

**Q.20.**  $\frac{\operatorname{cosec} A}{(\operatorname{cosec} A - 1)} + \frac{\operatorname{cosec} A}{\operatorname{cosec} A + 1} = 2 \sec^2 A$

$$\begin{aligned} \text{LHS} &= \frac{\operatorname{Cosec} A}{\operatorname{Cosec} A - 1} + \frac{\operatorname{Cosec} A}{\operatorname{Cosec} A + 1} = \frac{\operatorname{Cosec} A (\operatorname{Cosec} A + 1) + \operatorname{Cosec} A (\operatorname{Cosec} A - 1)}{(\operatorname{Cosec} A - 1)(\operatorname{Cosec} A + 1)} \\ &= \frac{\operatorname{Cosec}^2 A + \cancel{\operatorname{Cosec} A} + \operatorname{Cosec}^2 A - \cancel{\operatorname{Cosec} A}}{\operatorname{Cosec}^2 A - 1} = \frac{2 \operatorname{Cosec}^2 A}{\cot^2 A} = \frac{2}{\cancel{\sin^2 A}} \times \frac{\cancel{\sin^2 A}}{\cos^2 A} = 2 \sec^2 A \\ &= \text{RHS} \end{aligned}$$

**Q.21.**  $(1 + \cot A - \operatorname{cosec} A)$   
 $(1 + \tan A + \sec A) = 2$

Hence proved

$$\begin{aligned} \text{LHS} &= (1 + \cot A - \operatorname{Cosec} A) (1 + \tan A + \sec A) \\ &= \left(1 + \frac{\cos A}{\sin A} - \frac{1}{\sin A}\right) \left(1 + \frac{\sin A}{\cos A} + \frac{1}{\cos A}\right) = \left(\frac{\overbrace{\sin A + \cos A - 1}^{a-1}}{\sin A}\right) \left(\frac{\overbrace{\cos A + \sin A + 1}^{a+1}}{\cos A}\right) \\ &= \frac{(\sin A + \cos A)^2 - 1}{\sin A \cos A} = \frac{\sin^2 A + \cos^2 A + 2 \sin A \cos A - 1}{\sin A \cos A} = \frac{\cancel{1} + 2 \sin A \cos A - \cancel{1}}{\sin A \cos A} \\ &= \frac{2 \cancel{\sin A} \cos A}{\cancel{\sin A} \cos A} = 2 = \text{RHS} \quad \underline{\text{Hence proved}} \end{aligned}$$

**Q.6.** Using tables, find the acute angle  $\theta$ , when

(i)  $\cos \theta = 0.94$

(ii)  $\cos \theta = 0.8092$

(iii)  $\cos \theta = 0.1679$

(i)  $\cos \theta = 0.94$

$$\begin{array}{r} \cos 19^{\circ} 54' = 0.9403 \\ + \quad \quad \quad 3' \quad \quad \quad - \quad \quad \quad 3 \\ \hline \cos 19^{\circ} 57' = 0.94 \end{array}$$

$$\theta = 19^{\circ} 57'$$

(ii)  $\cos \theta = \underline{\underline{0.8092}}$

$$\begin{array}{r} \cos 35^{\circ} 54' = 0.8100 \\ (+) \quad \quad 5' = (-) \quad \quad \quad 8 \\ \hline \cos 35^{\circ} 59' = 0.8092 \end{array}$$

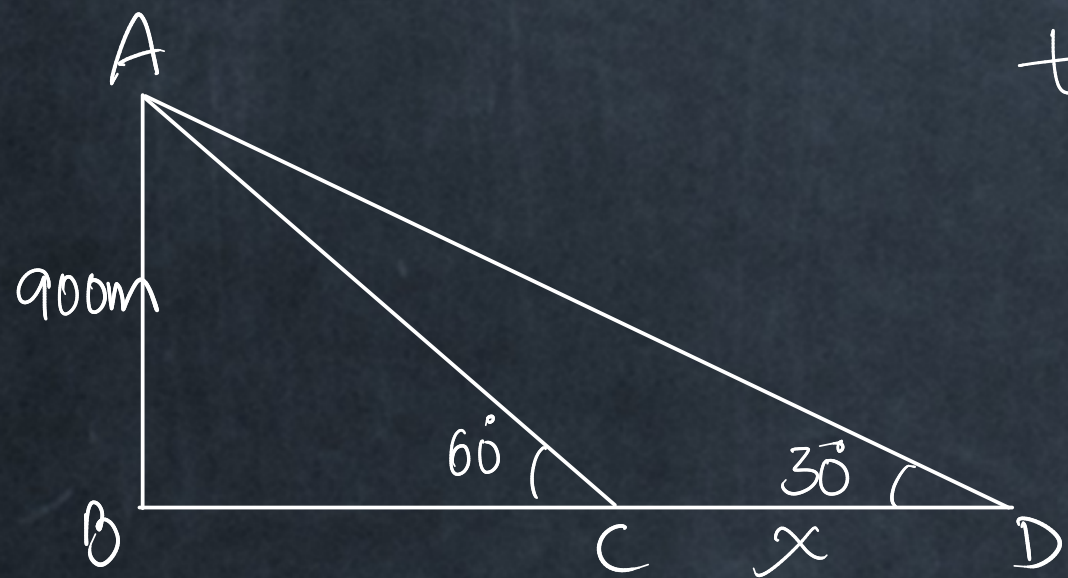
$$\theta = 35^{\circ} 59'$$

(iii)  $\cos \theta = 0.1679$

$$\begin{array}{r} \cos 80^{\circ} 18' = 0.1685 \\ (+) \quad \quad 2' \quad \quad (-) \quad \quad \quad 6 \\ \hline \cos 80^{\circ} 20' = 0.1679 \end{array}$$

$$\theta = 80^{\circ} 20'$$

17. An aeroplane at an altitude of 900 m finds that two ships are sailing towards it in the same direction. The angles of depression of the ships, as observed from the plane are  $60^\circ$  and  $30^\circ$  respectively. Find the distance between the ships.



$$\tan 60^\circ = \frac{900}{BC} \Rightarrow \sqrt{3} = \frac{900}{BC} \Rightarrow BC = \frac{900}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{300 \sqrt{3}}{1}$$

$$BC = 300\sqrt{3} \text{ m}$$

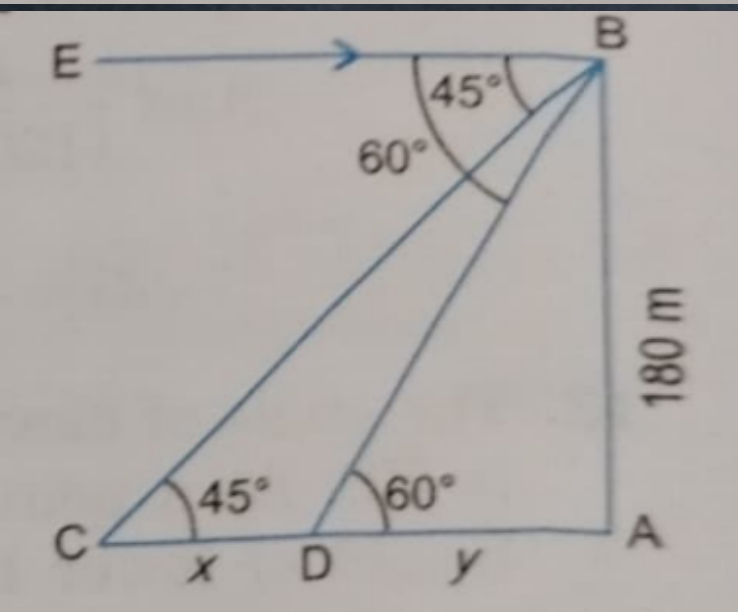
$$\tan 30^\circ = \frac{900}{BC+x} \Rightarrow \frac{1}{\sqrt{3}} = \frac{900}{300\sqrt{3}+x}$$

$$300\sqrt{3}+x = 900\sqrt{3}$$

$$x = 600\sqrt{3} = 1039.2 \text{ m}$$

$\therefore$  Distance b/w the two ships = 1039.2m

18. In the given figure, AB is a tower and two objects C and D are located on the ground on the same side of AB. When observed from the top B of the tower, their angles of depression are  $45^\circ$  and  $60^\circ$  respectively. Find the distance between the objects, if the height of the tower is 180 m.



$$\tan 60^\circ = \frac{180}{y} \Rightarrow \sqrt{3} = \frac{180}{y} \Rightarrow y = \frac{180}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 60\sqrt{3} \text{ m}$$

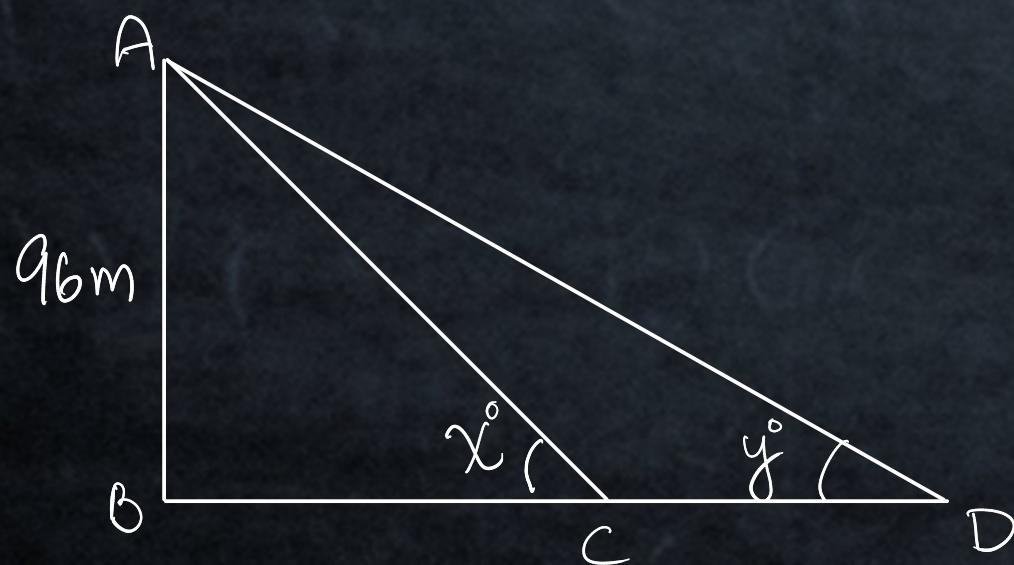
$$\tan 45^\circ = \frac{180}{x+y} \Rightarrow x+y = 180$$

$$x + 60\sqrt{3} = 180$$

$$x = 180 - 60\sqrt{3} = 76.08 \text{ m}$$

$\therefore$  Distance b/w the objects = 76.08 m

19. From the top of a church spire 96 m high, the angles of depression of two vehicles on a road, at the same level as the base of the spire and on the same side of it are  $x^\circ$  and  $y^\circ$ , where  $\tan x^\circ = \frac{1}{4}$  and  $\tan y^\circ = \frac{1}{7}$ . Calculate the distance between the vehicles.



Note: Since  $\frac{1}{4} > \frac{1}{7} \therefore$  Take  $\angle ACB = x^\circ$

$$\tan x^\circ = \frac{96}{BC} \Rightarrow \frac{1}{4} = \frac{96}{BC} \Rightarrow BC = 384 \text{ m}$$

$$\tan y^\circ = \frac{96}{CD+BC} \Rightarrow \frac{1}{7} = \frac{96}{CD+384}$$

$$CD + 384 = 672$$

$$CD = 288 \text{ m}$$