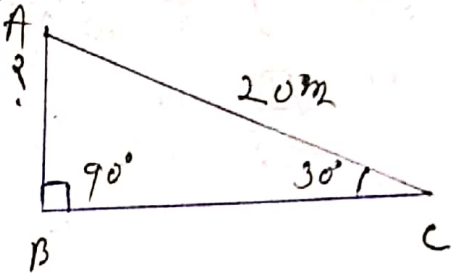
त्रिकोणमिति के कुछ अनुप्रयोग

Ex - 9.1

① माना कि AB = खंभे की ऊँचाई = ?
AC = 20 m लंबी डोरी



$\angle ACB = 30°$

ΔACB में

$$\sin 30° = \frac{AB}{AC}$$

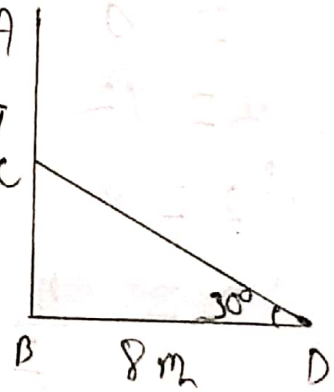
or, $$\frac{1}{2} = \frac{AB}{20}$$

or, $2AB = 20$

$$\therefore AB = \frac{20}{2} = 10$$

$= 10$ m Ans

② माना कि AB = पेड़ की ऊँचाई
AC = CD = पेड़ का टूटा हुआ भाग



$\angle BDC = 30°$

BD = 8 m

ΔBCD में

$$\tan 30° = \frac{BC}{BD}$$

or, $$\frac{1}{\sqrt{3}} = \frac{BC}{8}$$

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$$\text{or, } \sqrt{3}BC = 8$$

$$\therefore BC = \frac{8}{\sqrt{3}}$$

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

$$\text{or, } \frac{\sqrt{3}}{2} = \frac{8}{CD}$$

$$\text{or, } \sqrt{3}CD = 16$$

$$\therefore CD = \frac{16}{\sqrt{3}}$$

$$AB = AC + BC$$

$$= CD + BC$$

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

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

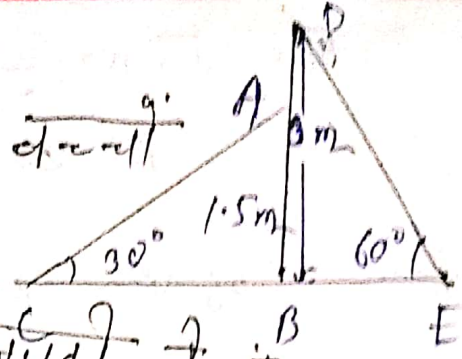
$$= \frac{24}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{8 \cancel{24} \times \sqrt{3}}{\cancel{3}}$$

$$= 8\sqrt{3}\,m$$ Ans

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(3)



5 वर्ष से कम 3 मी के बच्चों के लिए

माना कि AC = फिसलपट्टी की लंबाई = ?

AB = 1.5m

$\angle ACB = 30°$

ΔABC में

$$\sin 30° = \frac{AB}{AC}$$

or, $\frac{1}{2} = \frac{1.5}{AC}$

or, $AC = 2 \times 1.5$

$= 3m$ Ans

5 वर्ष से अधिक 3 मी के बच्चों के लिए

माना कि DE = फिसलपट्टी की लं० ?

DB = 3m

$\angle DEB = 60°$

ΔBDE में

$$\sin 60° = \frac{DB}{BE}$$

or, $\frac{\sqrt{3}}{2} = \frac{3}{BE}$

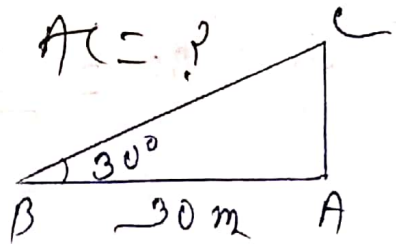
or, $\sqrt{3}BE = 6$

$\therefore BE = \frac{6}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{6\sqrt{3}}{3} = 2\sqrt{3}m$ Ans

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④ माना कि मीनार की ऊँचाई = AC = ?



AB = 30m

∠ABC = 30°

ΔABC में,

$\tan 30° = \frac{AC}{AB}$

or, $\frac{1}{\sqrt{3}} = \frac{AC}{30}$

or, $\sqrt{3}AC = 30$

$\therefore AC = \frac{30}{\sqrt{3}}$

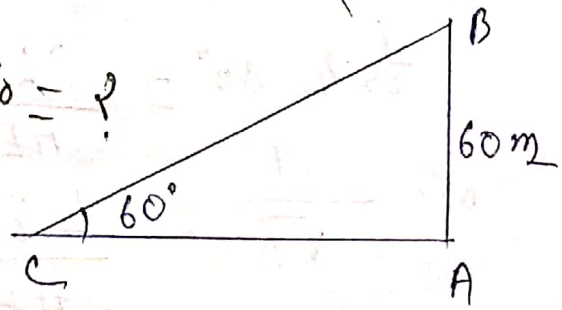
$= \frac{30 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$

$= \frac{10 \cancel{30} \times \sqrt{3}}{\cancel{3}}$

$= 10\sqrt{3}$ m Ans

⑤ माना कि पतंग की ऊँचाई = AB = 60m धरातल से

BC = डोरी की लंबाई = ?



∠ACB = 60°

ΔABC में,

$\sin 60° = \frac{AB}{BC}$

or, $\frac{\sqrt{3}}{2} = \frac{60}{BC}$

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or, $\sqrt{3}BC = 120$

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

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

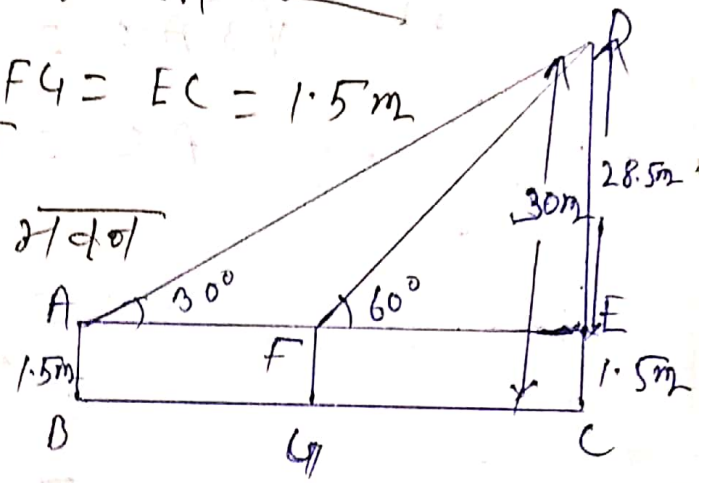
$= \frac{40 \times \sqrt{3}}{3}$

$= 40\sqrt{3}$ Ans

⑥ माना $\overset{\text{उ}}{\text{उ}}$ची $\overset{\text{ऊ}}{\text{ऊ}}$ची AB = FG = EC = 1.5m

CD = 30m $\overset{\text{उ}}{\text{उ}}$ची भवन

$\angle DFE = 60°$



$DE = CD - EC$

$= 30 - 1.5$

$= 28.5$ m

AF = भवन से और चली गई दूरी = ?

$\triangle ADE$ में

$\tan 30° = \frac{DE}{AE}$

or, $\frac{1}{\sqrt{3}} = \frac{28.5}{AE}$

or, $AE = 28.5\sqrt{3}$

$\triangle DEF$ में

$\tan 60° = \frac{DE}{EF}$

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$$\text{or, } \sqrt{3} = \frac{28.5}{EF}$$

$$\text{or, } EF = \frac{28.5}{\sqrt{3}}$$

$$AF = AE - EF$$

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

$$= \frac{85.5 - 28.5}{\sqrt{3}}$$

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

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

$$= 19\sqrt{3}$$

Ans

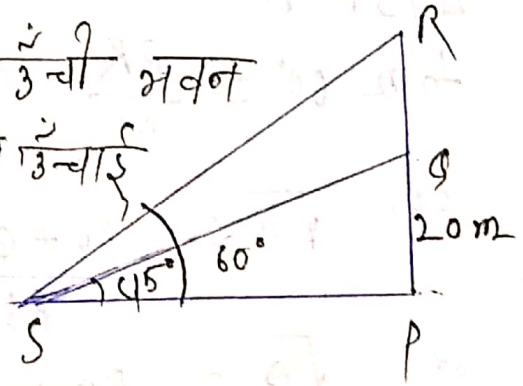
(7)

माना कि PQ = 20m ऊँची भवन

QR = मीनार की ऊँचाई

$\angle PSQ = 45°$ तथा

$\angle PSR = 60°$



ΔPSQ में

$$\tan 45° = \frac{PQ}{PS}$$

$$\text{or, } 1 = \frac{20}{PS}$$

$$\therefore PS = 20 \quad \text{——— (1)}$$

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ΔPSR में

$$\tan 60^\circ = \frac{PR}{PS}$$

or, $\sqrt{3} = \frac{PQ + QR}{20}$ (समी० Q से)

or, $\sqrt{3} = \frac{20 + QR}{20}$

or, $20 + QR = 20\sqrt{3}$

$\therefore QR = 20\sqrt{3} - 20$

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

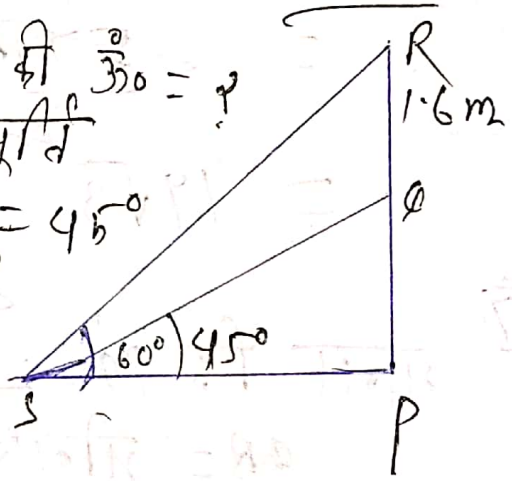
Ans

(8)

माना कि PQ = पूरतल की ऊँचाई = ?

QR = 1.6 m ऊँची मूर्ति

$\angle PSR = 60^\circ$ तथा $\angle PSQ = 45^\circ$



ΔPSR में

$$\tan 60^\circ = \frac{PR}{PS}$$

or, $\sqrt{3} = \frac{PQ + QR}{PS}$

or, $\sqrt{3} = \frac{PQ + 1.6}{PS}$

or, $\sqrt{3}\,PS = PQ + 1.6$

$\therefore PS = \frac{PQ + 1.6}{\sqrt{3}}$ ——— (1)

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ΔPSQ में,

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

or, $1 = \frac{PQ}{PS}$

or, $PS = PQ$ ——— (2)

from eqn (1) & (2)

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

or, $\sqrt{3}PQ = PQ + 1.6$

or, $\sqrt{3}PQ - PQ = 1.6$

or, $PQ(\sqrt{3} - 1) = 1.6$

$$\therefore PQ = \frac{1.6(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$$

$$= \frac{1.6(\sqrt{3}+1)}{(\sqrt{3})^2 - (1)^2}$$

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

$$= \frac{0.8}{\cancel{1.6}(\sqrt{3}+1)}$$

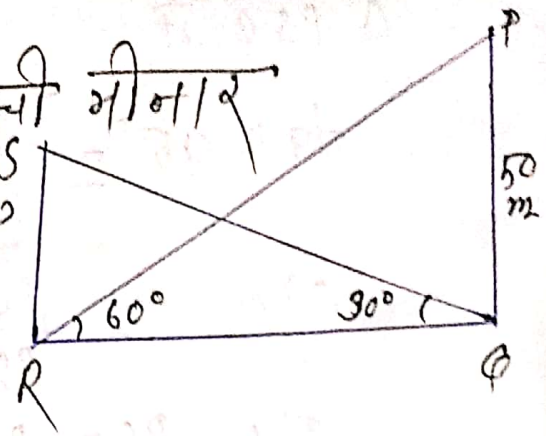
$$= 0.8(\sqrt{3}+1)\ m$$ Ans

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(9) माना कि PQ = 50 m ऊँची मीनार

RS = भवन की ऊँचाई = ?

$\angle RQS = 60°$



ΔPSQ में

$$\tan 60° = \frac{PQ}{QS}$$

or, $\sqrt{3} = \frac{50}{QS}$

$$\therefore QS = \frac{50}{\sqrt{3}}$$

ΔRSQ में

$$\tan 30° = \frac{RS}{QS}$$

or, $\frac{1}{\sqrt{3}} = \frac{RS}{\frac{50}{\sqrt{3}}}$

or, $\frac{1}{\sqrt{3}} = \frac{\sqrt{3}\,RS}{50}$

or, $\sqrt{3} \cdot \sqrt{3}\,RS = 50$

or, $3RS = 50$

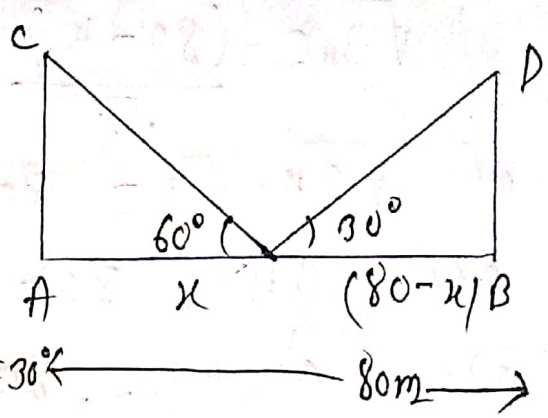
$$\therefore RS = \frac{50}{3}$$

$$= 16\frac{2}{3}\ m$$

Ans

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(10)



माना AB = BD
खंभे की उँचाई = ?
AB = 80 m चौड़ी सड़क
$\angle AEC = 60°$ तथा $\angle BED = 30°$

$AE = x$ माना
$BE = (80 - x)$

ΔACE में

$$\tan 60° = \frac{AC}{AE}$$

$$\text{or, } \sqrt{3} = \frac{AC}{x}$$

$$\text{or, } AC = \sqrt{3}x \quad \text{---------- (1)}$$

ΔBDE में

$$\tan 30° = \frac{BD}{BE}$$

$$\text{or, } \frac{1}{\sqrt{3}} = \frac{BD}{(80-x)}$$

$$\text{or, } \sqrt{3}\,BD = (80 - x)$$

$$\text{or, } BD = \frac{80 - x}{\sqrt{3}}$$

$$\text{or, } AC = \frac{80 - x}{\sqrt{3}} \quad \text{---------- (2)}$$

from eqn (1) & (2)

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$$\sqrt{3}x = \frac{(80-x)}{\sqrt{3}}$$

or, $\sqrt{3}x \cdot \sqrt{3} = 80 - x$

or, $3x = 80 - x$

or, $3x + x = 80$

or, $4x = 80$

$\therefore x = \frac{80}{4} = 20$

$BE = 80 - x = 80 - 20 = 60$

Putting the value of x in eqn (i)

$AC = \sqrt{3}x$

$= \sqrt{3} \times 20$

$= 20\sqrt{3}$ m

$AE = 20$ m

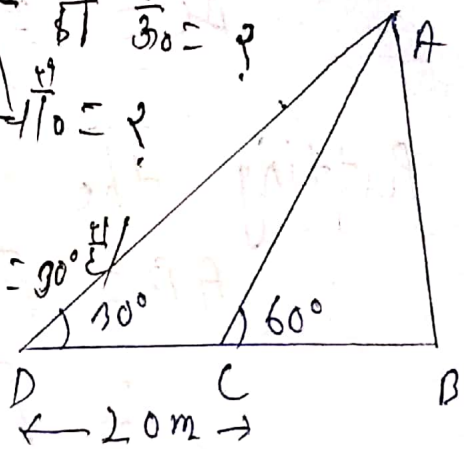
$BE = 60$ m

$AC = 20\sqrt{3}$ m

Ans

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(11) माना कि AB = टॉवर की ऊँचाई = ?
BC = नदी की चौड़ाई = ?
CD = 20m
∠ACB = 60° तथा ∠ADB = 30°



ΔABD में

$\tan 30° = \frac{AB}{BD}$

or, $\frac{1}{\sqrt{3}} = \frac{AB}{20+BC}$

or, $\sqrt{3}AB = 20 + BC$

$\therefore AB = \frac{20+BC}{\sqrt{3}}$ ——— (1)

ΔABC में

$\tan 60° = \frac{AB}{BC}$

or, $\sqrt{3} = \frac{AB}{BC}$

or, $AB = \sqrt{3}BC$ ——— (2)

from eqn (1) & (2)

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

or, $\sqrt{3}\cdot\sqrt{3}BC = 20 + BC$

or, $3BC = 20 + BC$

or, $3BC - BC = 20$

or, $2BC = 20$

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$\therefore BC = \frac{20}{2} = 10$

Putting the value of BC in eq^{n} (i)

$AB = \sqrt{3}\, BC$

$= \sqrt{3} \times 10$

$= 10\sqrt{3}$ m

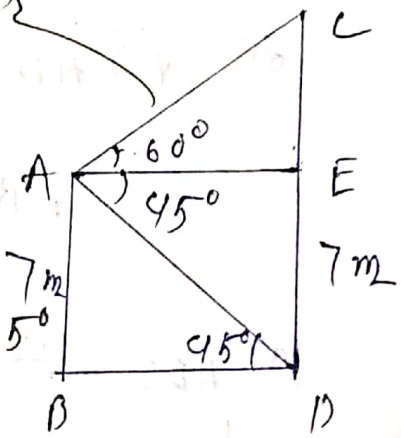
$AB = 10\sqrt{3}$ m

$BC = 10$ "

Ans

V.V.Q

(12) माना कि $AB = DE = 7$ m



और मीनार

$\angle CAE = 60°$ तथा $\angle ADB = 45°$

$CE = x$ माना

$CD = CE + DE$

$= x + 7$

$= (7 + x)$ m

ΔABD में

$\tan 45° = \frac{AB}{BD}$

or, $1 = \frac{7}{BD}$

or, $BD = 7$

$AE = 7$ m

ΔACE में

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$\tan 60° = \frac{CE}{AE}$

or, $\sqrt{3} = \frac{x}{7}$

$\therefore x = 7\sqrt{3}$

$CD = 7 + x$

$= 7 + 7\sqrt{3}$

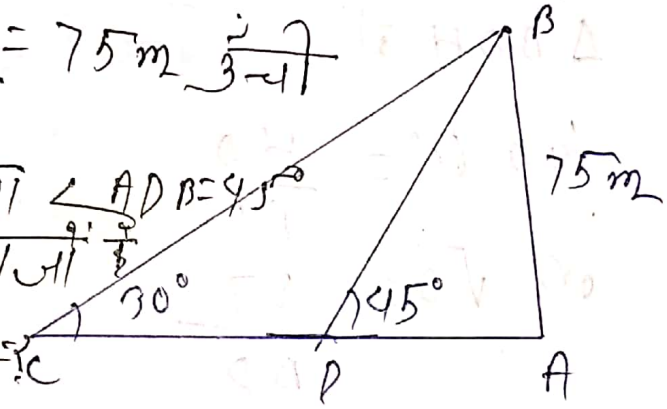
$= 7(1 + \sqrt{3})$

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

(13) माना कि AB = 75m ऊँची मीनार है। उसके

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

CD = दोनों जहाजों के बीच की दूरी = ?



ΔABC में

$\tan 30° = \frac{AB}{AC}$

or, $\frac{1}{\sqrt{3}} = \frac{75}{AC}$

or, $AC = 75\sqrt{3}$

ΔABD में

$\tan 45° = \frac{AB}{AD}$

or, $1 = \frac{75}{AD}$

$\therefore AD = 75$

$CD = AC - AD$

$= 75\sqrt{3} - 75$

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

Ans

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(14)

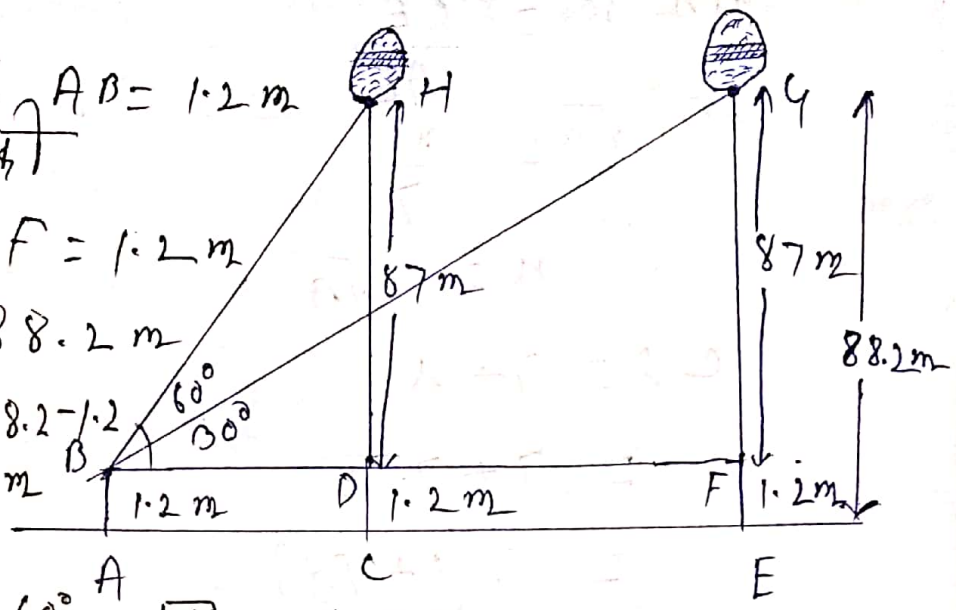
माना कि उँची लड़की $AB = 1.2\ m$

$AB = CD = EF = 1.2\ m$

$EG = CH = 88.2\ m$

$FG = DH = 88.2 - 1.2$

$= 87\ m$



$\angle DBH = 60°$ तथा $\angle GBF = 30°$

$DF =$ दोनों गुब्बारे के बीच की दूरी $= ?$

ΔBDH में

$$\tan 60° = \frac{HD}{BD}$$

$$\text{or, } \sqrt{3} = \frac{87}{BD}$$

$$\therefore BD = \frac{87}{\sqrt{3}}$$

ΔBFG में

$$\tan 30° = \frac{FG}{BF}$$

$$\text{or, } \frac{1}{\sqrt{3}} = \frac{87}{BF}$$

$$\text{or, } BF = 87\sqrt{3}$$

$$DF = BF - BD$$

$$= 87\sqrt{3} - \frac{87}{\sqrt{3}}$$

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$$= \frac{261 - 87}{\sqrt{3}}$$

$$= \frac{174 \cdot \sqrt{3}}{58\sqrt{3} \cdot \sqrt{3}}$$

$$= \frac{174\sqrt{3}}{3}$$

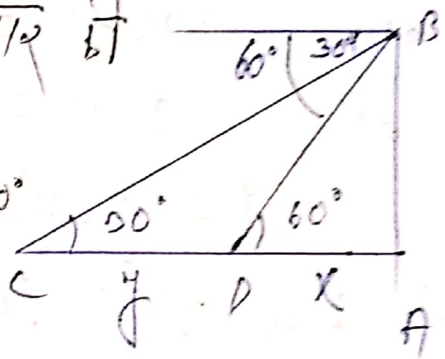
$$= 58\sqrt{3}\ m$$ Ans

(15) माना कि AB = मीनार की ऊँचाई $= 30 = ?$

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

$AD = x$ माना तथा

$CD = y$ माना



ΔABC में

$$\tan 30° = \frac{AB}{AC}$$

$$\text{or, } \frac{1}{\sqrt{3}} = \frac{AB}{AD + CD}$$

$$\text{or, } \frac{1}{\sqrt{3}} = \frac{AB}{x + y}$$

$$\text{or, } \sqrt{3}\,AB = x + y$$

$$\therefore AB = \frac{x + y}{\sqrt{3}} \quad \text{---------- (1)}$$

ΔABD में

$$\tan 60° = \frac{AB}{AD}$$

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or, $\sqrt{3} = \frac{AB}{x}$

or, $AB = \sqrt{3}x$ ——————— (2)

from eqn (1) & (2)

$\frac{x+y}{\sqrt{3}} = \sqrt{3}x$

or, $\sqrt{3} \cdot \sqrt{3}x = x+y$

or, $3x = x+y$

or, $3x - x = y$

or, $2x = y$

$y = 2x$

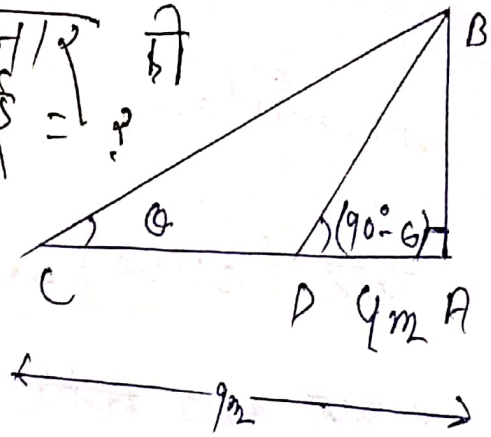
∴ $2x$ दूरी तय करने में 6 sec का समय लगता है

∴ 1 " " " " " $\frac{6}{2x}$ " " "

∴ x " " " " $\frac{3}{\cancel{2x}} \times \cancel{x}$

$= 3$ sec Ans

(16) माना कि AB = मीनार की ऊँचाई = ?



AD = 4m

AC = 9m

$\angle ACB = \theta$

$\angle ADB = (90° - \theta)$

ΔABC में,

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

or, $$\tan\theta = \frac{AB}{9} \quad \text{——— (1)}$$

ΔABD में,

$$\cot(90° - \theta) = \frac{AD}{AB}$$

or, $$\tan\theta = \frac{4}{AB} \quad \text{——— (2)}$$

from eqn (1) & (2)

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

or, $AB^2 = 36$

$\therefore AB = \sqrt{36}$

$= 6m$ Ans