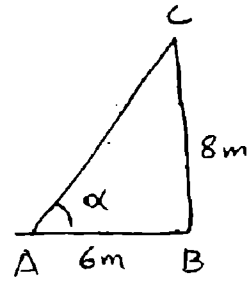
Exercise 12.3

Q No 1

Let α be the required vector



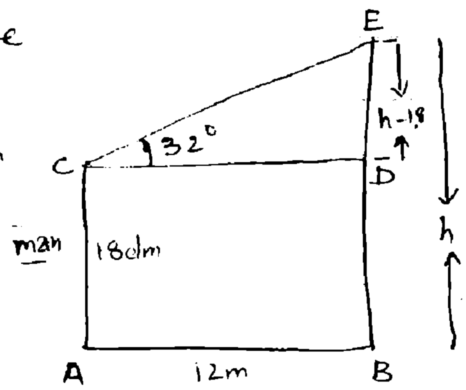
then $\tan\alpha = \frac{8}{6}$

$\Rightarrow \alpha = \tan^{-1}\left(\frac{8}{6}\right) = 53.13^\circ$

$= 53^\circ 8'$

Q No 2

Let h be the height of tree and AC be the man.



$\because 1m = 10dm$

then $AC = BD = 18dm = 1.8m$

and $AB = CD = 12m$

and $DE = h - \cancel{18}\ 1.8$

Now from triangle CDE

$\frac{DE}{CD} = \tan 32^\circ$

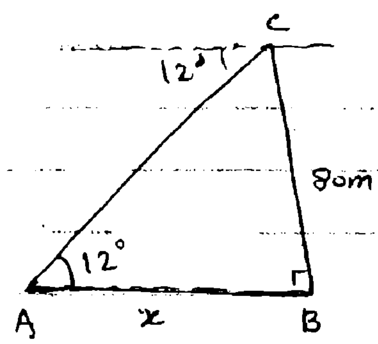
$\Rightarrow \frac{h-1.8}{12} = 0.6249$

$\Rightarrow h - 1.8 = 0.6249(12) \Rightarrow h - 1.8 = 7.4984$

$\Rightarrow h = 7.4984 + \cancel{18}\ 1.8 \Rightarrow \boxed{h = \cancel{25.498}\ 9.23\,m}$

Q No 3

Let x be the required distance



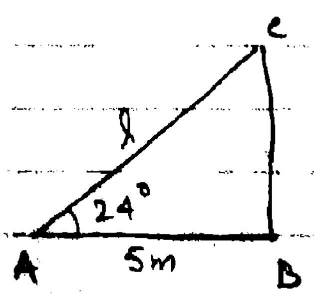
then $\tan 12^\circ = \frac{BC}{AB}$

$\Rightarrow 0.2126 = \frac{80}{x}$

$\Rightarrow x = \frac{80}{0.2126} \Rightarrow \boxed{x = 376.37m}$

Q No 4

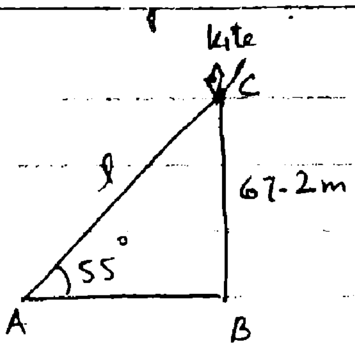
Consider l be the length of ladder, then



$\cos 24^\circ = \frac{AB}{AC}$

$\Rightarrow 0.9135 = \frac{5}{l}$

Q.No. 5 Let l be the length of string

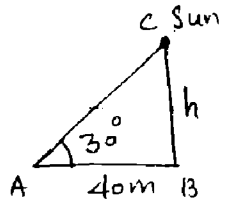


then $\sin 55° = \frac{BC}{AC}$

$\Rightarrow 0.819 = \frac{67.2}{l}$

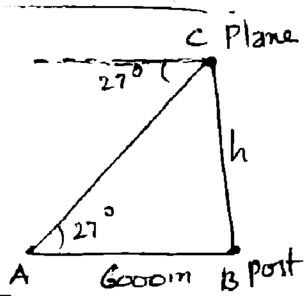
$\Rightarrow l = \frac{67.2}{0.819} \Rightarrow \boxed{l = 82.04\,m}$

Q.No 6



Do yourself

Q.No 7 Let height of plane be h.



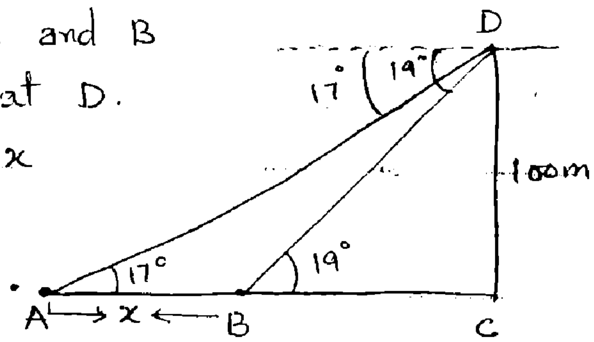
then $\tan 27° = \frac{BC}{AB}$

$\Rightarrow 0.5095 = \frac{h}{6000}$

$\Rightarrow (0.5095)(6000) = h \Rightarrow \boxed{h = 3057.15\,m}$

Q.No. 8

Let the ships be at A and B and man be on light house at D.
Let distance between ships $= x$



By triangle BCD

$\tan 19° = \frac{DC}{BC}$

$\Rightarrow 0.344 = \frac{100}{BC}$

$\Rightarrow BC = \frac{100}{0.344} \Rightarrow BC = 290.421$

Now by triangle ACD.

$\tan 17° = \frac{DC}{AC} \Rightarrow 0.3057 = \frac{100}{AC}$

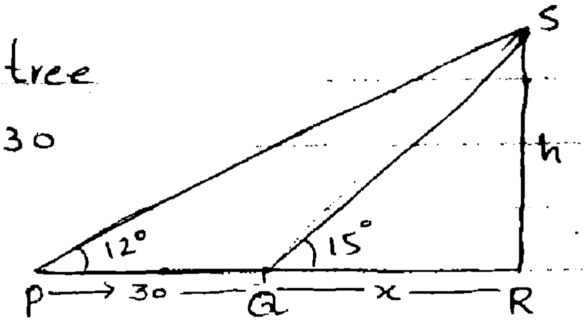
$\Rightarrow AC = \frac{100}{0.3057} \Rightarrow AC = 327.09$

Now

$x = AC - BC = 327.09 - 290.421$

$\Rightarrow \boxed{x = 36.66\,m}$

QNo. 9. Let h be the height of tree and $QR = x$ then $PR = x + 30$



from triangle QRS

$$\tan 15° = \frac{RS}{QR}$$

$$\Rightarrow 0.2679 = \frac{h}{x}$$

$$\Rightarrow 0.2679x = h \quad \text{---} \quad (i)$$

Also from triangle PRS.

$$\tan 12° = \frac{RS}{PR} \Rightarrow 0.2126 = \frac{h}{x+30}$$

$$\Rightarrow 0.2126(x+30) = h$$

$$\Rightarrow 0.2126x + 6.378 = h \quad \text{---} \quad (ii)$$

Comparing (i) and (ii)

$$0.2679x = 0.2126x + 6.378$$

$$\Rightarrow 0.2679x - 0.2126x = 6.378$$

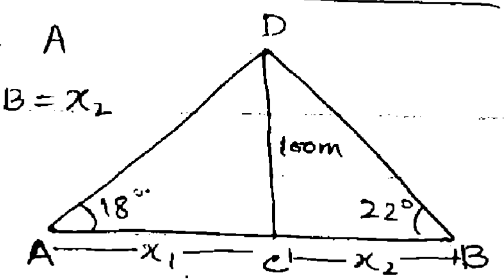
$$\Rightarrow 0.0553x = 6.378 \Rightarrow x = \frac{6.378}{0.0553} = 115.335$$

putting in (i)

$$h = 0.2679(115.335)$$

$$\Rightarrow \boxed{h = 30.898\,m}$$

QNo. 10 Let the men be at pt A and B. also $AC = x_1$ & $CB = x_2$



By triangle ACD

$$\frac{CD}{AC} = \tan 18°$$

$$\Rightarrow \frac{100}{x_1} = 0.3249$$

$$\Rightarrow \frac{100}{0.3249} = x_1 \Rightarrow x_1 = 307.768$$

Also by triangle BCD

$$\frac{CD}{CB} = \tan 22° \Rightarrow \frac{100}{x_2} = 0.4040 \Rightarrow \frac{100}{0.4040} = x_2$$

$$\Rightarrow x_2 = \frac{4040}{100} \Rightarrow x_2 = 247.50$$

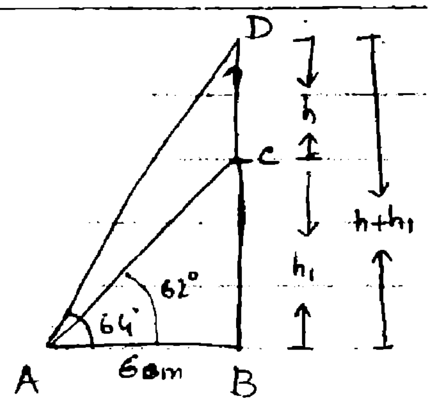
So Distance between men $= x_1 + x_2$

$$= 307.768 + 247.50 = 555.28\,m$$

Q No. 11 Let height of tower be h_1 and height of flag staff be h. then

$$BD = h + h_1 .$$

from triangle ABC



$$\frac{BC}{AB} = \tan 62^\circ$$

$$\Rightarrow \frac{h_1}{60} = 1.8807$$

$$\Rightarrow h_1 = (1.8807)(60) \Rightarrow h_1 = 112.844\,m.$$

Now from triangle ABD

$$\frac{BD}{AB} = \tan 64^\circ \Rightarrow \frac{h+h_1}{60} = (2.0503)$$

$$\Rightarrow h + h_1 = (2.0503)(60) \Rightarrow h + h_1 = 123.018$$

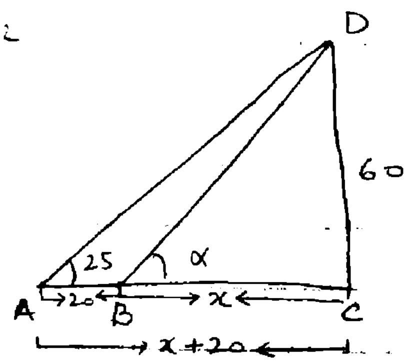
$$\Rightarrow h = 123.018 - h_1$$

$$= 123.018 - 112.844 \qquad \because h_1 = 112.844$$

$$\Rightarrow \boxed{h = 10.174\,m}$$

Q No 12 Let α be the required angle and $BC = x$ then $AC = x + 20$.

from triangle ACD



$$\frac{DC}{AC} = \tan 25^\circ$$

$$\Rightarrow \frac{60}{x+20} = 0.4663$$

$$\Rightarrow 60 = (0.4663)(x+20)$$

$$\Rightarrow 60 = 0.4663x + 9.326$$

$$\Rightarrow 60 - 9.326 = 0.4663x \Rightarrow 50.674 = 0.4663x$$

$$\Rightarrow x = \frac{50.674}{0.4663} = 108.6722$$

Now from triangle BCD

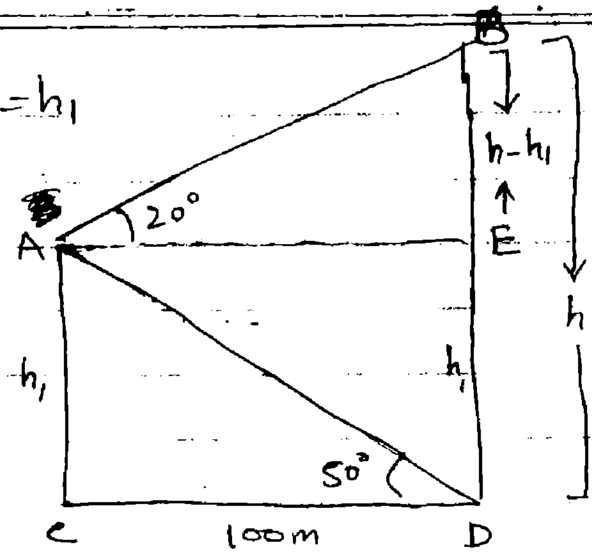
$$\tan\alpha = \frac{DC}{BC} = \frac{60}{x} = \frac{60}{108.6722} = 0.552$$

$$\Rightarrow \alpha = \tan^{-1}(0.552) \Rightarrow \boxed{\alpha = 28.904 = 28^\circ 54'}$$

Q No. 13 Let height of building $A = CA = h_1$

and height of building $B = h$

Then $EB = h - h_1$.



From triangle CDA

$$\frac{CA}{CD} = \tan 50^\circ$$

$$\Rightarrow \frac{h_1}{100} = 1.1918$$

$$\Rightarrow h_1 = (1.1918)(100)$$

$$= 119.175$$

Now from triangle AEB

$$\frac{EB}{AE} = \tan 20^\circ$$

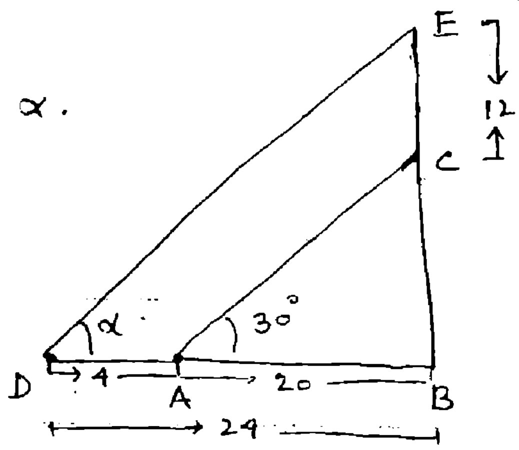
$$\Rightarrow \frac{h - h_1}{100} = 0.36397 \quad \Rightarrow h - h_1 = (0.36397)(100)$$

$$\Rightarrow h - h_1 = 36.397$$

$$\Rightarrow h = 36.397 + h_1 = 36.397 + 119.175 \qquad \because h_1 = 119.175$$

$$\Rightarrow \boxed{h = 155.572\,m}$$

Q No. 14



Let the required angle be α.

$\because$ $AB = 20$ and $DA = 4$

$\therefore$ $DB = 20 + 4 = 24$.

From triangle ABC

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

$$\Rightarrow \frac{BC}{20} = 0.577$$

$$\Rightarrow BC = (0.577)(20) = 11.547$$

So $BE = BC + CE = 11.547 + 12 = 23.547$.

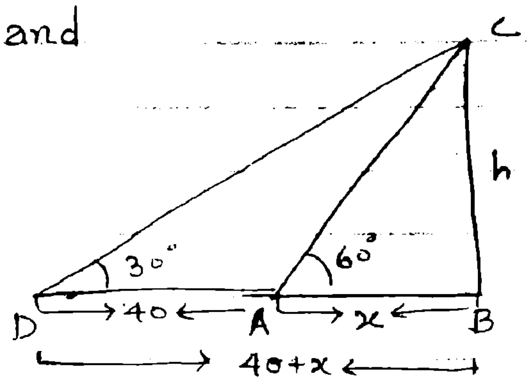
Now from triangle DBE

$$\tan\alpha = \frac{BE}{DB} = \frac{23.547}{24}$$

$$\Rightarrow \tan\alpha = 0.981 \quad \Rightarrow \alpha = \tan^{-1}(0.981) = 44.454$$

$$\Rightarrow \boxed{\alpha = 44^\circ 27'}$$

Q.No.15 Let height of tree be h and width of canal be x.



From triangle ABC.

$$\frac{BC}{AB} = \tan 60°$$

$$\Rightarrow \frac{h}{x} = 1.732$$

$$\Rightarrow h = 1.732x \quad \text{—— (i)}$$

From triangle DBC.

$$\frac{BC}{DB} = \tan 30°$$

$$\Rightarrow \frac{h}{40+x} = 0.577 \quad \Rightarrow h = 0.577(40+x)$$

$$\Rightarrow h = 23.094 + 0.577x \quad \text{—— (ii)}$$

Comparing (i) & (ii)

$$1.732x = 23.094 + 0.577x$$

$$\Rightarrow 1.732x - 0.577x = 23.094$$

$$\Rightarrow 1.155x = 23.094 \Rightarrow x = \frac{23.094}{1.155}$$

$$\Rightarrow \boxed{x = 19.995\ m}$$

putting in (i)

$$h = 1.732(19.995)$$

$$\Rightarrow \boxed{h = 34.63\ m}$$

The End