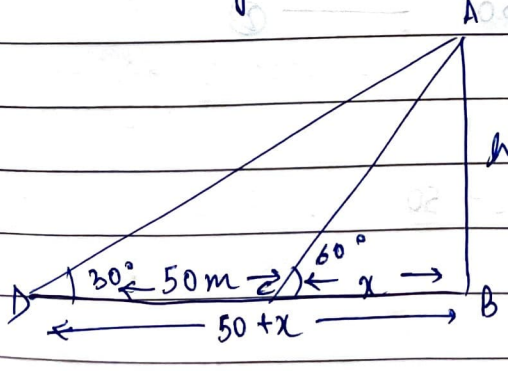
$$3h - h = 5$$

$$h = \frac{5}{2}$$

$$\boxed{h = 2.5\,m}$$

$\therefore$ Height of tower = $\boxed{2.5\,m}$

Q.10



Let the height of the tower be h and the distance CB be x.

$\angle ACB = 60°$, $\angle ADB = 30°$

$AB = 50$ m

In right $\triangle ABC$,

$$\tan 60° = \frac{AB}{BC}$$

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

$$h = \sqrt{3}x \quad \text{—— (1)}$$

In right $\triangle ABD$

$$\tan 30° = \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{50+x}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{50+\sqrt{3}h} \quad \text{(Putting (1))}$$

$$\frac{1}{\sqrt{3}} = \frac{h \times h}{50h+\sqrt{3}}$$

$$50h + \sqrt{3} = \sqrt{3}h^2$$

$$50 + x = \sqrt{3}h$$

$$x = \sqrt{3}h - 50 \quad \text{—— (2)}$$

From (1) & (2)

$$\frac{h}{\sqrt{3}} = \sqrt{3}h - 50$$

$$h = \sqrt{3}(\sqrt{3}h - 50)$$

$$h = 3h - 50\sqrt{3}$$

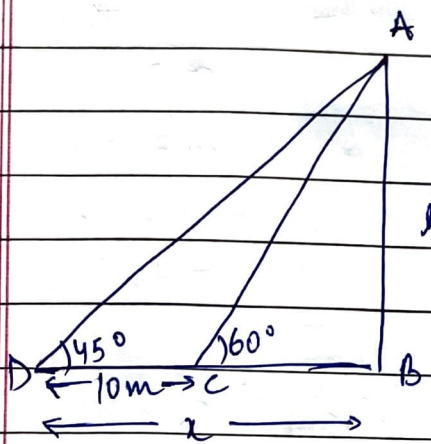
$$3h - h = 50\sqrt{3}$$

$$2h = 50\sqrt{3}$$

$$h = \frac{2550\sqrt{3}}{x}$$

$$\boxed{h = 25\sqrt{3}\ m}$$

Q. 11



Let the height of the tower be h and distance DB be x.

$DC = 10\ m$	$\angle ACB = 60°$
$BC = x - 10$	$\angle ADB = 45°$

In right $\triangle ABC$

$$\tan 60° = \frac{AB}{BC}$$

$$\sqrt{3} = \frac{h}{x - 10}$$

$$x - 10 = \frac{h}{\sqrt{3}}$$

$$x = \frac{h}{\sqrt{3}} + 10 \quad \text{---} \ (1)$$

In right $\triangle ABD$

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

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

$$x = h \quad \text{——} (2)$$

From (1) & (2)

$$h = \frac{h}{\sqrt{3}} + 10$$

$$h = \frac{h + 10\sqrt{3}}{\sqrt{3}}$$

$$\sqrt{3}h - h = 10\sqrt{3}$$

$$h(\sqrt{3} - 1) = 10\sqrt{3}$$

$$h = \frac{10\sqrt{3}}{\sqrt{3} - 1}$$

$$h = \frac{(10\sqrt{3}) \times (\sqrt{3} + 1)}{(\sqrt{3} - 1) \times (\sqrt{3} + 1)}$$

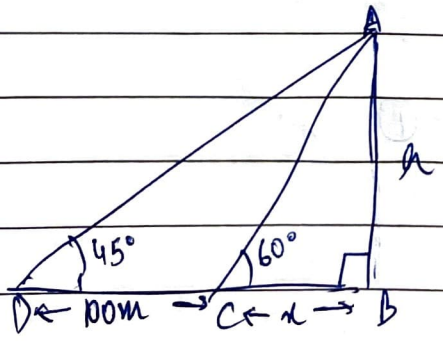
$$h = \frac{30 + 10\sqrt{3}}{(\sqrt{3})^2 - (1)^2}$$

$$h = \frac{30 + 10\sqrt{3}}{3 - 1}$$

$$h = \frac{10(3 + \sqrt{3})}{2}$$

$$\boxed{h = 5\sqrt{3}(\sqrt{3} + 1) \text{ m}}$$

Q.12



Let the height be h and the distance of the point be x.

$D = 100m$

$\angle ACB = 60°$, $\angle ADB = 45°$

In right $\triangle ABC$

$$\tan 60° = \frac{AB}{BC}$$

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

$$x = \frac{h}{\sqrt{3}} \quad \text{—— (1)}$$

In $\triangle ABD$

$$\tan 45° = \frac{AB}{BD}$$

$$1 = \frac{h}{100 + x}$$

$$x + 100 = h$$

$$x = h - 100 \quad \text{—— (2)}$$

From (1) & (2)

$$\frac{h}{\sqrt{3}} = h - 100$$

$$100 = h - \frac{h}{\sqrt{3}}$$

$$\sqrt{3}(100) = \sqrt{3}h - h$$

$$100\sqrt{3} = h(\sqrt{3} - 1)$$

$$h = \frac{100\sqrt{3}}{\sqrt{3} - 1} \times \frac{(\sqrt{3} + 1)}{(\sqrt{3} + 1)}$$

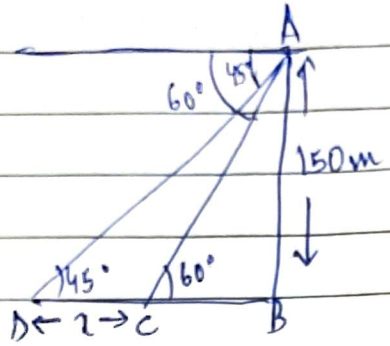
$$h = \frac{300 + 100\sqrt{3}}{3 - 1} = \frac{100\sqrt{3}(\sqrt{3} + 1)}{2}$$

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

Putting value of h in (1)

$$x = \frac{h}{\sqrt{3}} = \frac{50\sqrt{3}(\sqrt{3} + 1)}{\sqrt{3}} = \boxed{50(\sqrt{3} + 1)\ m}$$

Q.13



Let the distance be x.

Height of tower AB = 150 m

In Right $\triangle ABD$

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

$$1 = \frac{150}{BD}$$

$$BD = 150 \text{ m}$$

In right $\triangle ABC$

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

$$\sqrt{3} = \frac{150}{BC}$$

$$BC = \frac{150}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$BC = \frac{150^{50} \times \sqrt{3}}{3}$$

$$BC = 50\sqrt{3}$$

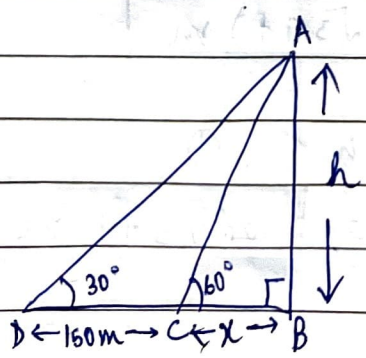
$$x = BD - BC$$

$$= 150 - 50\sqrt{3}$$

$$= 50(3 - \sqrt{3})$$

$$= \boxed{50\sqrt{3}(\sqrt{3} - 1) \text{ m}}$$

Q.14



Given - DC = 150 m

$\angle ACB = 60°$

$\angle ADB = 30°$

To prove - AB = 129.9 m

Proof - Let the height AB be h & the distance BC be x.

In right ΔABC

$$\tan 60° = \frac{AB}{BC}$$

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

$$x = \frac{h}{\sqrt{3}} \quad \text{— (1)}$$

In right ΔABD

$$\tan 30° = \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{150 + x}$$

$$\sqrt{3}h = 150 + x$$

$$\sqrt{3}h = 150 + \frac{h}{\sqrt{3}} \quad \text{(Putting (1))}$$

$$\sqrt{3}\left(\sqrt{3}h\right) = 150\sqrt{3} + h$$

$$3h - h = 150\sqrt{3}$$

$$2h = 150\sqrt{3}$$

$$h = \frac{150\sqrt{3}}{2}$$

$$h = 75\sqrt{3}$$

$$h = 75 \times 1.732$$

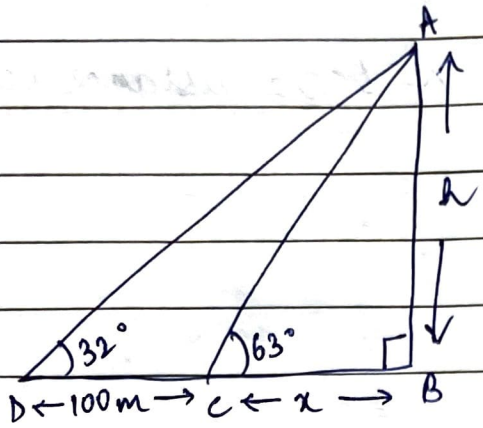
$$\boxed{h = 129.9 \text{ m}}$$

Hence, proved

Ch-12

Exercise 12.1

Q.15



Let the height AB be h and the distance BC be x.

$CD = 100$ m
$\angle ACB = 63°$
$\angle ADB = 32°$
$\tan 32° = 0.6248$
$\tan 63° = 1.9626$

} given

In right $\triangle ABC$

$$\tan 63° = \frac{AB}{BC}$$

$$1.9626 = \frac{h}{x}$$

$$x = \frac{h}{1.9626} \quad \text{——} \ (1)$$

In right $\triangle ABD$

$$\tan 32° = \frac{AB}{BD}$$

$$0.6248 = \frac{h}{100 + x}$$

$$h = 62.48 + 0.6248x$$

$$h = 62.48 + \left(\frac{0.6248 \times h}{1.9626}\right) \quad [\text{Putting } ①]$$

$$h = 62.48 + 0.3183h$$

$$h - 0.3183h = 62.48$$

$$0.6817h = 62.48$$

$$h = \frac{62.48}{0.6817}$$

$$h = \frac{6248.00}{6817} \; 91.65$$

$$\boxed{h = 91.65\ m}$$

Putting value of h in ①

$$x = \frac{h}{1.9626}$$

$$x = \frac{91.65}{1.9626}$$

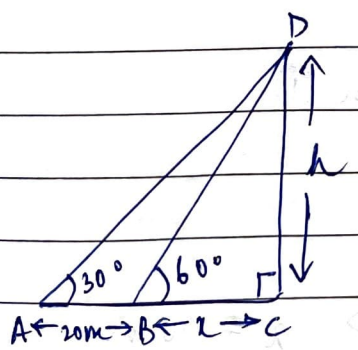
$$x = \frac{916500}{19626} \; 46.7 \quad \Rightarrow \quad x = 46.7\ m$$

Distance of the first position from the tower $= 100 + x$

$= 100 + 46.7$

$= \boxed{146.7\ m}$

Q.16



Let the height of the tower be h and the distance BC be x.

In right ΔDCB

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

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

$$x = \frac{h}{\sqrt{3}} \quad \text{---} (1)$$

In right ΔDCA

$$\tan 30^\circ = \frac{DC}{AC}$$

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

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

$$\sqrt{3}h = 20 + \frac{h}{\sqrt{3}} \quad \text{(Putting (1))}$$

$$\sqrt{3}\left(\sqrt{3}h\right) = 20\sqrt{3} + h$$

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

$$2h = 20\sqrt{3}$$

$$h = \frac{20\sqrt{3}}{2}$$

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

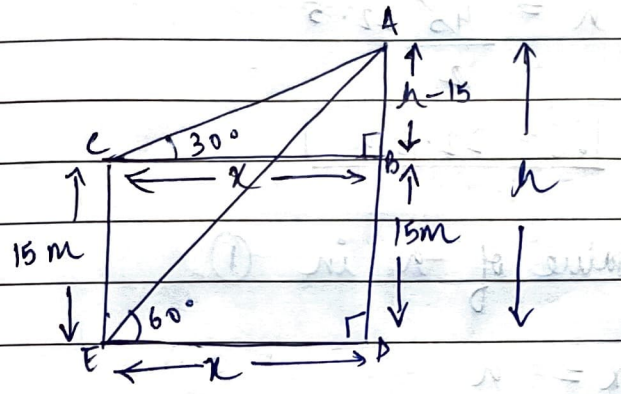
Putting value of h in (1)

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

$$x = \frac{10\sqrt{3}}{\sqrt{3}} \implies x = 10 \text{ m}$$

Distance of tower from point A = 20 + x
= 20 + 10
= 30 m

Q.17



Let the height of the tower be h and the distance between the ~~height~~ tower & the building be x.

CE = BD = 15 m | BC = ED = x

AB = h - 15

In right Δ ADE

$$\tan 60° = \frac{AD}{DE}$$

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

$$x = \frac{h}{\sqrt{3}} \quad \text{——— (1)}$$

In right Δ ABC

$$\tan 30° = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{h-15}{x}$$

$$\sqrt{3}h - 15\sqrt{3} = x$$

$$\sqrt{3}h - 15\sqrt{3} = \frac{h}{\sqrt{3}} \quad \text{(Putting (1))}$$

$$\sqrt{3}\left(\sqrt{3}h - 15\sqrt{3}\right) = h$$

$$3h - 45 = h$$

$$3h - h = 45$$

$$2h = 45$$

$$h = \frac{45}{2} = 22.5$$

$$\boxed{h = 22.5\ m}$$

Putting value of h in (1)

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

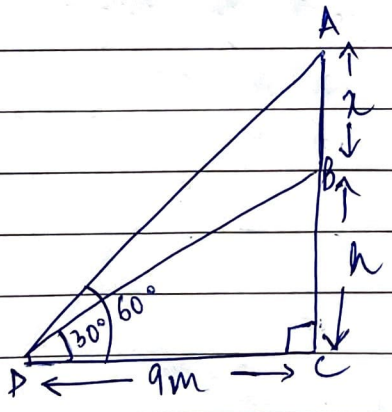
$$x = \frac{45}{2\sqrt{3}}$$

$$x = \frac{45}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \frac{45\sqrt{3}}{6} = 7.5\sqrt{3}$$

$$\boxed{x = 7.5\sqrt{3}\ m}$$

Q. 18



Let the height of tower & the flag pole be h & x respectively.

In right ΔBCD,

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

$$\frac{1}{\sqrt{3}} = \frac{h}{9}$$

$$h = \frac{9}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$h = \frac{3\cancel{9}\sqrt{3}}{\cancel{3}}$$

$$\boxed{h = 3\sqrt{3}\ m}$$

In right ΔACD,

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

$$\sqrt{3} = \frac{x+h}{9}$$

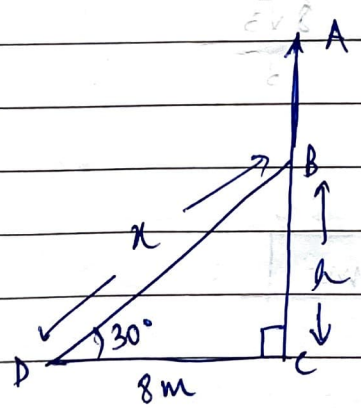
$$x + h = 9\sqrt{3}$$

$$x + 3\sqrt{3} = 9\sqrt{3}$$

$$x = 9\sqrt{3} - 3\sqrt{3}$$

$$\boxed{x = 6\sqrt{3}\ m}$$

Q.19



Let the broken part of tree be x, and the standing part of tree be h

$\angle BCD = 30^\circ$

In right ΔBCD,

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

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

$$h = \frac{8}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$h = \frac{8\sqrt{3}}{3} \text{ m} \quad \longrightarrow (1)$$

$$\cos 30^\circ = \frac{DC}{BD}$$

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

$$x = \frac{16}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \frac{16\sqrt{3}}{3} \text{ m} \quad \longrightarrow (2)$$

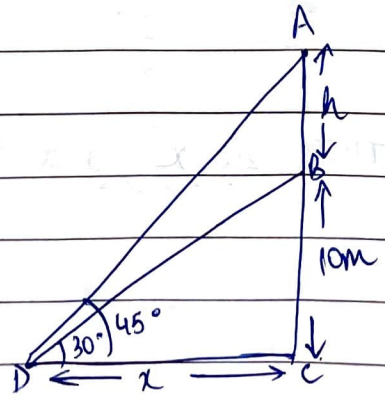
Height of tree $= x + h$

$$= \frac{16\sqrt{3}}{3} + \frac{8\sqrt{3}}{3}$$

$$= \frac{824\sqrt{3}}{3}$$

$$= \boxed{8\sqrt{3} \text{ m}}$$

Q. 20



Let the length of the flag staff and the distance of the building from the point P be h and x respectively.

Height of building = 10m

$\angle BCD = 30°$, $\angle ACD$

$\angle BDC = 30°$, $\angle ADC = 45°$

In right $\triangle BCD$,

$$\tan 30° = \frac{BC}{DC}$$

$$\frac{1}{\sqrt{3}} = \frac{10}{x}$$

$$\boxed{x = 10\sqrt{3}\ m} \quad - (1)$$

In right $\triangle ACD$,

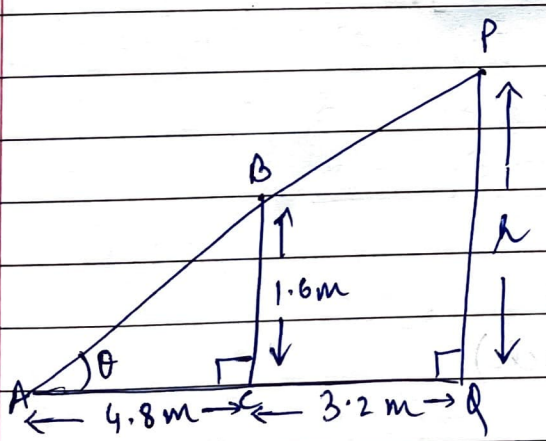
$$\tan 45° = \frac{AC}{DC}$$

$$1 = \frac{h+10}{x} \quad [\text{Putting } (1)]$$

$$10\sqrt{3} - 10 = h$$

$$\boxed{h = 10(\sqrt{3}-1)\ m}$$

Q.21



(i) BC = height of girl = 1.6m

Length of shadow = 4.8m

Distance between girl & lamp post = 3.2m

Let the height of lamp post be h.

(i) trigonometric ratios

In right ΔABC

$$\tan\theta = \frac{BC}{AC}$$

$$\tan\theta = \frac{1.6}{4.8}\ \frac{1}{3}$$

$$\tan\theta = \frac{1}{3} \quad \text{—— (1)}$$

In right ΔAPQ,

$$\tan\theta = \frac{PQ}{AQ}$$

$$\tan\theta = \frac{h}{4.8 + 3.2}$$

$$\tan\theta = \frac{h}{8} \quad \text{—— (2)}$$

From (1) & (2)

$$\frac{1}{3} = \frac{h}{8}$$

$$h = \frac{8}{3}$$

$$\boxed{h = 2.66\ m}$$

(ii) property of similar Δs

In ΔACB & ΔAQP

$\angle A = \angle A$ (Common)

$\angle ACB = \angle AQP$ (90° each)

$\therefore \Delta ACB \sim \Delta AQP$ (AA similarity)

$$\frac{AC}{AQ} = \frac{BC}{PQ} \quad \text{(CPST)}$$

$$\frac{4.8}{4.8 + 3.2} = \frac{1.6}{h}$$

$$\frac{4.8}{8} = \frac{1.6}{h}$$

$$h = \frac{1.6 \times 8}{4.8\,3}$$

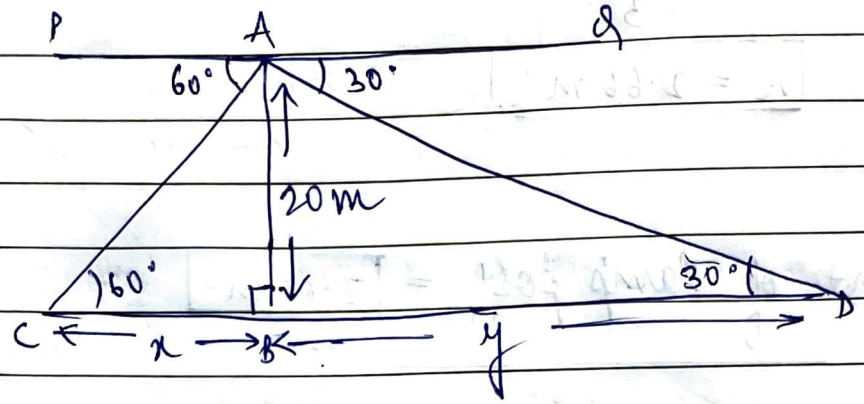
$$h = \frac{8}{3}$$

$$\boxed{h = 2.66\ m}$$

$\therefore$ Height of lamp post = $\boxed{2.66\ m}$

Ch-12
Exercise 12.1

Q. 33



Let the distance BC be x and distance BD be y.

Height of tree = 20 m

$\angle ACB = \angle CAP = 60°$

$\angle ADB = \angle DAQ = 30°$

In right $\triangle ABC$

$$\tan 60° = \frac{AB}{BC}$$

$$\sqrt{3} = \frac{20}{x}$$

$$x = \frac{20}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \frac{20\sqrt{3}}{3} \text{ m} \quad \text{——} \quad (1)$$

In right $\triangle ABD$,

$$\tan 30° = \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{20}{y}$$

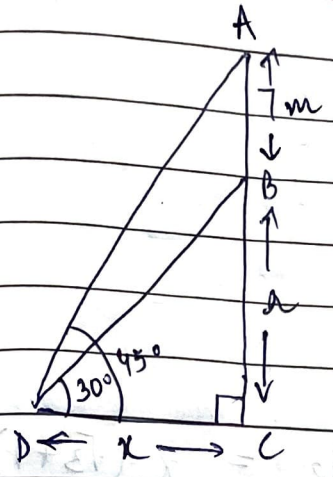
$$y = 20\sqrt{3} \quad \text{——} \quad (2)$$

Width of river = $x + y$

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

$$= \frac{20\sqrt{3} + 60\sqrt{3}}{3} = \boxed{\frac{80\sqrt{3}}{3} \text{ m}}$$

Q.34



Let the height of the tower and the distance DC be h and x respectively.

In right ΔBCD,

$$\tan 30° = \frac{BC}{DC}$$

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

$$x = h\sqrt{3} \quad \text{— (1)}$$

In right ΔACD,

$$\tan 45° = \frac{AC}{DC}$$

$$1 = \frac{7 + h}{x}$$

$$1 = \frac{7 + h}{h\sqrt{3}} \quad [\text{Putting (1)}]$$

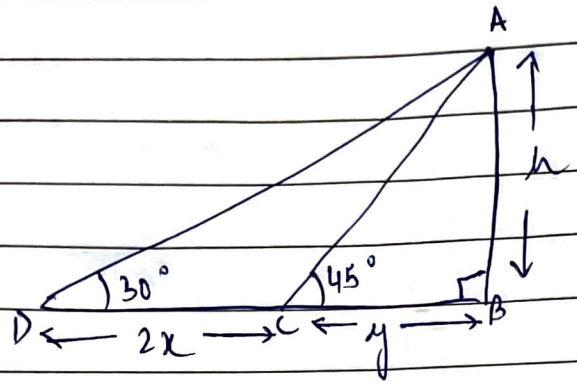
$$h\sqrt{3} - h = 7$$

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

$$h = \frac{(7)}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)} = \frac{7(\sqrt{3}+1)}{(\sqrt{3})^2 - (1)^2}$$

$$h = \frac{7(\sqrt{3}+1)}{3-1} = \boxed{\frac{7(\sqrt{3}+1)\,m}{2}}$$

Q.35



To prove - Height of tree = $x(\sqrt{3}+1)$ m

Given - $DC = 2x$

$\angle ACB = 45°$, $\angle ADB = 30°$

Proof - Let the height of the tree be h and the distance BC be y.

In right ΔABC,

$$\tan 45° = \frac{AB}{BC}$$

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

$$y = h \quad \text{——} \quad (1)$$

In right ΔABD,

$$\tan 30° = \frac{AB}{BD}$$

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

$$2x + y = \sqrt{3}h$$

$$2x + h = \sqrt{3}h \quad \text{(Putting (1))}$$

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

$$h(\sqrt{3}-1) = 2x$$

$$h = \frac{2x}{\sqrt{3}-1}$$

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

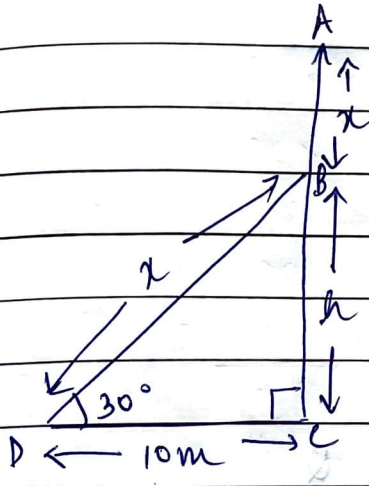
$$h = \frac{2x(\sqrt{3}+1)}{(\sqrt{3})^2-(1)^2} = \frac{2x(\sqrt{3}+1)}{3-1}$$

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

$$\boxed{h = x(\sqrt{3}+1)\ m}$$

Hence, proved

Q.36



Let the standing part & broken part of the tree be h and x respectively.

In right $\triangle BCD$

$$\tan 30° = \frac{BC}{DC}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{10}$$

$$h = \frac{10}{\sqrt{3}}\ m \quad \text{—— (1)}$$

In right $\triangle BCD$

$$\cos 30° = \frac{DC}{BD}$$

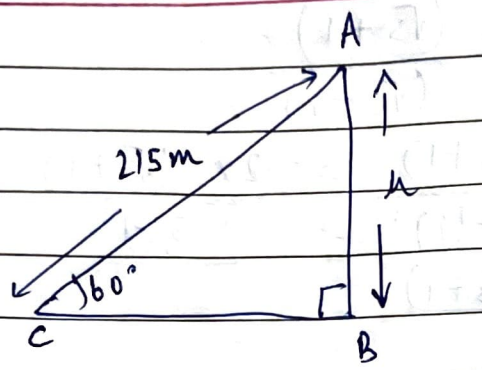
$$\frac{\sqrt{3}}{2} = \frac{10}{x}$$

$$x = \frac{20}{\sqrt{3}} \quad \text{—— (2)}$$

Height of tree $= x + h = \frac{20}{\sqrt{3}} + \frac{10}{\sqrt{3}} = \frac{30}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$$= \frac{10\cancel{3}\sqrt{3}}{\cancel{3}} = \boxed{10\sqrt{3}\ m}$$

Q. 37



Let the height of balloon from ground be h.

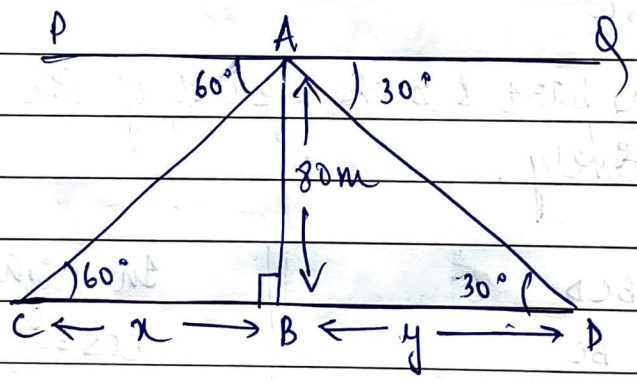
In right ΔABC,

$$\sin 60^\circ = \frac{AB}{AC}$$

$$\frac{\sqrt{3}}{2} = \frac{h}{215}$$

$$\boxed{h = \frac{215\sqrt{3}}{2} \text{ m}}$$

Q. 38



Let the distance BC & BD be x & y respectively.

In right ΔABC,

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

$$\sqrt{3} = \frac{80}{x}$$

$$x = \frac{80}{\sqrt{3}} \quad \text{——— (1)}$$

In right ΔABD

$$\tan 30° = \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{80}{y}$$

$$y = 80\sqrt{3} \quad \text{——} (2)$$

Distance between two men $= x + y$

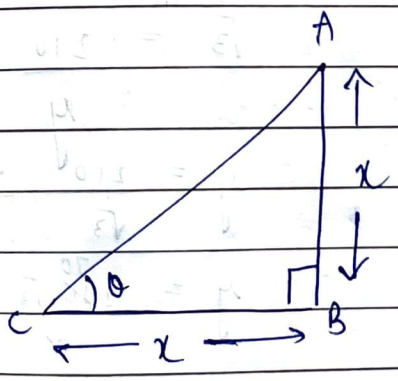
$$= \frac{80}{\sqrt{3}} + 80\sqrt{3}$$

$$= \frac{80 + 240}{\sqrt{3}}$$

$$= \frac{320}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \boxed{\frac{320\sqrt{3}}{3} \text{ m}}$$

Q.39



ATQ,

height of pole = length of shadow

Let the height of pole be x.

$\therefore$ Length of shadow $= x$.

In right ΔABC

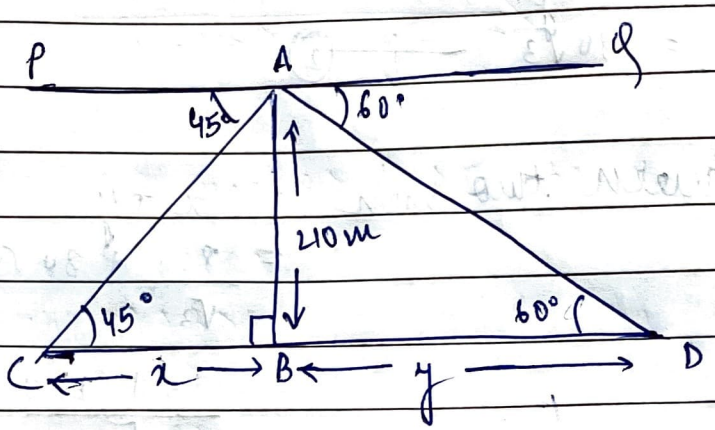
$$\tan\theta = \frac{AB}{BC}$$

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

$$\tan\theta = 1$$

$$\therefore \boxed{\theta = 45^\circ}$$

Q. 40



Let the distance BC & BD be x & y respectively.

In right ΔABC,

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

$$1 = \frac{210}{x}$$

$$x = 210\ m$$

In right ΔABD,

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

$$\sqrt{3} = \frac{210}{y}$$

$$y = \frac{210}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$y = \frac{210\sqrt{3}}{3}$$

$$y = 70\sqrt{3}\ m$$

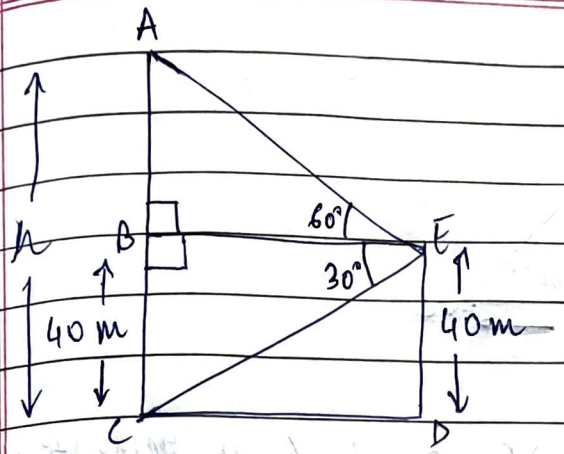
Width of river $= x + y$

$= 210 + 70\sqrt{3}$

$= 210 + 70(1.73) = 210 + 121.1$

$= \boxed{331.1\ m}$

Q.41



Let the height of the chimney be h.

Height of tower $DE = BC = 40m$

In right ΔABE

$$\tan 60° = \frac{AB}{BE}$$

$$\sqrt{3} = \frac{AB}{BE}$$

$$AB = BE\sqrt{3} \quad \text{—— (1)}$$

In right ΔCBE,

$$\tan 30° = \frac{BC}{BE}$$

$$\frac{1}{\sqrt{3}} = \frac{40}{BE}$$

$$BE = 40\sqrt{3} \quad \text{—— (2)}$$

Substitute (2) in (1)

$$AB = BE\sqrt{3}$$

$$AB = 40\sqrt{3} \times \sqrt{3}$$

$$AB = 120 \text{ m}$$

Height of chimney $= h$

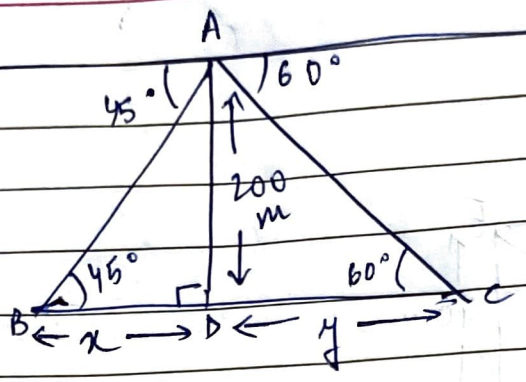
$$= AB + BC$$

$$= 120 + 40$$

$$= \boxed{160 \text{ m}}$$

∴ The height of the chimney meets the pollution control norms.

Q.42



Let the distance BD & DC be x & y respectively.

In right ΔABD,

$$\tan 45° = \frac{AD}{BD}$$

$$1 = \frac{200}{x}$$

$$x = 200 \text{ m}$$

In right ΔADC,

$$\tan 60° = \frac{AD}{DC}$$

$$\sqrt{3} = \frac{200}{y}$$

$$y = \frac{200}{\sqrt{3}} \text{ m}$$

Distance between the two ships $= x + y$

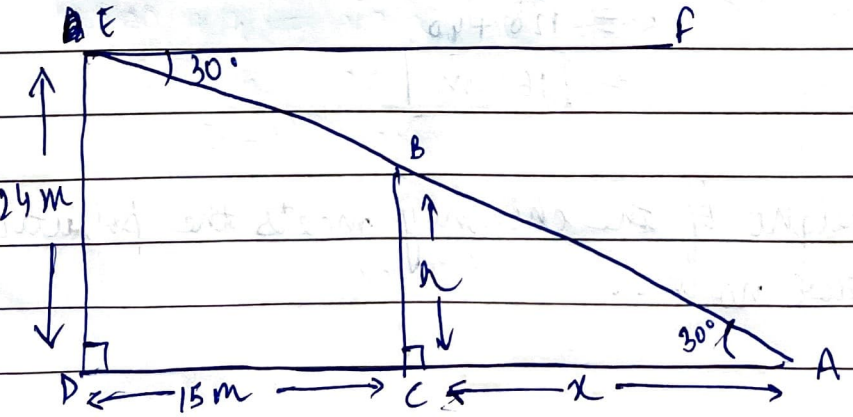
$$= 200 + \frac{200}{\sqrt{3}}$$

$$= \frac{200\sqrt{3} + 200}{\sqrt{3}} \quad \frac{200 + 200}{1.73}$$

$$= 200 + 115.60$$

$$= \boxed{315.60 \text{ m}}$$

Q.43



Let the height of the first pole be h & the distance AC be x

In right ΔABC,

$$\tan 30° = \frac{AB}{AC}$$

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

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

In right ΔAED,

$$\tan 30° = \frac{ED}{AD}$$

$$\frac{1}{\sqrt{3}} = \frac{24}{15+x}$$

$$15 + x = 24\sqrt{3}$$

$$x = 24\sqrt{3} - 15$$

$$\sqrt{3}h = 24\sqrt{3} - 15 \quad \text{(Putting (1))}$$

$$h = \frac{24\sqrt{3} - 15}{\sqrt{3}}$$

$$h = \frac{(24\sqrt{3} - 5\sqrt{3})\sqrt{3}}{\sqrt{3}}$$

$$h = \frac{\sqrt{3}(24-5)}{\sqrt{3}}$$

$$h = 24\sqrt{3} - 5\sqrt{3}$$

$$h =$$

$$h = \frac{24(1.732) - 15}{1.732}$$

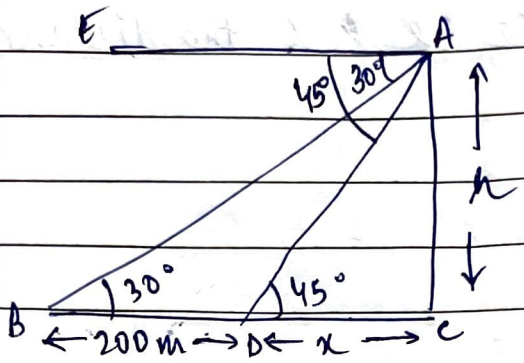
$$h = \frac{41.568 - 15}{1.732}$$

$$h = \frac{26.568}{1.732}$$

$$h = \boxed{15.33\ m}$$

∴ Height of first pole = $\boxed{15.33\ m}$

Q.44



Let the height of the light house be h and the distance DC be x.

In right $\triangle$ ~~ABC~~ ADC,

$$\tan 45^\circ = \frac{AC}{DC}$$

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

$$x = h \quad \text{— (1)}$$

In right $\triangle ABC$,

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

$$\frac{1}{\sqrt{3}} = \frac{h}{200+x}$$

$$200 + x = \sqrt{3}h$$

$$200 + h = \sqrt{3}h \quad \text{(Putting (1))}$$

$$\sqrt{3}h - h = 200$$

$$h(\sqrt{3}-1) = 200$$

$$h = \frac{(200)}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$$

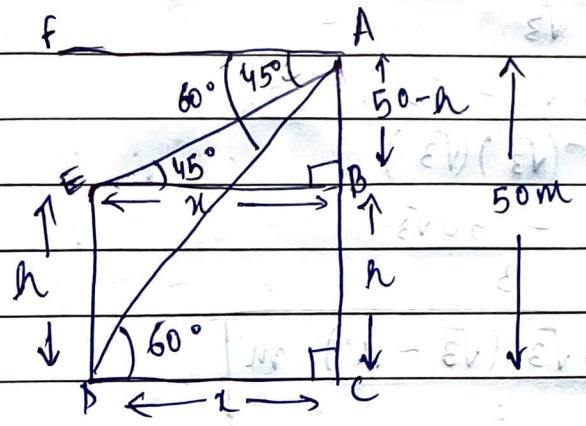
$$h = \frac{200(\sqrt{3}+1)}{(\sqrt{3})^2 - (1)^2}$$

$$h = \frac{200(\sqrt{3}+1)}{3-1}$$

$$h = \frac{100\,200(\sqrt{3}+1)}{2}$$

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

Q.46



Let the height of the pole be h & the distance DC be x

$BC = DE = h$ | $EB = DC = x$

$AC = 50\ m$

$AB = 50 - h$

In right ΔADC,

$$\tan 60° = \frac{AC}{DC}$$

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

$$x = \frac{50}{\sqrt{3}}\ m \quad \text{——— (1)}$$

In right ΔAEB,

$$\tan 45° = \frac{AB}{EB}$$

$$1 = \frac{50 - h}{x}$$

$$x = 50 - h$$

$$\frac{50}{\sqrt{3}} = 50 - h$$

$$h = 50 - \frac{50}{\sqrt{3}}$$

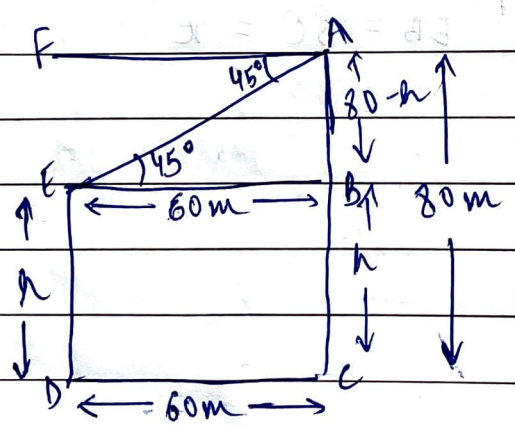
$$h = \frac{50\sqrt{3} - 50}{\sqrt{3}}$$

$$h = \frac{(50\sqrt{3} - 50)(\sqrt{3})}{(\sqrt{3})(\sqrt{3})}$$

$$h = \frac{150 - 50\sqrt{3}}{3}$$

$$\boxed{h = \frac{50\sqrt{3}\,(\sqrt{3} - 1)}{3}\ m}$$

Q.47



Let the height of the first tree be h

Height of second tree = 80m

BC = ED = a

AB = 80 - h

In right $\triangle ABE$,

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

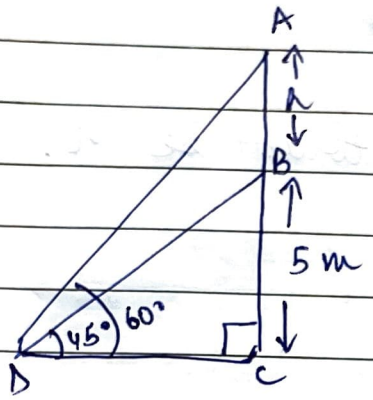
$$1 = \frac{80 - h}{60}$$

$$60 = 80 - h$$

$$h = 80 - 60$$

$$\boxed{h = 20\ m}$$

Q.48



Let the height of flag staff be h

In right $\triangle BCD$,

$$\tan 45^\circ = \frac{BC}{DC}$$

$$1 = \frac{5}{DC}$$

$$DC = 5\ m \quad \text{——— (1)}$$

In right $\triangle ACD$,

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

$$\sqrt{3} = \frac{h+5}{DC}$$

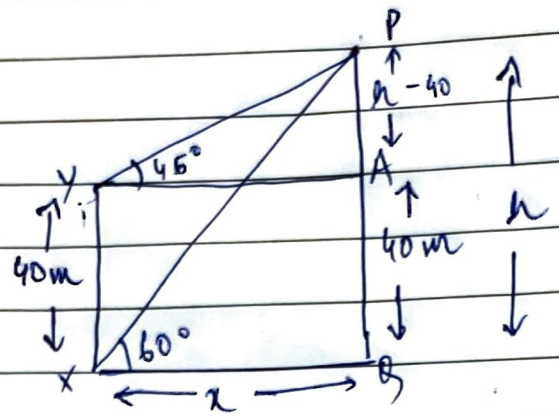
$$DC\sqrt{3} = h + 5$$

$5\sqrt{3} = h + 5$ (Putting ①)

$h = 5\sqrt{3} - 5$

$\boxed{h = 5(\sqrt{3} - 1)\ m}$

Q.49



Let the height of the tower be h.

$XY = 40\ m = AQ$

$PA = h - 40$

In right ΔPQX,

$$\tan 60° = \frac{PQ}{XQ}$$

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

$$x = \frac{h}{\sqrt{3}} \quad \text{——} \quad (1)$$

In right ΔPAY,

$$\tan 45° = \frac{PA}{AY}$$

$$1 = \frac{h - 40}{x}$$

$$x = h - 40$$

$$\frac{h}{\sqrt{3}} = h - 40 \quad \text{(Putting ①)}$$

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

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

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

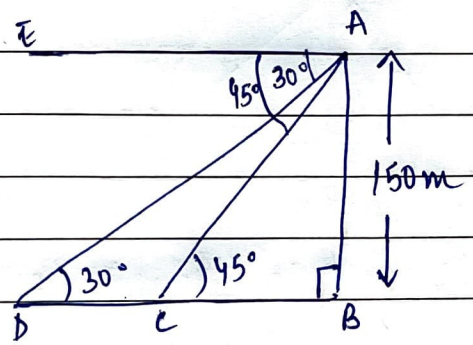
$$h = \frac{(40\sqrt{3})(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$$

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

$$h = \frac{\overset{20}{\cancel{40}}\sqrt{3}(\sqrt{3}+1)}{\cancel{2}}$$

$$\boxed{h = 20\sqrt{3}(\sqrt{3}+1)\ m}$$

Q. 50



Height of light house AB = 150 m

In right ΔABC,

$$\tan 45° = \frac{AB}{BC}$$

$$1 = \frac{150}{BC}$$

$$BC = 150\ m$$

In right ΔABD,

$$\tan 30° = \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{150}{BD}$$

$$BD = 150\sqrt{3}\ m$$

Distance between two ships = CD = BD − BC

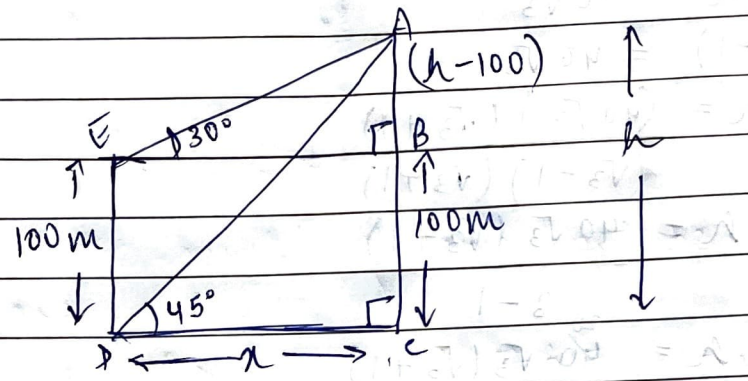
$$= 150\sqrt{3} - 150$$

$$= \boxed{150(\sqrt{3}-1)\ m}$$

Ch-12

Exercise 12.1

Q.51



Let the height of rock be h & the distance CD be x.

Height of Tower = 100 m

ED = BC = 100 m

AB = h - 100

In right $\triangle ACD$,

$$\tan 45^\circ = \frac{AC}{DC}$$

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

$$x = h \quad \text{—— (1)}$$

In right $\triangle ABE$,

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

$$\frac{1}{\sqrt{3}} = \frac{h-100}{x}$$

$$x = (h-100)\sqrt{3}$$

$$h = \sqrt{3}h - 100\sqrt{3} \quad \text{(Putting (1))}$$

$$\sqrt{3}h - h = 100\sqrt{3}$$

$$h(\sqrt{3}-1) = 100\sqrt{3}$$

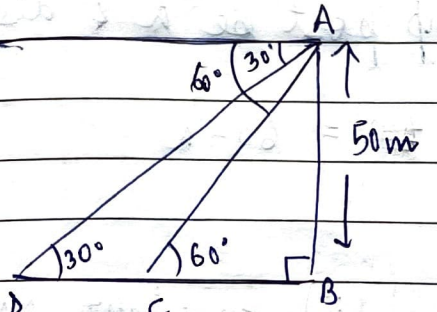
$$h = \frac{(100\sqrt{3}) \times (\sqrt{3}+1)}{(\sqrt{3}-1) \times (\sqrt{3}+1)}$$

$$h = \frac{300 + 100\sqrt{3}}{(\sqrt{3})^2 - (1)^2}$$

$$h = \frac{50\cancel{00}(3 + \sqrt{3})}{\cancel{2}}$$

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

Q. 52



Height of tower = 50 m

In right ΔABC,

$$\tan 60° = \frac{AB}{BC}$$

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

$$BC = \frac{50}{\sqrt{3}}\ m \quad \text{— (1)}$$

In right ΔABD

$$\tan 30° = \frac{AB}{BD}$$

$$\frac{1}{\sqrt{3}} = \frac{50}{BD}$$

$$BD = 50\sqrt{3}\ m \quad \text{— (2)}$$

Distance between two cars = CD

$$= BD - BC$$

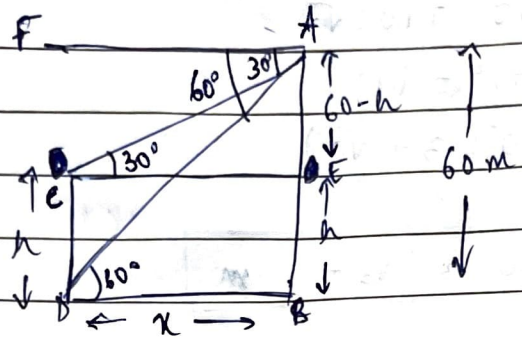
$$= 50\sqrt{3} - \frac{50}{\sqrt{3}} = \frac{150 - 50}{\sqrt{3}}$$

$$= \frac{100 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \boxed{\frac{100\sqrt{3}}{3}\ m}$$

Distance of first car from tower = BD = $\boxed{50\sqrt{3}\ m}$

Distance of second car from tower = BC = $\frac{50}{\sqrt{3}} = \boxed{\frac{50\sqrt{3}}{3}\ m}$

Q. 53



Let the height of lamp post be h & distance DB be x.

$BE = DC = h$ | $AE = 60 - h$

$AB = 60\ m$

(i) In right $\triangle ACD$,

$$\tan 60° = \frac{AC}{CD}$$

$$\sqrt{3} = \frac{60}{x}$$

$$x = \frac{60}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \frac{60\sqrt{3}}{3}$$

$$\boxed{x = 20\sqrt{3}\ m}$$

∴ Distance between AB & CD = $\boxed{20\sqrt{3}\ m}$

(ii) In right $\triangle AEC$,

$$\tan 30° = \frac{AE}{CE}$$

$$\frac{1}{\sqrt{3}} = \frac{60 - h}{x}$$

$$x = 60\sqrt{3} - \sqrt{3}h$$

$$20\sqrt{3} = 60\sqrt{3} - \sqrt{3}h$$

$$\sqrt{3}h = 60\sqrt{3} - 20\sqrt{3}$$

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

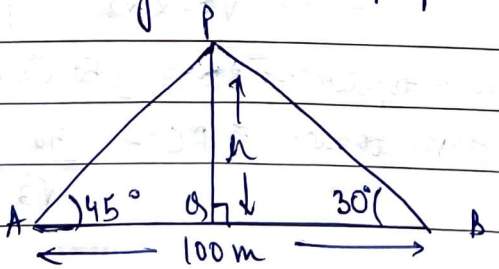
$$\boxed{h = 40\ m}$$

∴ Height of lamp post = $\boxed{40\ m}$

(iii) Difference between heights of building and lamp post = $60 - 40$

$= \boxed{20\ m}$

Q. 54



Let the height of light house be h.
Distance $AB = 100$ m.

In right $\triangle PQA$,

$$\tan 45^\circ = \frac{PQ}{AQ}$$

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

$$AQ = h \quad \text{—— (1)}$$

In right $\triangle PQB$

$$\tan 30^\circ = \frac{PQ}{QB}$$

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

$$QB = h\sqrt{3} \quad \text{—— (2)}$$

ATQ,

$$AQ + QB = AB$$

$$h + h\sqrt{3} = 100$$

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

$$h = \frac{(100)}{(\sqrt{3}+1)} \times \frac{(\sqrt{3}-1)}{(\sqrt{3}-1)}$$

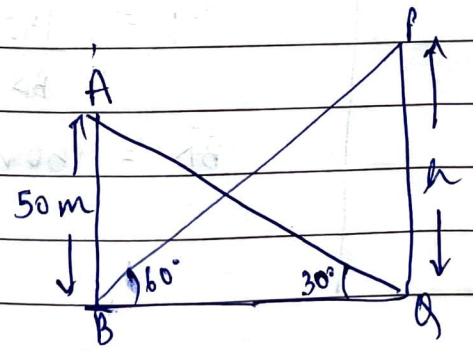
$$h = \frac{100(\sqrt{3}-1)}{(\sqrt{3})^2-(1)^2}$$

$$h = \frac{100(\sqrt{3}-1)}{3-1}$$

$$h = \frac{\overset{50}{\cancel{100}}(\sqrt{3}-1)}{\cancel{2}}$$

$$\boxed{h = 50(\sqrt{3}-1)\ m}$$

Q.35



Let the height of the hill be h.
Height of tower = 50 m

In ΔABQ,

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

$$\frac{1}{\sqrt{3}} = \frac{50}{BQ}$$

$$BQ = 50\sqrt{3}\ m \quad \text{— (1)}$$

In ΔPQB,

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

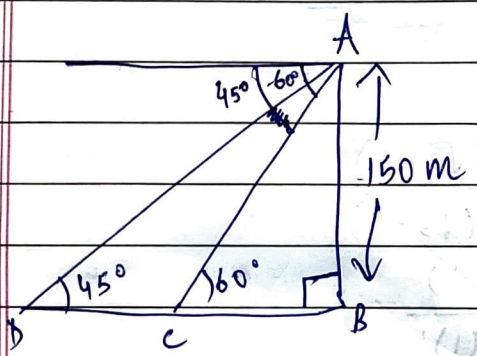
$$\sqrt{3} = \frac{h}{50\sqrt{3}}$$ (Putting (1))

$$\sqrt{3}(50\sqrt{3}) = h$$

$$h = 150\ m$$

$\therefore$ Height of hill = 150 m

Q.56 (i)



$AB = 150\ m$

Distance covered in 2 mins = DC

In ΔABC,

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

$$\sqrt{3} = \frac{150}{BC}$$

$$BC = \frac{150}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$BC = 50\sqrt{3}\ m \quad \text{— (1)}$$

In ΔABD,

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

$$1 = \frac{150}{BD}$$

$$BD = 150\ m \quad \text{— (2)}$$

$DC = BD - BC$

$= 150 - 50\sqrt{3}$

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

$\text{speed} = \frac{\text{distance}}{\text{time}}$

$= \frac{50(3-\sqrt{3})}{1000} \div \frac{2}{60}$

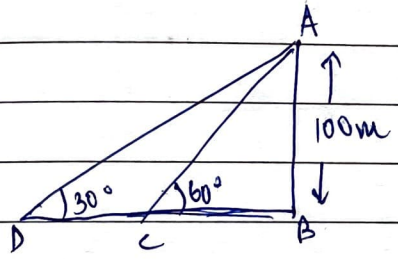
$= \frac{\cancel{50}^{25}(3-\sqrt{3})}{\cancel{1000}\,\cancel{\times 10}\,2} \times \frac{\cancel{60}^{3}}{2}$

$= \frac{9 - 3\sqrt{3}}{2} = \frac{9 - 3(1.732)}{2}$

$= \frac{9 - 5.196}{2} = \frac{3.804}{2}$

$= \boxed{1.902 \text{ km/h}} = \boxed{1902 \text{ m/h}}$

(ii)



$AB = 100$ m

Distance covered in 2 mins $= DC$

In $\triangle ABC$,

$\tan 60° = \frac{AB}{BC}$

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

$BC = \frac{100}{\sqrt{3}}$ m — (1)

In $\triangle ABD$,

$\tan 30° = \frac{AB}{BD}$

$\frac{1}{\sqrt{3}} = \frac{100}{BD}$

$BD = 100\sqrt{3}$ m — (2)

$DC = BD - BC$

$= 100\sqrt{3} - \frac{100}{\sqrt{3}}$

$= \frac{300 - 100}{\sqrt{3}} = \frac{200}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

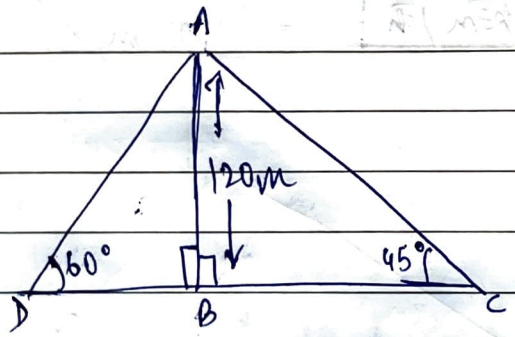
$= \frac{200\sqrt{3}}{3}$ m

Speed $= \frac{\text{distance}}{\text{time}}$

$= \frac{100 \cancel{200}\sqrt{3}}{\cancel{2} \times \cancel{3}\sqrt{3}} = \frac{100}{1.732}$

$= \boxed{57.736 \text{ m/min}}$

Q.57



Height of tower AB = 120 m

In ΔABD,

$\tan 60° = \frac{AB}{BD}$

$\sqrt{3} = \frac{120}{BD}$

$BD = \frac{120}{\sqrt{3}}$ m — (1)

In ΔABC,

$\tan 30° = \frac{AB}{BC}$

$\frac{1}{\sqrt{3}} = \frac{120}{BC}$

$BC = 120\sqrt{3}$ m — (2)

Distance between the two cars = $DC = DB + BC$

$= \frac{120}{\sqrt{3}} + 120\sqrt{3}$

$$= \frac{120 + 360}{\sqrt{3}}$$

$$= \frac{480}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{480\sqrt{3}}{3} = 160\sqrt{3}$$

In $\triangle ABC$,

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

$$1 = \frac{120}{BC}$$

$BC = 120$ m — (2)

Distance between the two cars = $DC = DB + BC$

$$= \frac{120}{\sqrt{3}} + 120$$

$$= \frac{120 + 120\sqrt{3}}{\sqrt{3}}$$

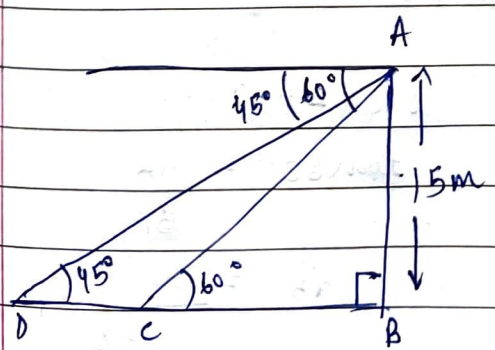
$$= \frac{120(\sqrt{3}+1)}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{120\sqrt{3}(\sqrt{3}+1)}{3}$$

$$= 40(3 + \sqrt{3}) = 40(3+1.732)$$

$$= 40(4.732) = \boxed{189.28 \text{ m}}$$

Q.58



$AB = 15\,m$ (Tower)

In ΔABC,

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

$$\sqrt{3} = \frac{15}{BC}$$

$$BC = \frac{15}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$BC = 5\sqrt{3}\,m \quad \text{—— (1)}$$

In ΔABD,

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

$$1 = \frac{15}{BD}$$

$$BD = 15\,m \quad \text{—— (2)}$$

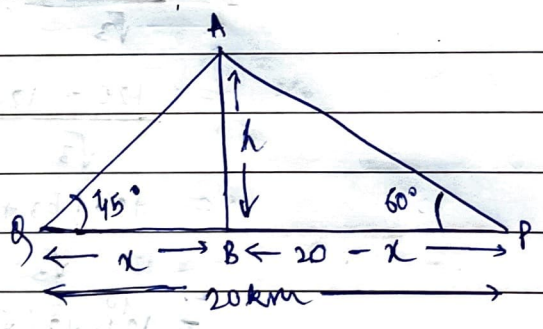
Distance CD $= BD - BC$

$= 15 - 5\sqrt{3}$

$= 5(3 - \sqrt{3})$

$= \boxed{5\sqrt{3}(\sqrt{3} - 1)\,m}$

Q.59



Let the height of the building be h and the distance QB be x

$QP = 20\,km$

$BP = 20 - x$

In ΔABQ,

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

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

In ΔABP,

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

$$\sqrt{3} = \frac{h}{20 - x}$$

$x = h$ —— (1)

$20\sqrt{3} - \sqrt{3}x = x$ (Putting (1))

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

$x(\sqrt{3}+1) = 20\sqrt{3}$

$x = \frac{(20\sqrt{3}) \times (\sqrt{3}-1)}{(\sqrt{3}+1) \times (\sqrt{3}-1)}$

$x = \frac{60 - 20\sqrt{3}}{3-1}$

$x = \frac{10(3-\sqrt{3})}{2}$

$x = 10(3 - \sqrt{3})$

$x = 10(3 - 1.732)$

$x = 10(1.268)$

$\boxed{x = 12.68 \text{ km}}$

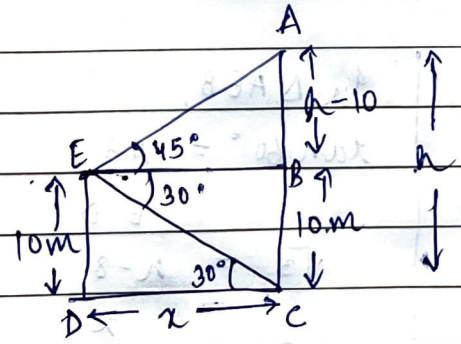
$BP = 20 - 12.68$

$= \boxed{7.32 \text{ km}}$

As $BP < QB$,

∴ ~~Team~~ Station P should send ~~it~~ its team and it has to travel 7.32 km.

Q.60



Let the height of the cliff AC be h & the distance DC be x

$ED = 10 \text{ m} = BC$

$AB = h - 10$

In ΔEDC,

$$\tan 30^\circ = \frac{ED}{DC}$$

$$\frac{1}{\sqrt{3}} = \frac{10}{x}$$

$$\boxed{x = 10\sqrt{3}\ m} \quad \text{—— (1)}$$

In ΔABE,

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

$$1 = \frac{h-10}{x}$$

$$x = h - 10$$

$$10\sqrt{3} = h - 10 \quad \text{(Putting (1))}$$

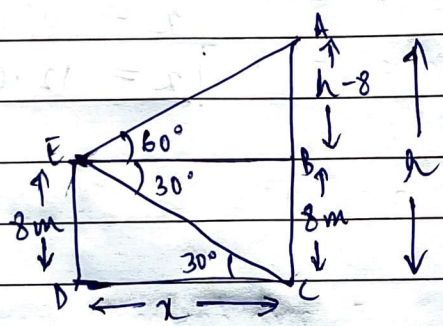
$$h = 10 + 10\sqrt{3}$$

$$\boxed{h = 10(\sqrt{3}+1)\ m}$$

$\therefore$ Height of cliff $= \boxed{10(\sqrt{3}+1)\ m}$

Distance DC $= \boxed{10\sqrt{3}\ m}$

Q.61



Let the height of the hill be h & the distance CD be x.

$ED = 8\ m = BC$

$AB = h - 8$

In ΔEDC,

$$\tan 30^\circ = \frac{ED}{DC}$$

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

$$\boxed{x = 8\sqrt{3}\ m} \quad \text{—— (1)}$$

In ΔAEB,

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

$$\sqrt{3} = \frac{h-8}{x}$$

$$\sqrt{3}(8\sqrt{3}) = h - 8 \quad \text{(Putting (1))}$$

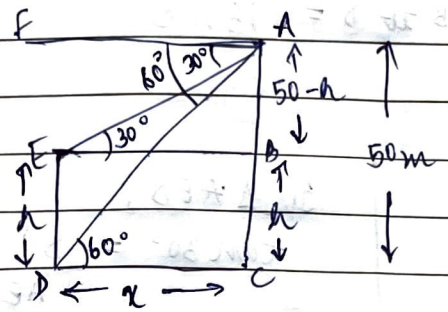
$$24 + 8 = h$$

$$\boxed{h = 32\ m}$$

$\therefore$ Height of cliff $= \boxed{32\ m}$

Distance DC $= \boxed{8\sqrt{3}\ m}$

Q. 62



Let the height of other temple be h & the distance DC be x.

$ED = h = BC$

$AB = 50 - h$

In ΔACD,

$$\tan 60° = \frac{AC}{DC}$$

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

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

$$\boxed{x = \frac{50\sqrt{3}}{3}\ m} \quad \text{— (1)}$$

In ΔABE,

$$\tan 30° = \frac{AB}{BE}$$

$$\frac{1}{\sqrt{3}} = \frac{50 - h}{x}$$

$$\frac{50}{\sqrt{3}} = 50\sqrt{3} - \sqrt{3}h$$

[Putting (1)]

$$50 = 150 - 3h$$

$$3h = 150 - 50$$

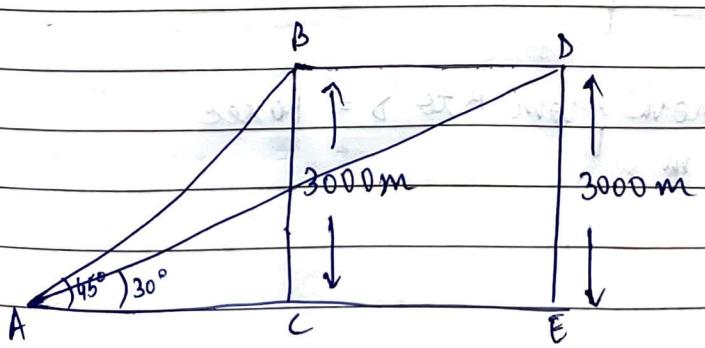
$$h = \frac{100}{3}$$

$$\boxed{h = 33.33\ m}$$

∴ Height of other temple = $\boxed{33.33 m}$

Distance DC = $\boxed{\frac{50\sqrt{3}}{3}}$

Q. 63



Time taken to move from B to D = 15 sec

BC = DE = 3000 m

In ΔACB,

$\tan 45° = \frac{BC}{AC}$

$1 = \frac{3000}{AC}$

$AC = 3000\ m$ — (1)

In ΔAED,

$\tan 30° = \frac{DE}{AE}$

$\frac{1}{\sqrt{3}} = \frac{3000}{AE}$

$AE = 3000\sqrt{3}\ m$ — (2)

Distance moved = BD = CE

$= AE - AC$

$= 3000\sqrt{3} - 3000$

$= 3000(\sqrt{3} - 1) = 3000(1.732 - 1)$

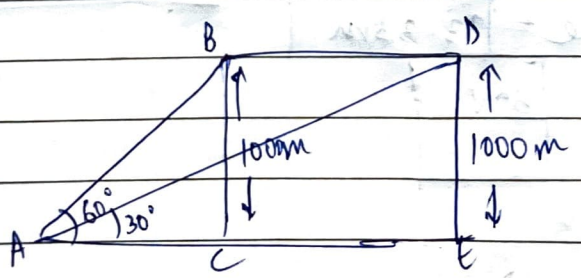
$= 3000(0.732) = 2196\ m$

Speed of aeroplane = $\frac{\text{distance}}{\text{time}}$

$= \frac{2196}{15} \times \frac{18}{5}$

$= \boxed{527.04\ km/h}$

Q.64



Time taken to move from B to D = 10 sec

BC = DE = 1000 m

In ΔACB,

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

$$\sqrt{3} = \frac{1000}{AC}$$

$$AC = \frac{1000}{\sqrt{3}} \text{ m} \quad \text{—} (1)$$

In ΔDEA,

$$\tan 30^\circ = \frac{DE}{AE}$$

$$\frac{1}{\sqrt{3}} = \frac{1000}{AE}$$

$$AE = 1000\sqrt{3} \text{ m} \quad \text{—} (2)$$

Distance moved = BD = CE

$$= AE - AC$$

$$= 1000\sqrt{3} - \frac{1000}{\sqrt{3}} = \frac{3000 - 1000}{\sqrt{3}}$$

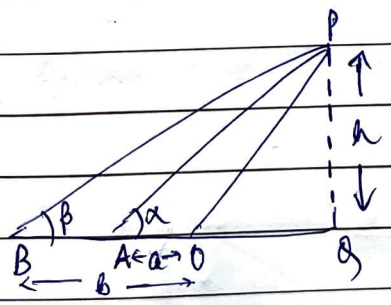
$$= \frac{2000}{1.732} = 1154.734 \text{ m}$$

$$\text{Speed of aeroplane} = \frac{\text{distance}}{\text{time}} = \frac{1154.734}{10} \times \frac{18}{5}$$

$$= \frac{115.47 \times 18}{5} = \frac{2078.46}{5}$$

$$= \boxed{415.69 \text{ km/h}}$$

Q. 65



To Prove - Height $PQ = \frac{(b-a)\tan\alpha\tan\beta}{\tan\alpha - \tan\beta}$

Proof - Let OP be the tree.

$\therefore OA = a$ & $OB = b$

In ΔALP,

$$\tan\alpha = \frac{PL}{AL}$$

$$\tan\alpha = \frac{h}{OL+a}$$

$$OL+a = \frac{h}{\tan\alpha}$$

$$OL+a = h\cot\alpha \quad -①$$

In ΔBLP,

$$\tan\beta = \frac{PL}{BL}$$

$$\tan\beta = \frac{h}{OL+b}$$

$$OL+b = \frac{h}{\tan\beta}$$

$$OL+b = h\cot\beta \quad -②$$

Subtract ① from ②

$$OL+b-OA-a = h\cot\beta - h\cot\alpha$$

$$b-a = h(\cot\beta - \cot\alpha)$$

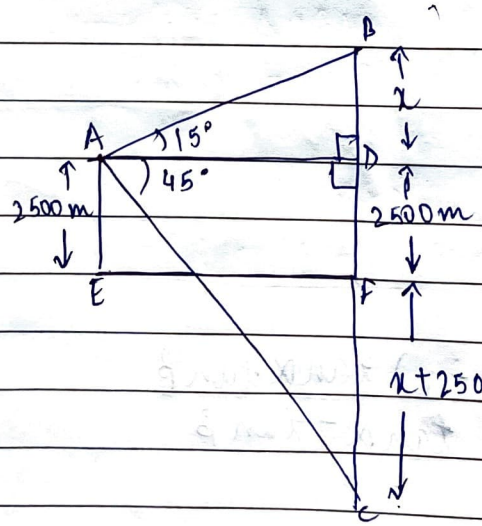
$$h = \frac{b-a}{\cot\beta - \cot\alpha}$$

$$h = \frac{b-a}{\frac{1}{\tan\beta} - \frac{1}{\tan\alpha}} = \frac{b-a}{\frac{\tan\alpha - \tan\beta}{\tan\alpha\tan\beta}}$$

$$\boxed{h = \frac{(b-a)\tan\alpha\tan\beta}{\tan\alpha - \tan\beta}}$$

Hence, proved

Q.66



Let the distance BD be x.

AP = 2500 m = DQ

QC = BQ = $x + 2500$ (Height of reflection is same as original height)

In $\triangle ADC$,

$$\tan 45° = \frac{DC}{AD}$$

$$1 = \frac{2500 + x + 2500}{AD}$$

$$AD = 5000 + x \quad \text{---} (1)$$

In $\triangle ABD$,

$$\tan 15° = \frac{BD}{AD}$$

$$0.268 = \frac{x}{5000 + x} \quad \text{(Putting (1))}$$

$$0.268(5000 + x) = x$$

$$1340 + 0.268x = x$$

$$x - 0.268x = 1340$$

$$0.732x = 1340$$

$$x = \frac{1340}{0.732}$$

$$\boxed{x = 1830.60 \text{ m}}$$

∴ Height of cloud from lake = BF

$= x + 2500$

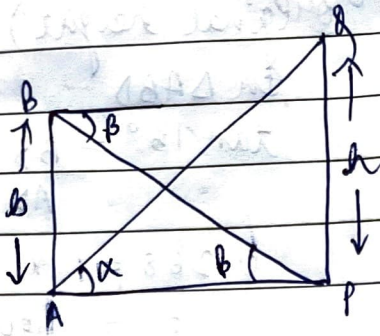
$= 1830.60 + 2500$

$= \boxed{4330.60 \text{ m}}$

31/03/2020

Ch-12
Exercise 12.1

Q.71



Let the height of the tower be h.

In right Δ BAP,

$$\tan\beta = \frac{AB}{AP}$$

$$\tan\beta = \frac{b}{AP}$$

$$AP = \frac{b}{\tan\beta}$$

$$AP = b\cot\beta \quad \text{——— (1)}$$

In right Δ QPA

$$\tan\alpha = \frac{QP}{AP}$$

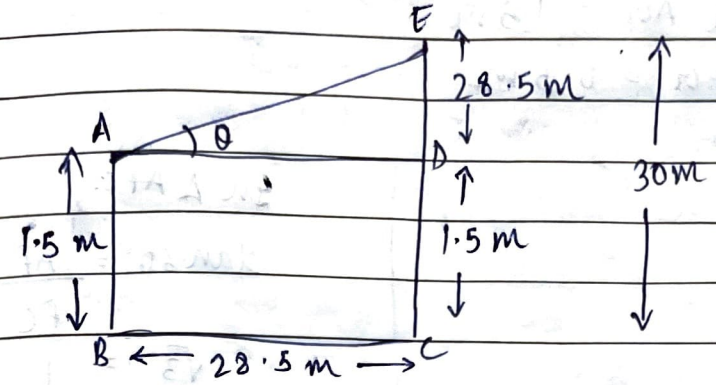
$$QP = A\tan\alpha$$

$$\boxed{QP = (\tan\alpha \cdot b\cot\beta)\,m} \text{ (Putting (1))}$$

∴ Height of tower = h

$$= \boxed{(b\tan\alpha\cot\beta)\,m}$$

Q. 72



Let the angle of elevation to the top of the tower be θ.

AB = 1.5 m = CD
PR = 30 m
DE = 30 − 1.5 = 28.5 m
BC = AD = 28.5 m

} given

In △ EDA,

$$\tan\theta = \frac{ED}{AD}$$

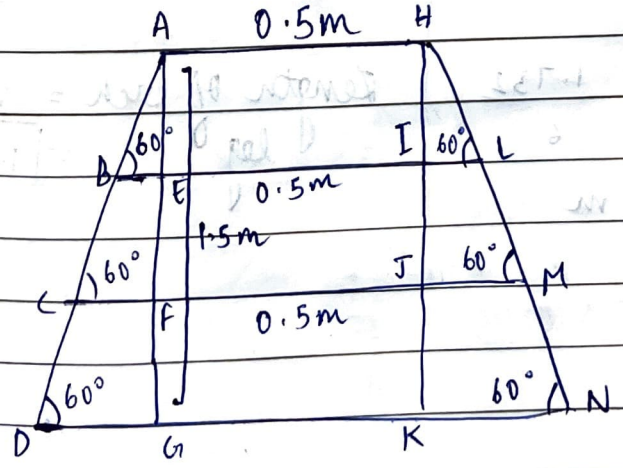
$$\tan\theta = \frac{28.5}{28.5}$$

$$\tan\theta = 1$$

$$\therefore \boxed{\theta = 45^\circ}$$

∴ The angle of elevation is 45°.

Q. 73



Height of stool AG = 1.5 m

$\therefore AE = EF = FG = 0.5\ m$

In ΔAGD,

$$\sin 60^\circ = \frac{AG}{AD}$$

$$\frac{\sqrt{3}}{2} = \frac{1.5}{AD}$$

$$\sqrt{3}\,AD = 3$$

$$AD = \frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$AD = \frac{3\sqrt{3}}{3}$$

$$\boxed{AD = \sqrt{3}\ m}$$

In ΔAEB,

$$\tan 60^\circ = \frac{AE}{BE}$$

$$\sqrt{3} = \frac{0.5}{BE}$$

$$BE = \frac{0.5 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$

$$BE = \frac{0.5 \times \sqrt{3}}{3}$$

$$BE = \frac{\sqrt{3}}{6} = \frac{1.732}{6}$$

$$BE = 0.288\ m$$

In ΔAFC,

$$\tan 60^\circ = \frac{AF}{FC}$$

$$\sqrt{3} = \frac{1}{FC}$$

$$FC = \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$FC = \frac{\sqrt{3}}{3} = \frac{1.732}{3}$$

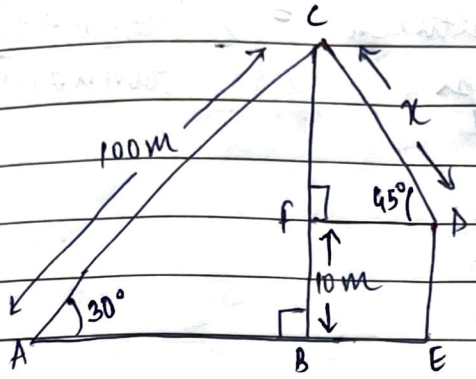
$$FC = 0.577\ m$$

Length of first step = 0.5 + 0.288 + 0.288 = $\boxed{1.076\ m}$

Length of second step = 0.5 + 0.577 + 0.577 = $\boxed{1.657\ m}$

Length of each leg = $\sqrt{3}$ = $\boxed{1.732\ m}$

Q. 74



Let the length of second string be x.

In right ΔABC,

$$\sin 30° = \frac{CB}{CA}$$

$$\frac{1}{2} = \frac{CB}{100}$$

$$CB = \frac{100}{2} 50$$

$$\boxed{CB = 50 \text{ m}}$$

In right ΔCFD,

$$\sin 45° = \frac{CF}{CD}$$

$$\frac{1}{\sqrt{2}} = \frac{40}{x}$$

$$\boxed{x = 40\sqrt{2} \text{ m}}$$

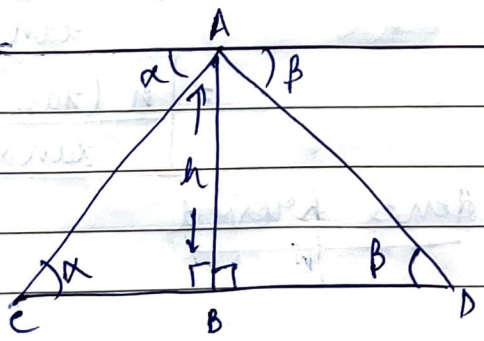
$FB = 10$ m (given)

$\therefore CF = 50 - 10$

$= \boxed{40 \text{ m}}$

$\therefore$ The length of second string is $40\sqrt{2}$ m.

Q. 75



To prove - Distance between the two ships $= \frac{h(\tan\alpha + \tan\beta)}{\tan\alpha \tan\beta}$ m

Proof - In right ΔABC,

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

$$\tan\alpha = \frac{h}{BC}$$

$$BC = \frac{h}{\tan\alpha} \quad \text{---(1)}$$

In right ΔABD,

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

$$\tan\beta = \frac{h}{BD}$$

$$BD = \frac{h}{\tan\beta} \quad \text{---(2)}$$

Distance between the two ships $= CD$

$= BC + BD$

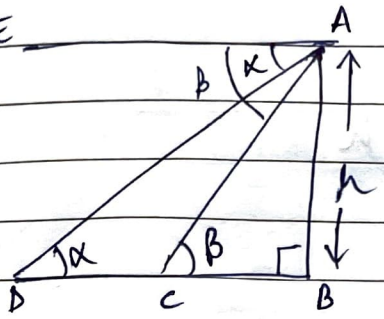
$= \frac{h}{\tan\alpha} + \frac{h}{\tan\beta}$

$= \frac{h\tan\beta + h\tan\alpha}{\tan\alpha\tan\beta}$

$= \boxed{\frac{h(\tan\alpha + \tan\beta)}{\tan\alpha\tan\beta}\ m}$

Hence, proved

Q.76



Let C & D be the two objects.

In right ΔABC,

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

$$\tan\beta = \frac{h}{BC}$$

$$BC = \frac{h}{\tan\beta} \quad \text{— (1)}$$

In right ΔABD,

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

$$\tan\alpha = \frac{h}{BD}$$

$$BD = \frac{h}{\tan\alpha} \quad \text{— (2)}$$

Distance between two objects = CD

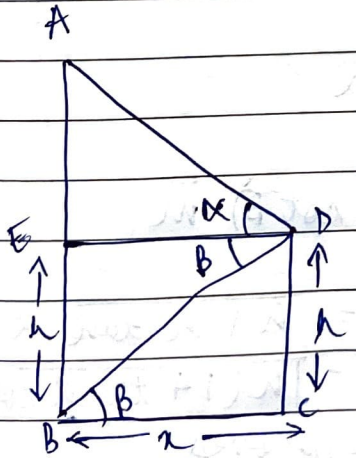
$$= BD - BC$$

$$= \frac{h}{\tan\alpha} - \frac{h}{\tan\beta}$$

$$= h\left(\frac{1}{\tan\alpha} - \frac{1}{\tan\beta}\right)$$

$$= \boxed{h(\cot\alpha - \cot\beta)\ m}$$

Q.77



Let the distance BC be x

$BC = ED = x$

Height of window $DC = h$

$EB = DC = h$

In right ΔDCB,

$$\tan\beta = \frac{CD}{BC}$$

$$\tan\beta = \frac{h}{x}$$

$$x = \frac{h}{\tan\beta} \quad \text{——— (1)}$$

In right ΔAED,

$$\tan\alpha = \frac{AE}{DE}$$

$$\tan\alpha = \frac{AE}{x}$$

$$x = \frac{AE}{\tan\alpha} \quad \text{——— (2)}$$

From (1) & (2)

$$\frac{h}{\tan\beta} = \frac{AE}{\tan\alpha}$$

$$AE = \frac{h\tan\alpha}{\tan\beta}$$

$$AE = (h\tan\alpha\cot\beta)\ m$$

Height of house $= AE + BE = h + h\tan\alpha\cot\beta$

$$= \boxed{h(1+\tan\alpha\cot\beta)\ m}$$

Hence, proved