

**Exercise 12.3 (Solutions)**

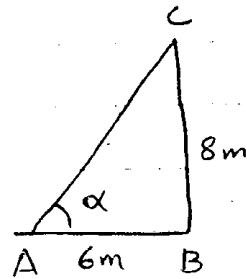
TEXTBOOK OF ALGEBRA AND TRIGONOMETRY FOR CLASS XI  
Available online @ <http://www.megalecture.com>, Version: 1.0.0

Q<sub>No</sub> 1

Let  $\alpha$  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<sub>No</sub> 2

Let  $h$  be the height of tree

and  $AC$  be the man.

then  $AC = BD = 18\text{dm} = 1.8\text{m}$

and  $AB = CD = 12\text{m}$

and  $DE = h - 1.8$

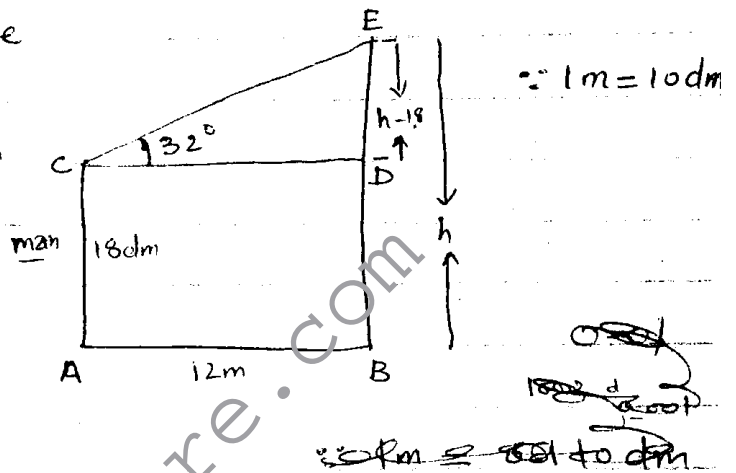
Now from triangle  $CDE$

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

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

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

$\Rightarrow h = 7.4984 + 1.8 \Rightarrow h = 9.23\text{m}$



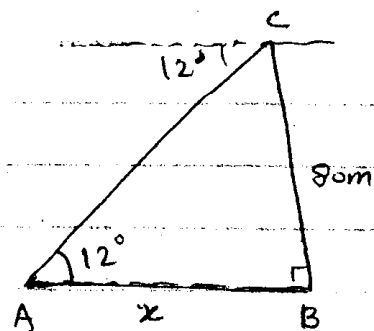
Q<sub>No</sub> 3

Let  $x$  be the required distance

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

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

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

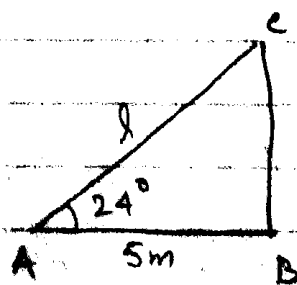


Q<sub>No</sub> 4

Consider  $l$  be the length of ladder. then

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

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

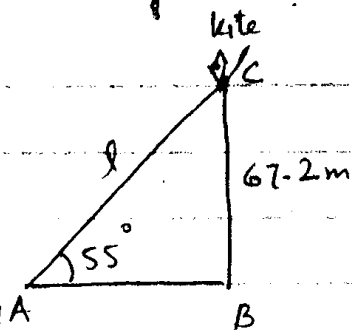


Q No 5 Let  $l$  be the length of string

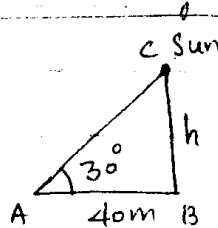
then  $\sin 55^\circ = \frac{BC}{AC}$

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

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



Q No 6



Do yourself

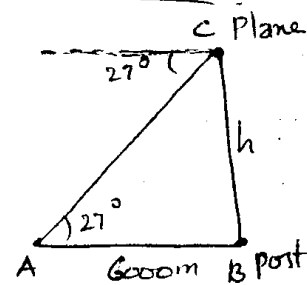
Q No 7

Let height of plane be  $h$ .

then  $\tan 27^\circ = \frac{BC}{AB}$

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

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



Q No 8

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

By triangle BCD

$\tan 19^\circ = \frac{DC}{BC}$

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

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

Now by triangle ACD

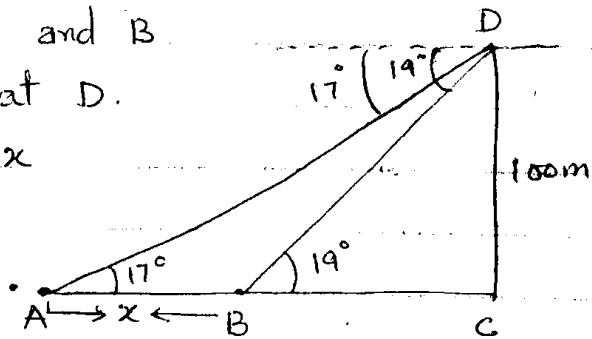
$\tan 17^\circ = \frac{DC}{AC} \Rightarrow 0.3057 = \frac{100}{AC}$

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

Now

$x = AC - BC = 327.09 - 290.421$

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



Qno.9. Let  $h$  be the height of tree

and  $QR = x$  then  $PR = x + 30$

from triangle  $QRS$

$$\tan 15^\circ = \frac{RS}{QR}$$

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

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

Also from triangle  $PRS$

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

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

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

Comparing (i) and (ii)

$$0.2679x = 0.2126x + 6.378$$

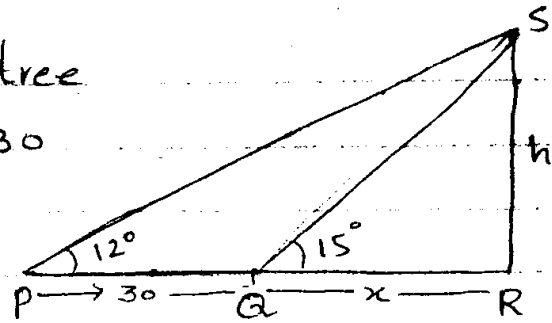
$$\Rightarrow 0.2679x - 0.2126x = 6.378$$

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

putting in (i)

$$h = 0.2679(115.335)$$

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



Qno.10 Let the men be at pt A

and B. also  $AC = x_1$  &  $CB = x_2$

By triangle  $ACD$

$$\frac{CD}{AC} = \tan 18^\circ$$

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

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

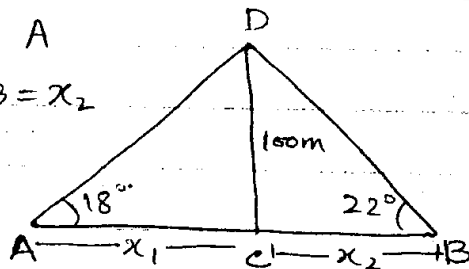
Also by triangle  $BCD$

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

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

so Distance between men =  $x_1 + x_2$

$$= 307.768 + 247.50 = 555.28 \text{ m}$$



Q<sub>no</sub>.11 Let height of tower be  $h_1$  and height of flag staff be  $h$ . then

$$BD = h + h_1$$

from triangle ABC

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

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

$$\Rightarrow h_1 = (1.8807)(60) \Rightarrow h_1 = 112.844 \text{ m}$$

Now from triangle ABD

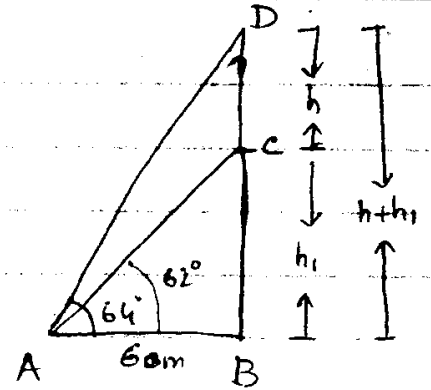
$$\frac{BD}{AB} = \tan 64^\circ \Rightarrow \frac{h+h_1}{60} = (2.0503)$$

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

$$\Rightarrow h = 123.018 - h_1$$

$$= 123.018 - 112.844 \quad \therefore h_1 = 112.844$$

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



Q<sub>no</sub>.12 Let  $\alpha$  be the required angle and  $BC = x$  then  $AC = x + 20$ .

from triangle ACD

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

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

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

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

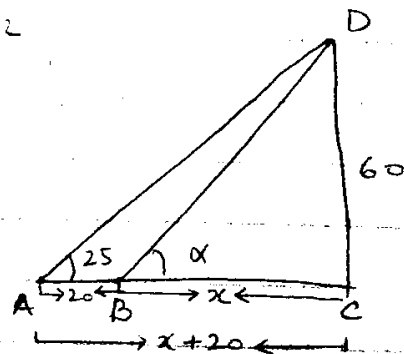
$$\Rightarrow 60 - 9.326 = 0.4663x \Rightarrow 50.674 = 0.4663x$$

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

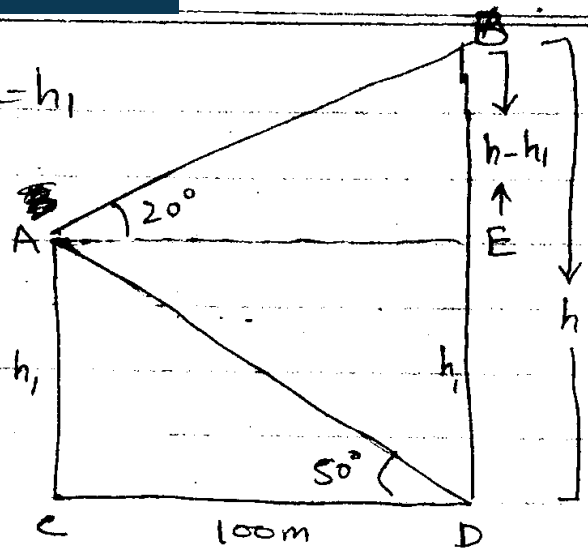
Now from triangle BCD

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

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



Q<sub>No.13</sub> 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

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

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

$$\Rightarrow h - h_1 = 36.397$$

$$\Rightarrow h = 36.397 + h_1 = 36.397 + 119.175 \quad \therefore h_1 = 119.175$$

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

Q<sub>No.14</sub>

Let the required angle be  $\alpha$ .

$$\because AB = 20 \text{ and } DA = 4$$

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

from triangle ABC

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

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

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

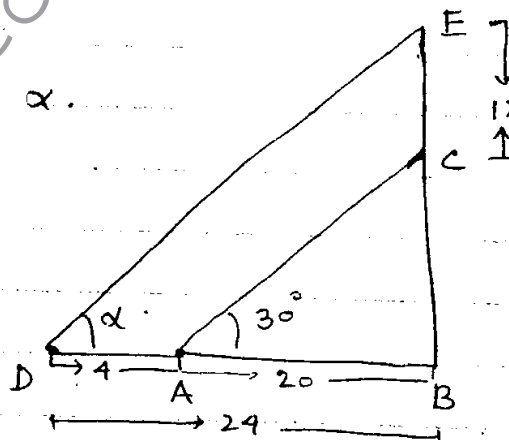
$$\text{So } BE = BC + CE = 11.547 + 12 = 23.547$$

Now from triangle DBE

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

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

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



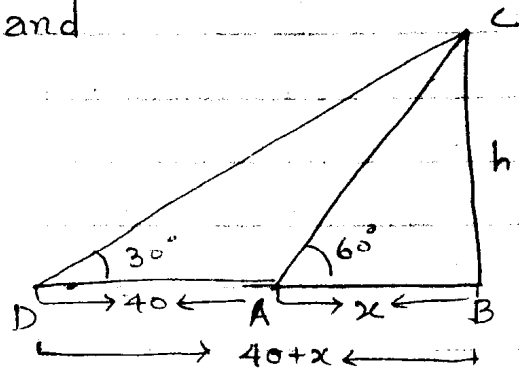
Q.No.15 Let height of tree be  $h$  and width of canal be  $x$ .

From triangle ABC.

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

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

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



from triangle DBC.

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

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

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

Comparing (i) & (ii)

$$1.732x = 23.094 + 0.577x$$

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

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

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

putting in (i)

$$h = 1.732(19.995)$$

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

The End

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