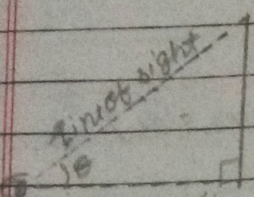
1/12/2020

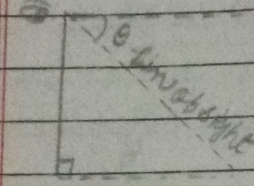
Ch-8

Height and Distance.

★ Important Notes:-

1) 

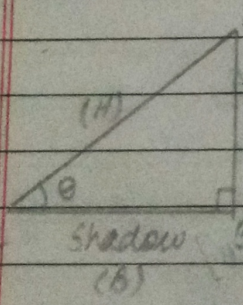
θ = Angle of elevation (उन्नयन कोण)

2) 

θ = Angle of dipression (अवनमन कोण)

★ Exercise - 8

Q:1.) The shadow of a vertical pillar is same the hieght of pillar, than angle of elevation of Sun will be:

Ans.) 

Given:- AB (height of pillar) = BC (Shadow)

θ = angle of elevation

We have P/B

$P/B = \tan\theta$

$\tan\theta = \frac{P}{B} = \frac{AB}{BC} = \frac{AB}{AB}$ (∵, AB = BC)

$\tan\theta = 1$

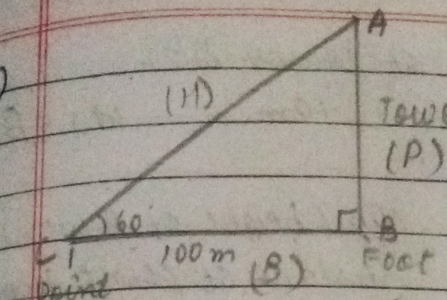
$\tan\theta = 45^\circ$

∴ $\theta = 45^\circ$ Ans.

Q:2) From a point ..... tower is:

(a) $100\sqrt{3}$ m (b) $\frac{100}{\sqrt{3}}$ m (c) $50\sqrt{3}$ m (d) $\frac{200}{\sqrt{3}}$ m

Ans.)



AB = height of tower
BC = 100m, θ = 60°

We have P/B i.e. = tanθ.

$$\tan\theta = \frac{P}{B}$$

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

$$\tan 60^\circ = \frac{AB}{100}$$

$$AB = 100 \times \tan 60^\circ$$

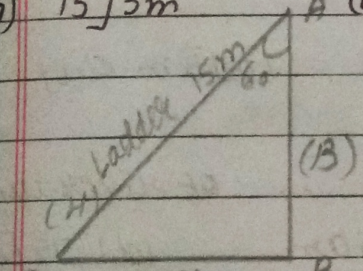
$$AB = 100 \times \sqrt{3}$$

$$AB = 100\sqrt{3}\ m$$ Ans.

Q:3.) A 15m long ..... wall is:-

(a) $15\sqrt{3}$m (b) ~~$100\sqrt{3}$m~~ (c) ~~15/2m~~ (d) ~~15m~~ ~~$200\sqrt{3}$m~~.

Ans.)



CA = (ladder) = 15m.
AB = height of wall

We have B/H = cosθ

$$\cos\theta = \frac{B}{H}$$

$$\cos 60^\circ = \frac{AB}{CA} = \frac{AB}{15}$$

$$AB = 15 \times \cos 60^\circ$$

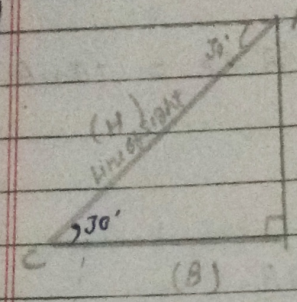
$$AB = 15 \times \frac{1}{2}$$

$$AB = 7.5\ m$$ Ans.

Q:4) From the top ..... of tower is:

(a) $10\sqrt{3}$ m (b) $10/\sqrt{3}$ m (c) 10m (d) $5\sqrt{3}$ m

Ans)



AB = 10m (height of tower)

BC = distance of point from base

$\theta = 30°$

$[\angle A = \angle C$ (Alt $\angle$)]

$$P/B = \tan\theta = \frac{AB}{BC}$$

$$\tan 30° = \frac{10}{BC}$$

$$BC = \frac{10}{\tan 30°}$$

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

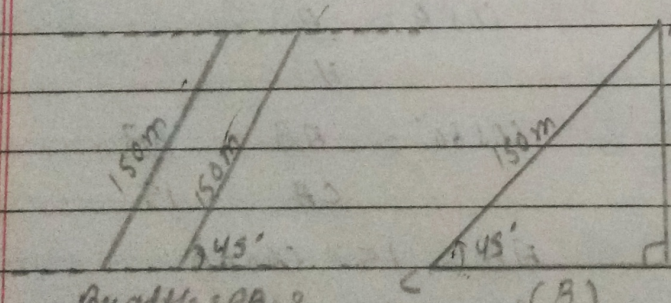
$$BC = 10 \times \frac{\sqrt{3}}{1}$$

$BC = 10\sqrt{3}$ m Ans

Q:5) A bridge above the ..... of river will be:

(a) 75m (b) $50\sqrt{2}$m (c) 150m (d) $75\sqrt{2}$ m

Ans)



AB = Breadth

CA = Length of Bridge

$\theta = 45°$

$$\frac{P}{H} = \sin\theta = \frac{AB}{CA}$$

$$\sin 45° = \frac{AB}{150}$$

$$AB = \frac{150}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$$

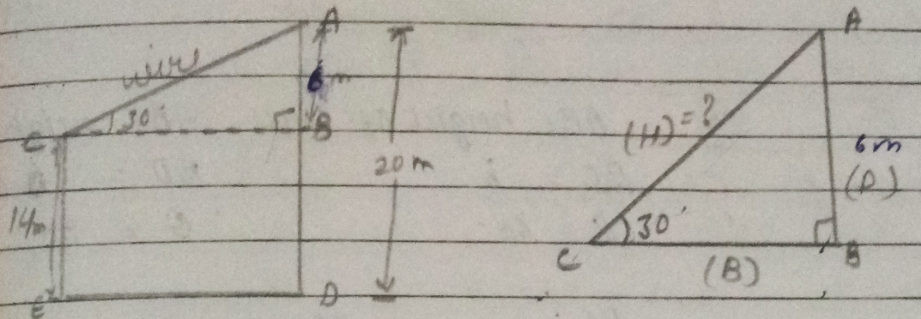
$AB = \frac{150}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$, $AB = \frac{75}{\cancel{150}} \frac{\sqrt{2}}{\cancel{2}}$

$AB = 75\sqrt{2}$ m Ans

Q:6) Top of two ---------- of wire is.

(a) 12 m (b) 10 m (c) 8 m (d) 6 m

Ans.



Given :) AD = 20m (Tower)

CE = 14m (Tower)

θ = 30° ($\angle$ which wire make)

CB = horizontal line

~~AB =~~ BD = CE = 14m

AB = AD - BC

AB = 20 - 14

AB = 6m.

$\frac{P}{H} = \sin\theta = \frac{AB}{BC}$

$\sin 30° = \frac{6}{BC}$

$BC = \frac{6}{\sin 30°}$

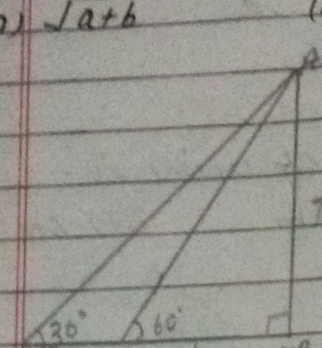
$BC = \frac{6}{\frac{1}{2}}$ $\Rightarrow$ $BC = 6 \times \frac{2}{1}$

BC = 12 m Ans.

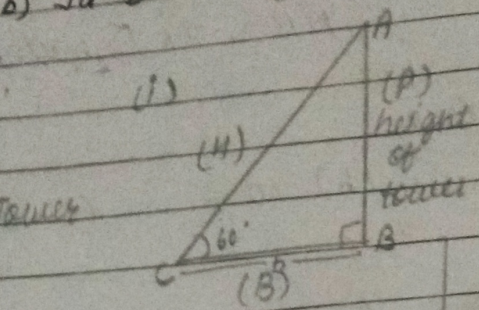
Q:7) The angle of ..... of tower is:

(a) $\sqrt{a+b}$ (b) $\sqrt{a-b}$ (c) $\sqrt{ab}$ (d) $\sqrt{a/b}$

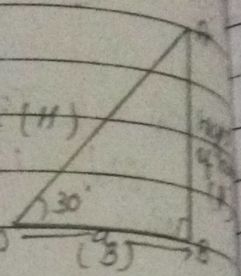
Ans)



(i)



(ii)



AB = height of tower
BC = b
$\theta = 60°$

$P/B = \tan\theta = AB/BC$

$\tan 60° = \frac{AB}{b}$

$AB = b \times \tan 60°$

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

$AB = \sqrt{3}b$ — ①

AB = height of tower
BD = a
$\theta = 30°$

$P/B = \tan\theta = AB/B$

$\tan 30° = \frac{AB}{a}$

$AB = a \times \tan 30°$

$AB = a \times 1/\sqrt{3}$

$AB = \frac{a}{\sqrt{3}}$ — ②

Multiply eq ① & ②

$AB \times AB = \frac{a}{\sqrt{3}} \times \sqrt{3}b$

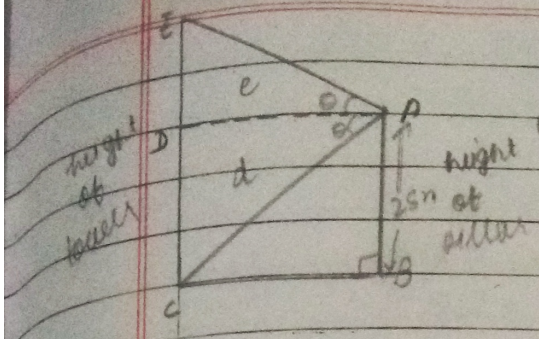
$AB^2 = ab$

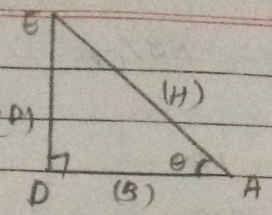
$AB = \sqrt{ab}$ Ans.

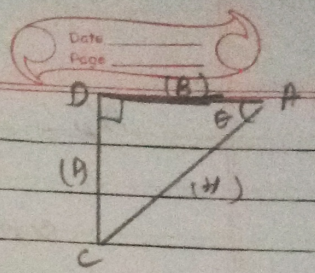
Q:8) From the top of a 25m high pillar ..... tower is:

(a) 25m (b) 100m (c) 75m (d) 50m

Ans.)







$P/B = \tan\theta$ $\quad$ $P/B = \tan\theta$

$\tan\theta = DE/AD$ $\quad$ $\tan\theta = CD/AD$

Compare both side

$\frac{DE}{AD} = \frac{CD}{AD}$

$DE = CD = 25m$

$\{\because, CD = AB = 25cm\}$

Height of tower = $CE = DE + CD$

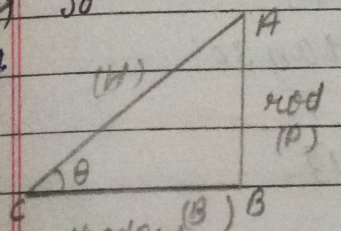
$CE = 25 + 25$

$CE = 50\ m$ Ans.

Q:9.) If ratio of length of ---------- of sun is :

(a) 30° (b) 45° (c) 60° (d) 90°

Ans)



AB = rod ; BC = Shadow of rod

Find = θ = ?

Ratio of rod & shadow = $1 : \sqrt{3}$

$P/B = \tan\theta = AB/BC$

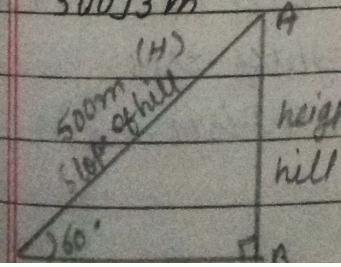
$\tan\theta = \frac{1}{\sqrt{3}}$

$\tan 30° \Rightarrow \theta = 30°$ Ans.

Q:10.) The slope of a ---------- the hill is:

(a) $500\sqrt{3}$ m (b) $500/\sqrt{3}$ m (c) $250\sqrt{3}$ m (d) $250/\sqrt{3}$ m.

Ans)



AB = height of hill

CA = Slope of hill

θ = 60°

$P/H = \sin\theta = AB/CA$

$\sin 60° = \frac{AB}{500}$

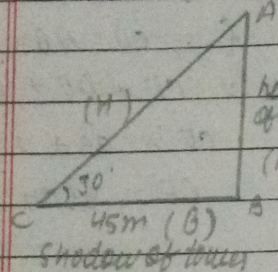
$AB = 500 \times \sin 60°$

$AB = \frac{250}{500} \times \frac{\sqrt{3}}{2}$

$AB = 250\sqrt{3}$ Ans.

Q. 11) A tower is vertically ---------- of the tower.

Ans.)



AB = height of tower

BC = 45m (Shodow)

$\theta = 30°$

$P/B = \tan\theta = AB/BC$

$\tan 30° = \frac{AB}{45}$

$AB = 45 \times \tan 30°$

$AB = 45 \times \frac{1}{\sqrt{3}}$

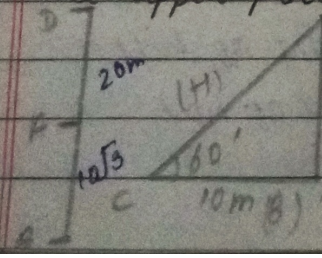
$AB = \frac{45}{\sqrt{3}}$

$AB = \frac{45}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \Rightarrow \frac{45\sqrt{3}}{3} \Rightarrow AB = 15\sqrt{3}$ m.

height of tower is $15\sqrt{3}$m Ans.

Q: 12.) The upper part ---------- tree ($\sqrt{3} = 1.732$).

Ans.)



AB = height of tree

BC = 10m (Distance)

$\theta = 60°$

$P/B = \tan\theta = AB/BC$

$\tan 60^\circ = \frac{AB}{10}$

$AB = 10 \times \tan 60^\circ$

$AB = 10 \times \sqrt{3}$

$AB = 10\sqrt{3}\ m$

To find CA $\Rightarrow$ $H/B = \sec\theta = CA/BC$

$\sec 60^\circ = \frac{AC}{10}$

$AC = 10 \times \sec 60^\circ$

$AC = 10 \times 2$

$AC = 20\ m$

Total height of tree

$\{AD = AC = 20m\}$

$BD = AB + AD$

$BD = 10\sqrt{3} + 20 \quad \{\sqrt{3} = 1.732\}$

$BD = 10 \times 1.732 + 20$

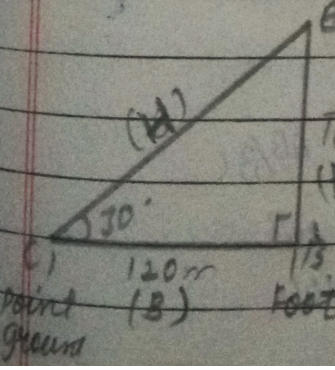
$BD = 17.32 + 20$

$BD = 37.32\ m$

$\therefore$ Original height of tree = 37.32 m Ans.

Q.17.) From a point ---------- became 60°?

Ans.)



AB = height of tower

BC = 120m (Distance)

$\theta = 30^\circ$

$P/B = \tan\theta = AB/BC$

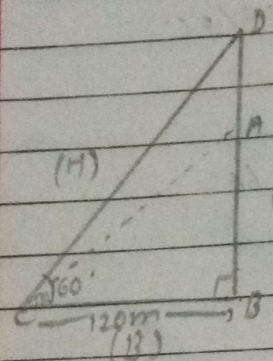
$\tan 30^\circ = \frac{AB}{120}$

$AB = 120 \times \tan 30°$

$AB = 120 \times \frac{1}{\sqrt{3}}$

$AB = \frac{120 \times \sqrt{3}}{\sqrt{3} \quad \sqrt{3}} \Rightarrow \frac{120\sqrt{3}}{3}$

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



BD = height of tower
BC = distance
$\theta = 60°$

$P/B = \tan\theta = BD/BC \quad [BD = AB + AD]$

$\tan 60° = \frac{AB + AD}{120}$

$AB + AD = 120 \times \tan 60°$

$40\sqrt{3} + AD = 120 \times \sqrt{3}$

$AD = 120\sqrt{3} - 40\sqrt{3}$

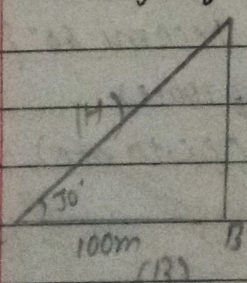
$AD = 80\sqrt{3}\ m \quad [\sqrt{3} = 1.732]$

$AD = 80 \times 1.732$

$AD = 138.56\ m$

∴ height of tower = 178.56 m Ans.

Q:14.) The angle of _____ of the tower.
Ans)



AB = height of tower
BC = 100m (Distance)
$\theta = 30°$

$P/B = \tan\theta = AB/BC$

$\tan 30° = \frac{AB}{100}$

$AB = 100 \times \tan 30^\circ$

$AB = 100 \times \frac{1}{\sqrt{3}}$

$AB = \frac{100}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

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

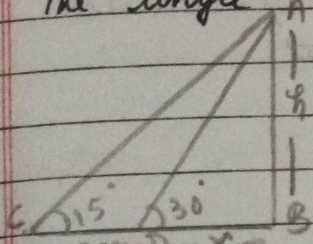
$AB = 33.33\sqrt{3} \quad \{\sqrt{3} = 1.732\}$

$AB = 33.33 \times 1.732 \Rightarrow 57.73m$

height of tower is ~~33.33~~ 57.73m. Ans.

Q:15) Ans.

The angle ---------- of the tower



In $\triangle ABD$.

AB = height of tower (h)

BD = Distance (x).

$\theta = 30^\circ$

$\tan\theta = \frac{P}{B} = \frac{AB}{BD}$

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

$\frac{1}{\sqrt{3}} = \frac{h}{x}$ (c.m)

$x = h\sqrt{3}$ — ①.

In $\triangle ABC$

AB = Height of Tower

BC = Distance = $100m + x$

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

$\tan 15^\circ = \frac{h}{100}$ (CD = BD).

$2-\sqrt{3} = \frac{h}{100+x}$ (c.m)

$(2-\sqrt{3})(100+x) = h$

$200 + 2x - 100\sqrt{3} - x\sqrt{3} = h$

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

$3h$

$200 + 2x - 100\sqrt{3} - 3h = h$

$200 + 2x h\sqrt{3} - 100\sqrt{3} - 3h = h$

$200 + 2h\sqrt{3} - 100\sqrt{3} - 3h = h$

$200 - 100\sqrt{3} = h - 2h\sqrt{3} + 3h$

$100 - (2-\sqrt{3}) = 4h - 2h\sqrt{3}$ (common).

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

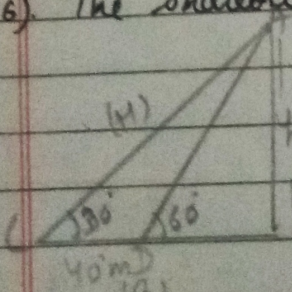
$100 = 2h$

$h = \frac{100}{2} = 50m.$

Height of tower $= 50m.$

Q:16). The shadow - - - - - - - - tower.

Ans



In ΔABD

AB = height of tower

BD = Distance

$\theta = 60°$

$\tan\theta = \frac{P}{B} = \frac{AB}{BD}$ - (1)

$\tan 60° = \frac{AB}{BD}$, $BD = \frac{AB}{\sqrt{3}}$ - (1)

In ΔABC

$\tan\theta = \frac{P}{B} = \frac{AB}{BC}$ {$BC = CD + BD$}.

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

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{\frac{40+AB}{\sqrt{3}}} \quad (C.M).$$

$$40 + \frac{AB}{\sqrt{3}} = AB\sqrt{3}$$

$$\frac{40\sqrt{3} + AB}{\sqrt{3}} = AB\sqrt{3}$$

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

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

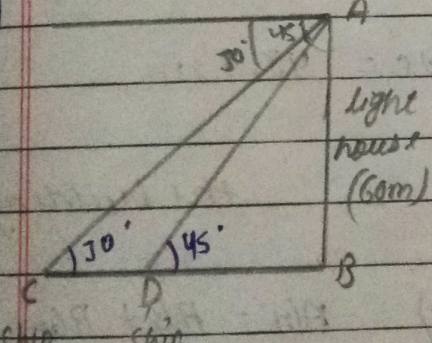
$$40\sqrt{3} = 3AB - AB$$

$$40\sqrt{3} = 2AB$$

$$AB = \frac{40\sqrt{3}}{2} = 20\sqrt{3} = 20 \times 1.732 \rightarrow 39.64\,m$$ Ans

Q:17) The angle of ---------- two ships.

Ans)



In ΔABD

AB = height of light house (60m)

BD = distance

$\theta = 45^\circ$

$$P/B = \tan\theta = AB/BD$$

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

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

$$BD = AB = 60$$

In ΔABC

AB = height

$BC = CD + BD$; $BD = CD + AB$

$\theta = 30°$

$P/B = \tan\theta = AB/BC$

$$\tan 30° = \frac{AB}{CD+BD}$$

$$\frac{1}{\sqrt{3}} \quad \frac{AB}{CD+AB} \qquad \{BD = AB\}$$

$CD + AB = AB\sqrt{3}$

$CD = AB\sqrt{3} - AB$

$CD = AB(\sqrt{3}-1)$ $\{AB = 60; \sqrt{3} = 1.732\}$

$CD = 60\ (1.732 - 1)$

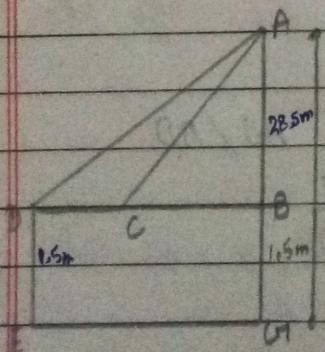
$CD = 60 \times 0.732$

$CD = 43.92$ Ans.

Distance between two ships = 43.92m

Q.18.) A 1.5m tall ---------- the building?

Ans.)



FOR AB $\Rightarrow$ $AG = AB + BG$

$30' = AB + 1.5$

$AB = 30 - 1.5$

$AB = 28.5$ m.

In ΔABC, AB = height

BC = distance

$\theta = 60°$

$P/B = \tan\theta = AB/BC$

$\tan 60' = \frac{28.5}{BC}$

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

$BC = \frac{28.5}{\sqrt{3}}$ — (1)

In $\triangle ABD$, AB = height

BD = distance $(CD + BC)$

$\theta = 30'$

$P/B = \tan\theta = AB/BD$

$\tan 30' = \frac{28.5}{CD+BC}$

$\frac{1}{\sqrt{3}} = \frac{28.5}{CD + \frac{28.5}{\sqrt{3}}}$

$CD + \frac{28.5}{\sqrt{3}} = 28.5\sqrt{3}$

$\frac{CD\sqrt{3} + 28.5}{\sqrt{3}} = 28.5\sqrt{3}$

$CD\sqrt{3} = 28.5\sqrt{3} - 28.5$

$CD\sqrt{3} = 28.5\,(\sqrt{3}-1)$

CD

$BD = \frac{AB}{1/\sqrt{3}}$

$BD = AB\sqrt{3}$ — (2)

$BD = BC + CD$

$CD = BD - BC$

$CD = 28.5\sqrt{3} - \frac{28.5}{\sqrt{3}}$

$CD = 28.5\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)$

$CD = 28.5\left(\frac{3-1}{\sqrt{3}}\right)$

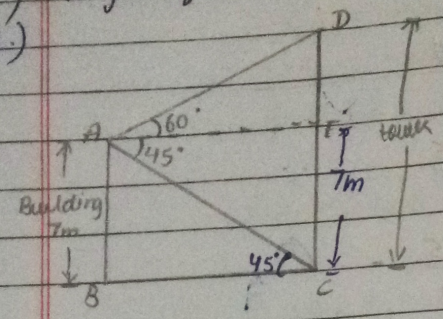
$CD = 28.5 \times \frac{2}{\sqrt{3}}$

$CD = \frac{57}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$CD = \frac{19\cancel{57}\sqrt{3}}{3}$; $CD = 19\sqrt{3}$ Ans.

Q:19.) Angle of elevation ..... the tower.

Ans.)



In ΔABC

AB = height of building (7m)

BC = Distance

$\theta = 45°$

$P/B = \tan\theta = AB/BC$

$\tan 45° = \frac{AB}{BC}$

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

$BC = AB = 7$ ——①

$AE = BC = 7m$

In ΔAED

DE = height

AE = 7m (Distance)

$\theta = 60°$

$P/B \quad \tan\theta = DE/AE$

$\tan 60° = \frac{DE}{7}$

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

$DE = 7\sqrt{3}\,m$ ——②

height of tower ⇒ $CD = DE + CE$

$CD = 7\sqrt{3} + 7$

$CD = 7(\sqrt{3}+1)$ Ans.

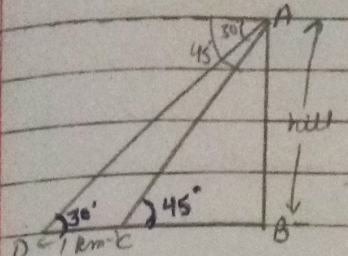
Q:20.)

Ans.)

Q:20:)

Ans:)

From the top ---------- of the hill.



In ΔABC

AB = height

BC = Distance

$\theta = 45°$

$$P/B = \tan\theta = AB/BC$$

$$\tan 45° = \frac{AB}{BC}$$

$$AB = BC \times 1$$

$$AB = BC \quad \text{---- (1)}$$

In ΔABD

AB = height

BC = Distance ($BC + CD$)

$\theta = 30°$

$$P/B = \tan\theta = AB/BD$$

$$\tan 30° = \frac{AB}{BC+CD}$$

$$\frac{1}{\sqrt{3}} \times \frac{AB}{BC+CD}$$

$$BC + CD = AB\sqrt{3} \quad \{\text{from eq(1)} - AB = BC\}$$

$$AB + CD = AB\sqrt{3}$$

$$CD = AB\sqrt{3} - AB$$

$$CD = AB(\sqrt{3}-1)$$

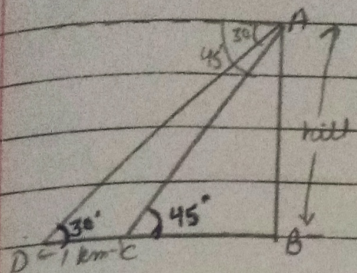
$$1 = AB(\sqrt{3}-1)$$

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

Rationalise the denominator

(1:20:)
Ans:)

From the top ---------- of the hill.



In ΔABC

AB = height

BC = Distance

$\theta = 45°$

$$P/B = \tan\theta = AB/BC$$

$$\tan 45° = \frac{AB}{BC}$$

$$AB = BC \times 1$$

$$AB = BC \quad \text{---- (1)}$$

In ΔABD

AB = height

BC = Distance $(BC + CD)$

$\theta = 30°$

$$P/B = \tan\theta = AB/BD$$

$$\tan 30° = \frac{AB}{BC+CD}$$

$$\frac{1}{\sqrt{3}} \times \frac{AB}{BC+CD}$$

$$BC + CD = AB\sqrt{3} \quad \{\text{from eq(1)} - AB = BC\}$$

$$AB + CD = AB\sqrt{3}$$

$$CD = AB\sqrt{3} - AB$$

$$CD = AB(\sqrt{3}-1)$$

$$1 = AB(\sqrt{3}-1)$$

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

Rationalise the denominator

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

$\Rightarrow \frac{\sqrt{3}+1}{(\sqrt{3})^2-(1)^2}$

$\Rightarrow \frac{\sqrt{3}+1}{3-1}$

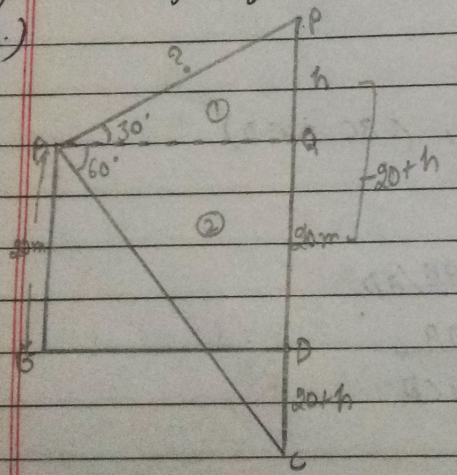
$\Rightarrow \frac{1.732+1}{2}$

$\Rightarrow \frac{2.732}{2}$

$\Rightarrow 1.366$ km Ans.

Q:21.) The angle of ---------- point A.

Ans.)



In ΔAPQ, $\{\theta = 30°\}$

$P/B = \tan\theta = PQ/AQ$

$\tan 30° = \frac{PQ}{AQ}$

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

$AQ = h\sqrt{3}$ ___ (1)

In ΔAQC $\{\theta = 60°\}$

$P/B = \tan\theta = QC/AQ$

$\tan 60° = \frac{QC}{AQ}$

$AQ = \frac{40+h}{\sqrt{3}}$ ___ (2)

From eq (1) & (2)

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

$h \times \sqrt{3} \times \sqrt{3} = 40 + h$

$3h - h = 40$

$2h = 40$

$h = \frac{40}{2}$

$h = 20\ m.$

Now, In ΔAPQ $\{\theta = 30°\}$

$P/H = \sin\theta = PQ/AP$

$\sin 30° = \frac{PQ}{AP}$

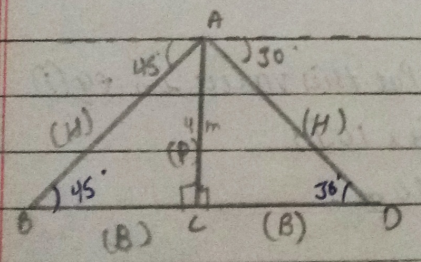
$\frac{1}{2} = \frac{20}{AP}$

$AP = 40\ m$ Ans

Distance of cloud from point A is 40m.

Q:22) From a ---------- the river.

Ans.)



In ΔABC

AC = height of bridge (4m)

BC = width of river $\{\theta = 45°\}$

$P/B = \tan\theta = AB/BC$

$\tan 45° = 4/BC$

$BC = 4/1 = 4$

In ΔADC, $P/B = \tan\theta = AC/CD$

$\tan 30° = AC/CD$

$CD = AC/\tan 30°$

$CD = \frac{4}{1/\sqrt{3}}$; $CD = 4\sqrt{3}$

$BD = BC + CD$

$BD = 4 + 4\sqrt{3}$

$\boxed{BD = 4(1+\sqrt{3})\ m}$ Ans.

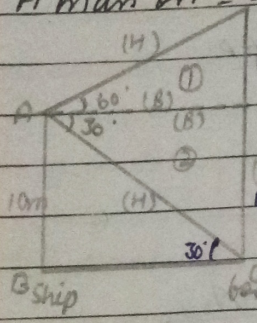
Or

$BD = 4(1 + 1.732)$

$= 4 \times 2.732 = \boxed{10.928\ m}$ Ans.

Q:23.) A man on ..... of the hill.

Ans.)



AB = height of ship = 10m.

CD = height of hill = ?

BC = distance = ?

In ΔAED

$P/B = \tan\theta = DE/AE$

$\tan 60° = DE/AE$

$DE = \sqrt{3}\,AE$ ← (1)

In ΔAEC

$P/B = \tan\theta = EC/AE$

$\tan 30° = 10/AE$

$AE = 10/1/\sqrt{3}$

$AE = 10\sqrt{3}$ — Put this value in eq (1).

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

$DE = 30\ m$.

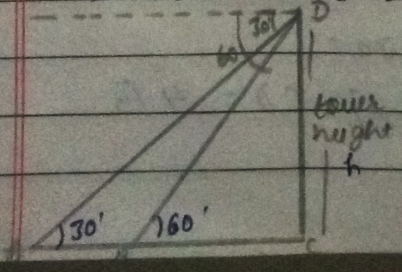
⇒ Height ⇒ $DE + CE$

$= 30 + 10 = \underline{40m}$. Ans.

Distance ⇒ $BC = AE = \underline{10\sqrt{3}}$ Ans.

Q: 25.) A straight ~~vertical~~ ..... ~~break ? ($\sqrt{3} = 1.732$)~~ point.

Ans.)



Let height of tower = h

uniform speed = v

time = n

{AC = AB + BC}

AB = distance covered in 6 sec.

Distance = time x speed

$\Rightarrow 6 \times v = 6v$.

BC = distance = time x speed

$= n \times v = nv$.

$AC = AB + BC \Rightarrow 6v + nv$.

In ΔADC

$P/B = \tan\theta = CD/AC$

$\tan 30^\circ = \frac{h}{6v+nv}$

$\frac{1}{\sqrt{3}} = \frac{h}{6v+nv}$

$6v + nv = h\sqrt{3}$.

$h = \frac{6v+nv}{\sqrt{3}}$ — (1)

In ΔBCD,

$P/B = \tan\theta = CD/BC$

$\tan 60^\circ = h/nv$

$\sqrt{3} = h/nv$

$h = \sqrt{3}nv$ — (2)

Compare eq (1) & (2)

$\frac{6v+nv}{\sqrt{3}} = nv\sqrt{3}$

$6v + nv = nv\sqrt{3} \times 3$

$6v + nv = 3nv$

$6v = 3nv - nv$

$6v = 2nv$

$n = \frac{3 \cancel{6v}}{2\cancel{v}}$

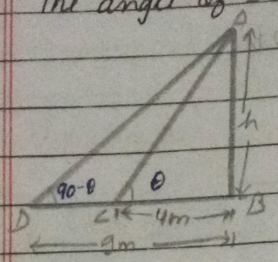
AC = AB + BC

= 6 + 3 = 9 sec Ans.

BC = 3 sec Ans.

Q:26) The angle of ---------- tower is 6m.

Ans.)



Prove :- height of tower is 6 m

In ΔABC, AB = height, BC = distance, $\{\theta\}$

$P/B = \tan\theta = AB/BC$

$\tan\theta = h/4$ ——①

In ΔABD AB = height BD = distance, $\{\theta = 90-\theta\}$

$P/B = \tan\theta = AB/BD$

$\tan 90-\theta = h/9$. $\{\tan 90-\theta = \cot\theta\}$

$\cot\theta = h/9$

$\{\tan\theta = \frac{1}{\cot\theta}\}$ $\because$ $\tan\theta = \frac{9}{h}$ ——②

From eq. ① & ②

$\frac{h}{4} = \frac{9}{h}$

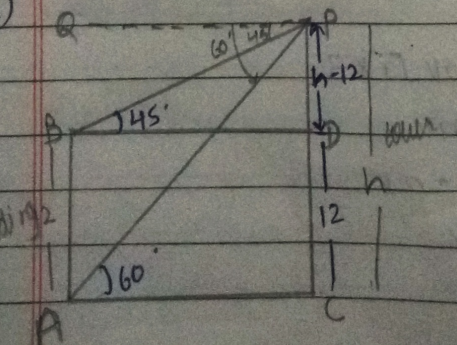
$h^2 = 36$

$h = \sqrt{36}$

$h = 6m$ [H.P.]

Q:27.) A tower ---------- tower. ($\sqrt{3} = 1.732$)

Ans.)



In ΔACP, PC = height, AC = distance, $\theta = 60°$

$P/B = \tan\theta = PC/AC$

$\tan 60° = h/AC$

$\sqrt{3} = h/AC$

$AC = h/\sqrt{3}$ ——①

In $\triangle BPD$, $P/B = \tan\theta = PD/BD$

$\tan 45^\circ = PD/BD$

$1 = PD/BD$

$BD = PD$ ___ (2)

$BD = AC$ ___ (3)

$AC = PD = h - 12$ ___ (4)

From eq (1) & (4),

$$\frac{h}{\sqrt{3}} = h - 12$$

$$h = \sqrt{3}(h - 12)$$

$$h = \sqrt{3}h - 12\sqrt{3}$$

$$12\sqrt{3} = \sqrt{3}h - h$$

$$12\sqrt{3} = h(\sqrt{3} - 1)$$

$$h(\sqrt{3} - 1) = 12\sqrt{3}$$

$$h = \frac{12\sqrt{3}}{\sqrt{3} - 1}$$

Rationalise the denominator,

$$\Rightarrow \frac{12\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$\Rightarrow \frac{12\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3})^2 - (1)^2} \rightarrow 3 - 1 = 2$$

$$\Rightarrow \frac{6\cancel{12}\sqrt{3}(\sqrt{3}+1)}{\cancel{2}_1}$$

$$\Rightarrow 6\sqrt{3}(\sqrt{3}+1)$$

$$\Rightarrow 6 \times 3 + 6\sqrt{3}$$

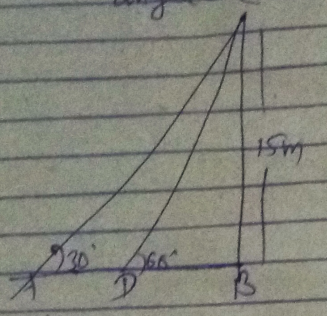
$$\Rightarrow 18 + 6 \times 1.732$$

$$\Rightarrow 18 + 10.392$$

$$= 28.392 \text{ m}$$ Ans.

Q:28.) If angle ---------- high pillar.

Qes If angle of elevation of Sun changes from 30° to 60° then find the difference in the lengths of shadow of 15m higher pillar at these angles.



ΔDBC

$\tan 60 = \frac{BC}{BD}$

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

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

$BD = \frac{15}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \Rightarrow \frac{15\sqrt{3}}{3} = 5\sqrt{3}$

ΔABC

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

$\frac{1}{\sqrt{3}} = \frac{15}{AB}$

$AB = 15\sqrt{3}$

Difference in the lengths,

$AB - BD = AD$

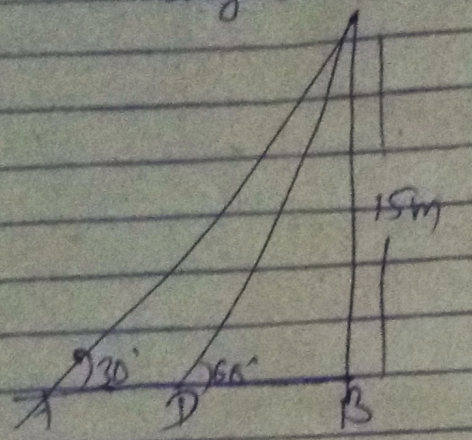
$15\sqrt{3} - 5\sqrt{3}$

$5(3\sqrt{3} - \sqrt{3})$ $10\sqrt{3}$

10×1.732

$17.32 m.$

Qes If angle of elevation of Sun changes from 30° to 60° then find the difference in the lengths of shadow of 15m higher pillar at these angles.



ΔDBC

$\tan 60 = \frac{BC}{BD}$

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

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

$BD = \frac{15}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \Rightarrow \frac{15\sqrt{3}}{3} = 5\sqrt{3}$

ΔABC

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

$\frac{1}{\sqrt{3}} = \frac{15}{AB}$

$AB = 15\sqrt{3}$

Difference in the lengths,

$AB - BD = AD$

$15\sqrt{3} - 5\sqrt{3}$

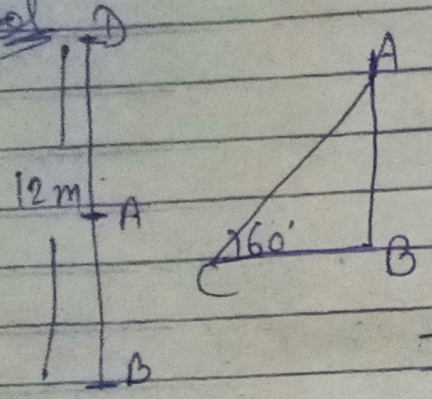
$5(3\sqrt{3} - \sqrt{3})$ $10\sqrt{3}$

10×1.732

17.32 m.

Q24 A Verticle stragiht tree 12 m high is broken by Strong cold wind in such a way that its top touches the ground and makes an angle of 60° with the ground. Find at what height from the ground did the tree break?

Sol



Suppose tree breaks from 'A' point.

If $AB = h$ then $AD = 12 - h$.

Because $AB + AD = 12$ m.

$AB = h = ?$

$AD = AC = 12 - h$

In $\triangle ABC$

$$\sin 60 = \frac{P}{H} = \frac{AB}{AC}$$

$$\frac{\sqrt{3}}{2} = \frac{h}{12-h}$$

$$\sqrt{3}(12-h) = 2h$$

$$12\sqrt{3} - h\sqrt{3} = 2h$$

$$12\sqrt{3} = 2h + h\sqrt{3}$$

$$12\sqrt{3} = h(2+\sqrt{3})$$

$$h = \frac{12\sqrt{3}}{2+\sqrt{3}}$$

if $\sqrt{3} = 1.732$

$$h = \frac{12 \times 1.732}{2 + 1.732} = \frac{20.784}{3.732}$$

$$h = 5.569 \text{ m}.$$