

Chapter 18. Trigonometric Ratios and Standard Angles

17. TRIGONOMETRICAL RATIOS OF STD ANGLES.

EXERCISE - 17.1

Solution- 1 (i):

$$7 \sin 30^\circ \cos 60^\circ$$

$$\Rightarrow 7 \cdot \left(\frac{1}{2}\right) \left(\frac{1}{2}\right)$$

$$\Rightarrow \frac{7}{4}$$

(ii) $3 \sin^2 45^\circ + 2 \cos^2 60^\circ$

$$\rightarrow 3 \left(\frac{1}{\sqrt{2}}\right)^2 + 2 \left(\frac{1}{2}\right)^2$$

$$\rightarrow \frac{3}{2} + \frac{2}{4}$$

$$\rightarrow \frac{3}{2} + \frac{1}{2}$$

$$\Rightarrow \frac{3+1}{2}$$

$$\Rightarrow \frac{4}{2}$$

$$\Rightarrow 2$$

(iii) sol :- $\cos^2 45^\circ + \sin^2 60^\circ + \sin^2 30^\circ$

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

$$\Rightarrow \frac{1}{2} + \frac{3}{4} + \frac{1}{4}$$

$$\Rightarrow \frac{2+3+1}{4} = \frac{6}{4} = \frac{3}{2}$$

(iv) sol :-

$$\cos 90^\circ + \cos^2 45^\circ \sin 30^\circ \tan 45^\circ$$

$$\Rightarrow 0 + \left(\frac{1}{\sqrt{2}}\right)^2 \cdot \left(\frac{1}{2}\right) \cdot (1)$$

$$\Rightarrow 0 + \frac{1}{2} \cdot \frac{1}{2}$$

$$\Rightarrow 0 + \frac{1}{4}$$

$$\Rightarrow \frac{0+1}{4}$$

$$\Rightarrow \frac{1}{4}$$

Solution - 2

(i) sol :- $\frac{\sin^2 45^\circ + \cos^2 45^\circ}{\tan^2 60^\circ}$

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

$$\Rightarrow \frac{\frac{1}{2} + \frac{1}{2}}{3}$$

$$\Rightarrow \frac{1+1}{2 \cdot 3}$$

$$\Rightarrow \frac{2}{6}$$

$$\Rightarrow \frac{1}{3}$$

$$(ii) \text{ sol } 1 - \frac{\sin 30^\circ - \sin 90^\circ + 2 \cos 0^\circ}{\tan 30^\circ \times \tan 60^\circ}$$

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

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

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

$$\Rightarrow \frac{3}{2}$$

(iii) sol 1 -

$$\frac{4}{3} \tan^2 30^\circ + \sin^2 60^\circ - 3 \cos^2 60^\circ + \frac{3}{4} \tan^2 60^\circ - 2 \tan^2 45^\circ$$

$$\Rightarrow \frac{4}{3} \left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 - 3 \left(\frac{1}{2}\right)^2 + \frac{3}{4} (\sqrt{3})^2 - 2 \cdot (1)^2$$

$$\Rightarrow \frac{4}{3} \cdot \frac{1}{3} + \frac{3}{4} - \frac{3}{4} + \frac{9}{4} - 2$$

$$\Rightarrow \frac{4}{9} + \frac{9}{4} - 2$$

$$\Rightarrow \frac{4 \times 4 + 9 \times 9 - 2 \times 36}{36} = \frac{16 + 81 - 72}{36}$$

$$\Rightarrow \frac{25}{36}$$

Solution - 3 :

$$(i) \quad \frac{\sin 60^\circ}{\cos^2 45^\circ} - 3 \tan 30^\circ + 5 \cos 90^\circ$$

$$\Rightarrow \frac{\frac{\sqrt{3}}{2}}{(\frac{1}{\sqrt{2}})^2} - 3 \frac{1}{\sqrt{3}} + 5(0)$$

$$\Rightarrow \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} - \frac{3}{\sqrt{3}} + 0$$

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

$$\Rightarrow \frac{\sqrt{3} \cdot \sqrt{3} - 3}{\sqrt{3}}$$

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

$$\Rightarrow 0$$

(ii) Sol :

$$2\sqrt{2} \cos 45^\circ \cos 60^\circ + 2\sqrt{3} \sin 30^\circ \tan 60^\circ - \cos 0^\circ$$

$$\Rightarrow 2\sqrt{2} \cdot \frac{1}{\sqrt{2}} \cdot \frac{1}{2} + 2\sqrt{3} \cdot \frac{1}{2} \cdot \sqrt{3} - 1$$

$$\Rightarrow 1 + 3 - 1$$

$$\Rightarrow 3$$

(iii) Sol :

$$\frac{4}{5} \tan^2 60^\circ - \frac{2}{\sin^2 30^\circ} - \frac{3}{4} \tan^2 30^\circ$$

$$\Rightarrow \frac{4}{5} (\sqrt{3})^2 - \frac{2}{(\frac{1}{2})^2} - \frac{3}{4} (\frac{1}{\sqrt{3}})^2$$

$$\Rightarrow \frac{4}{5} \cdot 3 - \frac{2}{(\frac{1}{4})} - \frac{3}{4} \cdot \frac{1}{3}$$

$$\Rightarrow \frac{12}{5} - 8 - \frac{1}{4}$$

$$\Rightarrow \frac{12 \times 4 - 8 \times 5 \times 4 - 1 \times 5}{5 \times 4}$$

$$\Rightarrow \frac{48 - 160 - 5}{20}$$

$$\Rightarrow -\frac{117}{20}$$

$$\Rightarrow -5 \frac{17}{20}$$

Solution - 4 :

(i) Sol :

$$\text{LHS} \Rightarrow \cos^2 30^\circ + \sin^2 30^\circ + \tan^2 45^\circ$$

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

$$\Rightarrow \frac{3}{4} + \frac{1}{2} + 1$$

$$\Rightarrow \frac{3 + 2 + 4}{4}$$

$$\Rightarrow \frac{9}{4}$$

$$\Rightarrow 2\frac{1}{4} //$$

(ii) Solⁿ

$$\text{LHS} \Rightarrow 4 (\sin^4 30^\circ + \cos^4 60^\circ) - 3 (\cos^2 45^\circ - \sin^2 90^\circ)$$

$$\Rightarrow 4 \left[\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^4 \right] - 3 \left(\left(\frac{1}{\sqrt{2}}\right)^2 - 1^2 \right)$$

$$\Rightarrow 4 \left(\frac{1}{16} + \frac{1}{16} \right) - 3 \left(\frac{1}{2} - 1 \right)$$

$$\Rightarrow 4 \left(\frac{1+1}{16} \right) - 3 \left(-\frac{1}{2} \right)$$

$$\Rightarrow 4 \frac{2}{16} + \frac{3}{2}$$

$$\Rightarrow \frac{1}{2} + \frac{3}{2}$$

$$\Rightarrow \frac{1+3}{2}$$

$$\Rightarrow \frac{4}{2}$$

$$\Rightarrow \underline{\underline{2}} = \text{RHS}$$

(iii) Sol :-

$$\text{LHS} \Rightarrow \cos 60^\circ = \frac{1}{2}$$

$$\text{RHS} \Rightarrow \cos^2 30^\circ - \sin^2 30^\circ = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2$$

$$= \frac{3}{4} - \frac{1}{4}$$

$$= \frac{3-1}{4}$$

$$= 2$$

$$= \frac{1}{4}$$

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

\therefore LHS = RHS.

Solution - 5 :

(i) sol : Given $x = 30^\circ$

$$\text{LHS} \Rightarrow \tan 2x$$

$$\Rightarrow \tan 2(30^\circ)$$

$$\Rightarrow \tan 60^\circ$$

$$\Rightarrow \sqrt{3}$$

$$\text{RHS} \Rightarrow \frac{2 \tan x}{1 - \tan^2 x}$$

$$\Rightarrow \frac{2 \cdot \tan 30^\circ}{1 - \tan^2 30^\circ}$$

$$\Rightarrow \frac{2 \cdot \frac{1}{\sqrt{3}}}{1 - \left(\frac{1}{\sqrt{3}}\right)^2}$$

$$\Rightarrow \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}}$$

$$\Rightarrow \frac{\frac{2}{\sqrt{3}}}{\frac{3-1}{3}}$$

$$\Rightarrow \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}}$$

$$\Rightarrow \frac{3 \sqrt{3}}{\sqrt{3} \sqrt{3}}$$

$$\Rightarrow \frac{3\sqrt{3}}{3}$$

$$\Rightarrow \sqrt{3}$$

$$\therefore \text{LHS} = \text{RHS}$$

(ii) Sol :

$$\text{Given } x = 15^\circ$$

$$\text{LHS} \Rightarrow 4 \sin 2x \cdot \cos 4x \cdot \sin 6x$$

$$\Rightarrow 4 \sin(2 \cdot 15) \cdot \cos(4 \cdot 15) \cdot \sin 6(15)$$

$$\Rightarrow 4 \sin 30^\circ \cdot \cos 60^\circ \cdot \sin 90^\circ$$

$$\Rightarrow 4 \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot 1$$

$$\Rightarrow 1$$

$$\therefore \text{LHS} = \text{RHS}$$

Solution-6 :-

(i) Sol :

$$\sqrt{\frac{1 - \cos^2 30^\circ}{1 - \sin^2 30^\circ}}$$

$$(\because \sin^2 A + \cos^2 A = 1)$$

$$\Rightarrow \sqrt{\frac{\sin^2 30^\circ}{\cos^2 30^\circ}}$$

$$\Rightarrow \sqrt{\frac{\left(\frac{1}{2}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2}}$$

$$\Rightarrow \sqrt{\frac{\frac{1}{4}}{\frac{3}{4}}}$$

$$\Rightarrow \frac{1}{\sqrt{3}} //$$

(ii) Sol :-

$$\frac{\sin 45^\circ \cdot \cos 45^\circ \cdot \cos 60^\circ}{\sin 60^\circ \cos 30^\circ \cdot \tan 45^\circ}$$

$$\Rightarrow \frac{\frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} \cdot \frac{1}{2}}{\frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} \cdot 1}$$

$$\Rightarrow \frac{\frac{1}{2}}{\frac{3}{2}}$$

$$\Rightarrow \frac{1}{3}$$

Solution - 7 :

Given $\theta = 30^\circ$

(i) Sol:

$$\begin{aligned} \text{LHS} &\Rightarrow \sin 2\theta = \sin 2 \cdot 30^\circ \\ &= \sin 60 \\ &= \frac{\sqrt{3}}{2} \end{aligned}$$

$$\begin{aligned} \text{RHS} &\Rightarrow 2 \sin \theta \cos \theta = 2 \cdot \sin 30^\circ \cdot \cos 30^\circ \\ &= 2 \cdot \frac{1}{2} \cdot \frac{\sqrt{3}}{2} \\ &= \frac{\sqrt{3}}{2} \end{aligned}$$

$$\therefore \text{LHS} = \text{RHS}$$

(ii) Sol:

$$\begin{aligned} \text{LHS} \Rightarrow \cos 2\theta &= \cos 2 \cdot 30^\circ \\ &= \cos 60^\circ \\ &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{RHS} \Rightarrow 2\cos^2\theta - 1 &= 2 \cdot \cos^2 30^\circ - 1 \\ &= 2 \cdot \left(\frac{\sqrt{3}}{2}\right)^2 - 1 \\ &= 2 \cdot \frac{3}{4} - 1 \\ &= \frac{3-2}{2} \\ &= \frac{1}{2} \end{aligned}$$

$\therefore \text{LHS} = \text{RHS}$.

(iii) Sol:

$$\begin{aligned} \text{LHS} \Rightarrow \sin 3\theta &= \sin 3 \cdot 30^\circ \\ &= \sin 90^\circ \\ &= 1 \end{aligned}$$

$$\begin{aligned} \text{RHS} \Rightarrow 3\sin\theta - 4\sin^3\theta &= 3 \cdot \sin 30^\circ - 4\sin^3 30^\circ \\ &\Rightarrow 3 \cdot \frac{1}{2} - 4 \left(\frac{1}{2}\right)^3 \\ &\Rightarrow \frac{3}{2} - \frac{4}{8} \\ &\Rightarrow \frac{3-1}{2} \end{aligned}$$

$$\Rightarrow \frac{2}{2} = 1$$

$$\therefore \text{LHS} = \text{RHS}$$

(iv) Sol :

$$\begin{aligned} \text{LHS} &= \cos 3\theta \Rightarrow \cos 3 \cdot 30^\circ \\ &\Rightarrow \cos 90^\circ \\ &\Rightarrow 0 \end{aligned}$$

$$\begin{aligned} \text{RHS} &\Rightarrow 4 \cos^3 \theta - 3 \cos \theta = 4 \cdot \cos^3 30^\circ - 3 \cos 30^\circ \\ &= 4 \cdot \left(\frac{\sqrt{3}}{2}\right)^3 - 3 \cdot \frac{\sqrt{3}}{2} \\ &= 4 \cdot \frac{3\sqrt{3}}{8} - \frac{3\sqrt{3}}{2} \\ &= \frac{3\sqrt{3}}{2} - \frac{3\sqrt{3}}{2} \\ &= 0 \end{aligned}$$

$$\therefore \text{LHS} = \text{RHS}$$

Solution - 8 :-

Given $\theta = 30^\circ$

$$\Rightarrow 2 \sin \theta ; \sin 2\theta$$

$$\Rightarrow \frac{2 \sin \theta}{\sin 2\theta} = \frac{2 \cdot \sin 30^\circ}{\sin 2 \cdot 30^\circ}$$

$$= \frac{2 \cdot \frac{1}{2}}{\sin 60}$$

$$= \frac{1}{\frac{\sqrt{3}}{2}}$$

$$\frac{2 \sin \theta}{\sin 2\theta} = \frac{2}{\sqrt{3}}$$

$$\sin 2\theta$$

$$\sqrt{3}$$

$$\therefore 2 \sin \theta : \sin 2\theta = 2 : \sqrt{3}$$

Solution - 9:-

Given $A = 30^\circ$; $B = 60^\circ$

$$\text{LHS} \Rightarrow \sin(A+B)$$

$$\Rightarrow \sin(30^\circ + 60^\circ)$$

$$\Rightarrow \sin 90^\circ$$

$$\Rightarrow 1$$

$$\text{RHS} \Rightarrow \sin A + \sin B$$

$$\Rightarrow \sin 30^\circ + \sin 60^\circ$$

$$\Rightarrow \frac{1}{2} + \frac{\sqrt{3}}{2}$$

$$\Rightarrow \frac{1+\sqrt{3}}{2}$$

$$\therefore \text{LHS} \neq \text{RHS}$$

$$\text{i.e., } \sin(A+B) \neq \sin A + \sin B.$$

Solution - 10:-

Given $A = 60^\circ$, $B = 30^\circ$

(i) Sol:

$$\text{LHS} \Rightarrow \sin(A+B) = \sin(60+30)$$

$$= \sin 90^\circ$$

$$= 1$$

$$\text{RHS} \Rightarrow \sin A \cos B + \cos A \sin B$$

$$\Rightarrow \sin 60^\circ \cdot \cos 30^\circ + \cos 60^\circ \sin 30^\circ$$

$$\Rightarrow \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{1}{2} \cdot \frac{1}{2}$$

$$\Rightarrow \frac{3}{4} + \frac{1}{4} = \frac{3+1}{4} = \frac{4}{4} = 1$$

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(ii) Sol:-

$$A = 60^\circ; B = 30^\circ$$

$$\begin{aligned} \text{LHS} \Rightarrow \cos(A+B) &= \cos(60+30) \\ &= \cos 90^\circ \\ &= 0 \end{aligned}$$

$$\text{RHS} \Rightarrow \cos A \cdot \cos B - \sin A \sin B$$

$$\Rightarrow \cos 60^\circ \cdot \cos 30^\circ - \sin 60^\circ \sin 30^\circ$$

$$\Rightarrow \frac{1}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \cdot \frac{1}{2}$$

$$\Rightarrow \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4}$$

$$\Rightarrow 0$$

$$\therefore \text{LHS} = \text{RHS}$$

$$\text{i.e.} \cos(A+B) = \cos A \cos B - \sin A \sin B.$$

(iii) Sol:-

$$\begin{aligned} \text{LHS} \Rightarrow \sin(A-B) &= \sin(60-30) \\ &= \sin 30^\circ \\ &= \frac{1}{2} \end{aligned}$$

$$\text{RHS} \Rightarrow \sin A \cos B - \cos A \sin B$$

$$\Rightarrow \sin 60^\circ \cdot \cos 30^\circ - \cos 60^\circ \cdot \sin 30^\circ$$

$$\Rightarrow \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{1}{2} \cdot \frac{1}{2}$$

$$\Rightarrow \frac{3}{4} - \frac{1}{4}$$

$$\Rightarrow \frac{3-1}{2} = \frac{1}{2} = \text{RHS}$$

$$\therefore \sin(A-B) = \sin A \cos B - \cos A \sin B$$

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(iv) Sol :-

$$A = 60^\circ ; B = 30^\circ$$

$$\begin{aligned} \text{LHS} \Rightarrow -\tan(A-B) &= -\tan(60-30) \\ &= -\tan 30^\circ \\ &= -\frac{1}{\sqrt{3}} \end{aligned}$$

$$\text{RHS} \Rightarrow \frac{-\tan A - \tan B}{1 + \tan A \cdot \tan B}$$

$$\Rightarrow \frac{-\tan 60^\circ - \tan 30^\circ}{1 + \tan 60^\circ \cdot \tan 30^\circ}$$

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

$$\Rightarrow \frac{\frac{\sqrt{3} \cdot \sqrt{3} - 1}{\sqrt{3}}}{2}$$

$$\Rightarrow \frac{\frac{3-1}{\sqrt{3}}}{2}$$

$$\Rightarrow \frac{\frac{2}{\sqrt{3}}}{2}$$

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

$$\therefore \text{LHS} = \text{RHS}$$

$$\text{ie, } \tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Solution - 11 :-

(i) Sol :

Given $2 \sin 2\theta = \sqrt{3}$

$$\sin 2\theta = \frac{\sqrt{3}}{2}$$

$$\sin 2\theta = \sin 60^\circ$$

$$2\theta = 60$$

$$\theta = \frac{60}{2}$$

$$\theta = 30^\circ$$

(ii) Sol :

Given $\cos(2\theta + x) = \sin 60^\circ$

$$\cos(2\theta + x) = \frac{\sqrt{3}}{2}$$

$$\cos(2\theta + x) = \cos 30^\circ$$

$$2\theta + x = 30^\circ$$

$$x = 30 - 2\theta$$

$$x = 10^\circ$$

(iii) Given $3 \sin^2 \theta = 2 \frac{1}{4}$

$$3 \sin^2 \theta = \frac{9}{4}$$

$$\sin^2 \theta = \frac{9^3}{4 \times 3}$$

$$\sin^2 \theta = \frac{3}{4}$$

$$\sin \theta = \frac{\sqrt{3}}{2}$$

$$\sin \theta = \frac{\sqrt{3}}{2}$$

$$\sin \theta = \frac{\sqrt{3}}{2}$$

$$\sin \theta = \sin 60^\circ$$

$$\theta = \underline{60^\circ}$$

Solution - 12 :-

Given $\sin \theta = \cos \theta$

$$\frac{\sin \theta}{\cos \theta} = 1$$

$$\tan \theta = 1$$

$$\therefore \theta = 45^\circ$$

$$\Rightarrow 2 \tan^2 \theta + \sin^2 \theta - 1$$

$$\Rightarrow 2 \tan^2 45 + \sin^2 45 - 1$$

$$\Rightarrow 2 \cdot (1) + \left(\frac{1}{\sqrt{2}}\right)^2 - 1$$

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

$$\Rightarrow \frac{4 + 1 - 2}{2}$$

$$\Rightarrow \frac{3}{2}$$

Solution - 13 :-

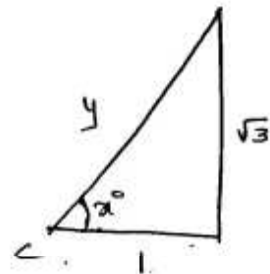
(i) From figure

$$\tan x^\circ = \frac{\sqrt{3}}{1}$$

$$\tan x^\circ = \sqrt{3}$$

(ii)

$$x = 60^\circ$$



Solution - 15 :-

Given $\tan 3x = \sin 45^\circ \cdot \cos 45^\circ + \sin 30^\circ$

$$\tan 3x = \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} + \frac{1}{2}$$

$$= \frac{1}{2} + \frac{1}{2}$$

$$= \frac{1+1}{2}$$

$$= \frac{2}{2}$$

$$\tan 3x = 1$$

$$\tan 3x = \tan 45^\circ$$

$$3x = 45^\circ$$

$$x = 15^\circ$$

$$x = 15^\circ$$

Solution - 16 :

(i) Given $4\cos^2 x - 1 = 0$

$$4\cos^2 x = 1$$

$$\cos^2 x = \frac{1}{4}$$

$$\cos x = \frac{1}{\sqrt{4}}$$

$$\cos x = \frac{1}{2}$$

$$\cos x = \cos 60^\circ$$

$$x = 60^\circ$$

(ii) $\sin^2 x + \cos^2 x \Rightarrow \sin^2 60^\circ + \cos^2 60^\circ$

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

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$$\Rightarrow 1 \frac{3}{4} + \frac{1}{4}$$

$$\Rightarrow \frac{3+1}{4}$$

$$\Rightarrow \frac{4}{4}$$

$$\Rightarrow 1.$$

$$(iii) \cos^2 x^\circ - \sin^2 x^\circ$$

$$\Rightarrow \cos^2 60^\circ - \sin^2 60^\circ$$

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

$$\Rightarrow \frac{1}{4} - \frac{3}{4}$$

$$\Rightarrow \frac{1-3}{4}$$

$$\Rightarrow \frac{-2}{4}$$

$$\Rightarrow -\frac{1}{2}$$

Solution - 17 :-

(i) Sol:

Given $\sec \theta = \operatorname{cosec} \theta$

$$\frac{1}{\cos \theta} = \frac{1}{\sin \theta}$$

$$\sin \theta = \cos \theta$$

$$\frac{\sin \theta}{\cos \theta} = 1$$

$$\tan \theta = 1$$

$$\theta = 45^\circ$$

(ii) Sol: i

$$\text{Given } \tan \theta = \cot \theta$$

$$\frac{\tan \theta}{\cot \theta} = 1$$

$$\left(\because \tan \theta = \frac{1}{\cot \theta} \right)$$

$$\tan^2 \theta = 1$$

$$\therefore \theta = 45^\circ$$

Solution- 18 :-

$$\text{Given } \sin 3x = 1$$

$$\sin 3x = \sin 90^\circ$$

$$3x = 90^\circ$$

$$x = \frac{90^\circ}{3}$$

$$x = 30^\circ$$

(i) Sol: i

$$\sin x \Rightarrow \sin 30 = \frac{1}{2}$$

$$(ii) \cos 2x \Rightarrow \cos 2 \cdot 30^\circ$$

$$\Rightarrow \cos 60^\circ$$

$$\rightarrow \frac{1}{2}$$

$$(iii) \tan^2 x - \sec^2 x = \tan^2 30^\circ - \sec^2 30^\circ$$

$$= \left(\frac{1}{\sqrt{3}} \right)^2 - \left(\frac{2}{\sqrt{3}} \right)^2$$

$$= \frac{1}{3} - \frac{4}{3}$$

$$= \frac{1-4}{3} = \frac{-3}{3} = -1$$

Solution - 19 :

Given $3 \tan^2 \theta - 1 = 0$

$$3 \tan^2 \theta = 1$$

$$\tan^2 \theta = \frac{1}{3}$$

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

$$\theta = 30^\circ$$

$$\therefore \cos 2\theta = \cos 2 \cdot 30^\circ$$

$$= \cos 60^\circ$$

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

Solution - 20 :-

Given $\sin x + \cos y = 1$

$$x = 30^\circ$$

$$\therefore \sin 30^\circ + \cos y = 1$$

$$\frac{1}{2} + \cos y = 1$$

$$\cos y = 1 - \frac{1}{2}$$

$$\cos y = \frac{1}{2}$$

$$y = 60^\circ$$

Solution - 21 :-

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$$\text{Given } \sin(A+B) = \frac{\sqrt{3}}{2} = \cos(A-B)$$

$$\sin(A+B) = \frac{\sqrt{3}}{2}$$

$$\sin(A+B) = \sin 60^\circ$$

$$A+B = 60^\circ \text{ ----- (i)}$$

$$\cos(A-B) = \frac{\sqrt{3}}{2}$$

$$\cos(A-B) = \cos 30^\circ$$

$$A-B = 30^\circ \text{ ----- (ii)}$$

From (i) & (ii)

$$A+B = 60^\circ$$

$$A-B = 30^\circ$$

$$2A = 90^\circ$$

$$A = 45^\circ$$

From (i) $\Rightarrow A+B = 60^\circ$

$$45^\circ + B = 60^\circ$$

$$B = 60^\circ - 45^\circ$$

$$B = 15^\circ$$

$$\therefore A = 45^\circ ; B = 15^\circ$$

Solution-22 :

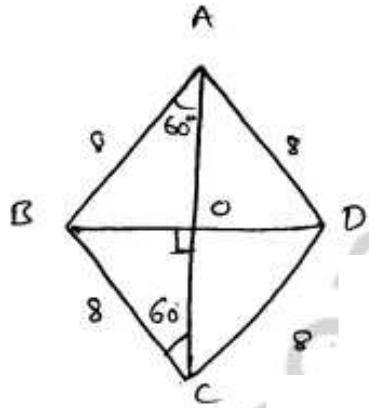
From fig $\triangle BOC$.

$$\sin 60 = \frac{BO}{BC}$$

$$\frac{\sqrt{3}}{2} = \frac{BO}{8}$$

$$BO = \frac{8 \cdot \sqrt{3}}{2}$$

$$BO = 4\sqrt{3}$$



Similarly from $\triangle OCD$

$$\sin 60 = \frac{OD}{CD}$$

$$\frac{\sqrt{3}}{2} = \frac{OD}{8}$$

$$OD = 4\sqrt{3}$$

$$\therefore BD = BO + OD = 4\sqrt{3} + 4\sqrt{3} = 8\sqrt{3}$$

and from $\triangle BOC$; $\cos 60 = \frac{OC}{BC}$

$$\frac{OC}{8} = \frac{1}{2}$$

$$OC = 4$$

from $\triangle AOB$; $\cos 60 = \frac{OA}{AB}$

$$\frac{1}{2} = \frac{OA}{8}$$

$$OA = 4$$

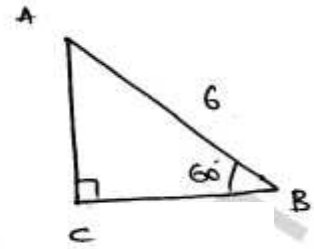
$$\therefore AC = OA + OC = 4 + 4 = \underline{8}$$

Solution-23

Given $AB = 6$

$\angle C = 90^\circ$

$\angle B = 60^\circ$



From fig :

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

$$\frac{\sqrt{3}}{2} = \frac{AC}{6}$$

$$AC = \frac{6 \cdot \sqrt{3}}{2}$$

$$AC = 3\sqrt{3}$$

from fig

$$\cos 60 = \frac{BC}{AB}$$

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

$$BC = \frac{6}{2}$$

$$BC = 3$$

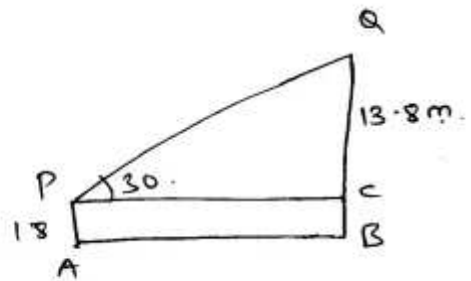
Solution-24

Given $AP = 1.8\text{m}$.

$QC = QB - CB$

$\therefore CB = AP = 1.8\text{m}$.

$QC = 13.8 - 1.8$



$$QC = 12 \text{ m}$$

from fig ; $\tan 30^\circ = \frac{QC}{PC}$

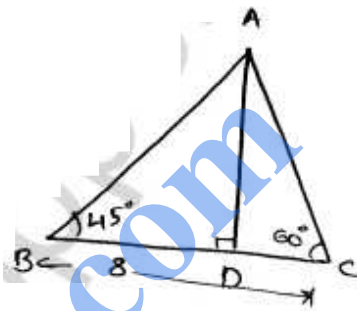
$$\frac{1}{\sqrt{3}} = \frac{12}{PC}$$

$$PC = 12\sqrt{3} \text{ mts}$$

PC = distance of man from the building is $12\sqrt{3}$ mts

Solution - 25 :-

$$\begin{aligned} \Delta ABC ; \angle B &= 45^\circ \\ \angle C &= 60^\circ \\ BC &= 8 \text{ m} \end{aligned}$$



from figure ΔABD

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

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

$$AD = BD \quad \text{--- (i)}$$

In ΔADC ; $\tan 60^\circ = \frac{AD}{DC}$

$$\sqrt{3} = \frac{AD}{DC}$$

$$\Rightarrow DC = \frac{AD}{\sqrt{3}}$$

$$\therefore BC = 8$$

$$\Rightarrow BD + DC = 8$$

$$\Rightarrow AD + \frac{AD}{\sqrt{3}} = 8$$

$$\sqrt{3}AD + AD = 8$$

$$(\sqrt{3}+1)AD = 8\sqrt{3}$$

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$$AD = \frac{8\sqrt{3}}{\sqrt{3}+1}$$

$$AD = \frac{8\sqrt{3}}{\sqrt{3}+1} \cdot \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$= \frac{8\sqrt{3}(\sqrt{3}-1)}{3-1}$$

$$= \frac{8 \times 3 - 8\sqrt{3}}{2}$$

$$= \frac{24 - 8\sqrt{3}}{2}$$

$$= 12 - 4\sqrt{3}$$

$$AD = 4(3 - \sqrt{3})$$

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EXERCISE - 17.2Solution - 1 :

(i) Sol :

$$\text{Given } \frac{\cos 18^\circ}{\sin 72^\circ}$$

$$\Rightarrow \frac{\cos 18^\circ}{\sin (90^\circ - 18^\circ)}$$

$$\Rightarrow \frac{\cos 18^\circ}{\cancel{\cos 18^\circ}}$$

$$\Rightarrow 1$$

$$\therefore \sin(90^\circ - \theta) = \cos \theta$$

(ii) Sol :-

$$\text{Given } \frac{\tan 41^\circ}{\cot 49^\circ}$$

$$\Rightarrow \frac{\tan 41^\circ}{\cot (90^\circ - 41^\circ)}$$

$$\Rightarrow \frac{\tan 41^\circ}{\tan 41^\circ}$$

$$\Rightarrow 1$$

$$\cot(90^\circ - \theta) = \tan \theta$$

(iii) Sol :-

$$\text{Given } \frac{\operatorname{cosec} 17^\circ 30'}{\sec 72^\circ 30'}$$

$$= \frac{\operatorname{cosec} 17^\circ 30'}{\sec (90^\circ - 17^\circ 30')}$$

$$\Rightarrow \frac{\operatorname{cosec} 17^\circ 30'}{\cancel{\operatorname{cosec} 17^\circ 30'}}$$

$$\Rightarrow 1$$

$$\sec(90^\circ - \theta) = \operatorname{cosec} \theta$$

Solution - 2 :-

$$(i) \text{ Sol: } \frac{\cot 40^\circ}{\tan 50^\circ} - \frac{1}{2} \left(\frac{\cos 35^\circ}{\sin 55^\circ} \right)$$

$$\Rightarrow \frac{\cot 40^\circ}{\tan(90-40^\circ)} - \frac{1}{2} \left[\frac{\cos 35^\circ}{\sin(90-35^\circ)} \right]$$

$$\Rightarrow \frac{\cancel{\cot 40^\circ}}{\cancel{\cot 40^\circ}} - \frac{1}{2} \left(\frac{\cancel{\cos 35^\circ}}{\cancel{\cos 35^\circ}} \right)$$

$$\Rightarrow 1 - \frac{1}{2}$$

$$\Rightarrow \frac{2-1}{2}$$

$$\Rightarrow \frac{1}{2} //$$

(ii) Sol:

$$\left(\frac{\sin 49^\circ}{\cos 41^\circ} \right)^2 + \left(\frac{\cos 41^\circ}{\sin 49^\circ} \right)^2$$

$$\Rightarrow \left[\frac{\sin 49^\circ}{\cos(90-49^\circ)} \right]^2 + \left[\frac{\cos 41^\circ}{\sin(90-41^\circ)} \right]^2$$

$$\Rightarrow \left(\frac{\cancel{\sin 49^\circ}}{\cancel{\sin 49^\circ}} \right)^2 + \left(\frac{\cancel{\cos 41^\circ}}{\cancel{\cos 41^\circ}} \right)^2$$

$$\Rightarrow 1^2 + 1^2$$

$$\Rightarrow 1 + 1$$

$$\Rightarrow 2$$

$$(iii) \text{ Sol: } \frac{\sin 72^\circ}{\cos 18^\circ} - \frac{\sec 32^\circ}{\operatorname{cosec} 58^\circ}$$

$$\Rightarrow \frac{\sin 72^\circ}{\cos(90-18^\circ)} - \frac{\sec 32^\circ}{\operatorname{cosec}(90-58^\circ)}$$

$$\Rightarrow \frac{\sin 72^\circ}{\sin 72^\circ} - \frac{\sec 32^\circ}{\sec 32^\circ}$$

$$\Rightarrow 1 - 1$$

$$\Rightarrow 0$$

$$(iv) \text{ Sol: } \frac{\cos 75^\circ}{\sin 15^\circ} + \frac{\sin 12^\circ}{\cos 78^\circ} - \frac{\sin 72^\circ}{\sin 72^\circ}$$

$$\Rightarrow \frac{\cos 75^\circ}{\sin(90-75^\circ)} + \frac{\sin 12^\circ}{\cos(90-12^\circ)} - \frac{\cos 18^\circ}{\sin(90-18^\circ)}$$

$$\Rightarrow \frac{\cos 75^\circ}{\cos 75^\circ} + \frac{\sin 12^\circ}{\sin 12^\circ} - \frac{\cos 18^\circ}{\cos 18^\circ}$$

$$\Rightarrow 1 + 1 - 1$$

$$\Rightarrow 1$$

$$(v) \text{ Sol: } \frac{\sin 25^\circ}{\sec 65^\circ} + \frac{\cos 25^\circ}{\operatorname{cosec} 65^\circ}$$

$$\Rightarrow \frac{\sin 25^\circ}{\sec(90-25^\circ)} + \frac{\cos 25^\circ}{\operatorname{cosec}(90-25^\circ)}$$

$$\Rightarrow \frac{\sin 25^\circ}{\operatorname{cosec} 25^\circ} + \frac{\cos 25^\circ}{\sec 25^\circ}$$

$$\Rightarrow \frac{\sin 25^\circ}{\frac{1}{\sin 25^\circ}} + \frac{\cos 25^\circ}{\frac{1}{\cos 25^\circ}}$$

$$\Rightarrow \sin^2 25^\circ + \cos^2 25^\circ$$

$$(\because \cos^2 \theta + \sin^2 \theta = 1)$$

$$\Rightarrow 1$$

Solution-3 :

(i) Sol : $\sin 62^\circ - \cos 28^\circ$

$$\Rightarrow \sin 62^\circ - \cos(90 - 62^\circ)$$

$$\Rightarrow \sin 62^\circ - \sin 62^\circ$$

$$\Rightarrow 0$$

(ii) Sol : $\operatorname{cosec} 35^\circ - \sec$

$$\Rightarrow \operatorname{cosec} 35^\circ - \sec(90 - 35^\circ)$$

$$\Rightarrow \operatorname{cosec} 35^\circ - \sec 55^\circ$$

$$\Rightarrow 0$$

Solution-4 :

(i) Sol : $\cos^2 26^\circ + \cos 64^\circ \sin 26^\circ + \frac{\tan 36^\circ}{\cot 54^\circ}$

$$\Rightarrow \cos^2 26^\circ + \cos(90 - 26^\circ) \sin 26^\circ + \frac{\tan 36^\circ}{\cot(90 - 36^\circ)}$$

$$\Rightarrow \cos^2 26^\circ + \sin 26^\circ \sin 26^\circ + \frac{\tan 36^\circ}{\tan 36^\circ}$$

$$\Rightarrow \cos^2 26^\circ + \sin^2 26^\circ + 1$$

$$\Rightarrow 1 + 1 = 2 //$$

$$(ii) \frac{\sec 17^\circ}{\operatorname{cosec} 73^\circ} + \frac{\tan 68^\circ}{\cot 22^\circ} + \cos^2 44^\circ + \cos^2 46^\circ$$

$$\Rightarrow \frac{\sec 17^\circ}{\operatorname{cosec} (90-17)} + \frac{\tan 68^\circ}{\cot (90-68)} + \cos^2 46^\circ + \cos^2 44^\circ$$

$$\Rightarrow \frac{\sec 17^\circ}{\sec 17^\circ} + \frac{\tan 68^\circ}{\tan 68^\circ} + \cos^2 (90-44^\circ) + \cos^2 44^\circ$$

$$\Rightarrow 1 + 1 + (\sin^2 44^\circ + \cos^2 44^\circ)$$

$$\Rightarrow 2 + 1$$

$$\Rightarrow \underline{3}$$

Solution -5 :-

$$(i) \text{ Sol :- } \frac{\sin 65^\circ}{\cos 25^\circ} + \frac{\cos 32^\circ}{\sin 58^\circ} - \sin 28^\circ \sec 62^\circ + \operatorname{cosec}^2 30^\circ$$

$$\Rightarrow \frac{\sin 65^\circ}{\cos (90-65^\circ)} + \frac{\cos 32^\circ}{\sin (90-32^\circ)} - \sin 28^\circ \sec (90-28^\circ) + (2)^2$$

$$\Rightarrow \frac{\sin 65^\circ}{\sin 65^\circ} + \frac{\cos 32^\circ}{\cos 32^\circ} - \sin 28^\circ \cdot \operatorname{cosec} 28^\circ + 4$$

$$\Rightarrow 1 + 1 - \sin 28^\circ \frac{1}{\sin 28^\circ} + 4$$

$$\Rightarrow 6 - 1$$

$$\Rightarrow \underline{5}$$

$$(ii) \text{ Sol: } \frac{\sec 29^\circ}{\operatorname{cosec} 61^\circ} + 2 \cot 8^\circ \cdot \cot 17^\circ \cdot \cot 45^\circ \cdot \cot 73^\circ \cdot \cot 82^\circ - 3 (\sin^2 38^\circ + \sin^2 52^\circ)$$

$$\Rightarrow \frac{\sec 29^\circ}{\operatorname{cosec}(90-29^\circ)} + 2 \cot(90-82^\circ) \cdot \cot(90-73^\circ) \cot 45^\circ \cot 73^\circ \cot 82^\circ - 3 (\sin^2 38^\circ + \sin^2(90-38^\circ))$$

$$\Rightarrow \frac{\sec 29^\circ}{\operatorname{cosec} 29^\circ} + 2 \cot 82^\circ \tan 82^\circ \cdot \cot 17^\circ \cdot \tan 17^\circ \cot 45^\circ - 3 (\sin^2 38^\circ + \cos^2 38^\circ)$$

$$\Rightarrow 1 + 2(1) - 3(1)$$

$$\Rightarrow 1 + 2 - 3$$

$$\Rightarrow \underline{0}$$

Solution - 6 :-

$$(i) \text{ Sol: } \tan 81^\circ + \cos 72^\circ$$

$$\Rightarrow \tan(90-9^\circ) + \cos(90-18^\circ)$$

$$\Rightarrow \cot 9^\circ + \sin 18^\circ$$

$$(ii) \text{ Sol: } \Rightarrow \cot 49^\circ + \operatorname{cosec} 87^\circ$$

$$\Rightarrow \cot(90-41^\circ) + \operatorname{cosec}(90-3^\circ)$$

$$\Rightarrow \tan 41^\circ + \sec 3^\circ$$

Solution - 7 :

$$(i) \text{ Sol: } \sin^2 28^\circ - \cos^2 62^\circ = 0$$

$$\text{LHS} \Rightarrow \sin^2 28^\circ - \cos^2 62^\circ$$

$$\Rightarrow \sin^2 28^\circ - \cos^2 (90 - 28^\circ)$$

$$\Rightarrow \sin^2 28^\circ - \sin^2 28^\circ$$

$$\Rightarrow 0$$

$$\therefore \text{LHS} = \text{RHS}$$

$$(ii) \text{ Sol: } \text{LHS} \Rightarrow \cos^2 25^\circ + \cos^2 \dots$$

$$\Rightarrow \cos^2 25^\circ + \cos^2 (90 - 25^\circ)$$

$$\Rightarrow \cos^2 25^\circ + \sin^2 25^\circ$$

$$\Rightarrow 1$$

$$= \text{RHS}$$

$$\therefore \text{LHS} = \text{RHS}$$

$$(iii) \text{ Sol: } \rightarrow \operatorname{cosec}^2 67^\circ - \tan^2 23^\circ$$

$$\Rightarrow \operatorname{cosec}^2 (90 - 23^\circ) - \tan^2 23^\circ$$

$$\Rightarrow \sec^2 23^\circ - \tan^2 23^\circ$$

$$\Rightarrow 1$$

$$\therefore \text{LHS} = \text{RHS}$$

$$(iv) \text{ Sol: } \text{LHS} \Rightarrow \sec^2 22^\circ - \cot^2 68^\circ$$

$$\Rightarrow \sec^2 22^\circ - \cot^2 (90 - 22^\circ)$$

$$\Rightarrow \sec^2 22^\circ - \tan^2 22^\circ$$

$$\Rightarrow 1 = \text{RHS}$$

Solution - 8 :-

(i) Sol: LHS $\Rightarrow \sin 63^\circ \cdot \cos 27^\circ + \cos 63^\circ \sin 27^\circ$
 $\Rightarrow \sin 63^\circ \cos (90-63^\circ) + \cos 63^\circ \sin (90-63^\circ)$
 $\Rightarrow \sin 63^\circ \sin 63^\circ + \cos 63^\circ \cdot \cos 63^\circ$
 $\Rightarrow \sin^2 63^\circ + \cos^2 63^\circ$
 $\Rightarrow \underline{1}$

\therefore LHS = RHS.

(ii) Sol: LHS $\Rightarrow \sec 31^\circ \sin 59^\circ + \cos 31^\circ \operatorname{cosec} 59^\circ$
 $\Rightarrow \sec 31^\circ \sin (90-31^\circ) + \cos 31^\circ \operatorname{cosec} (90-31^\circ)$
 $\Rightarrow \sec 31^\circ \cos 31^\circ + \cos 31^\circ \sec 31^\circ$
 $\Rightarrow 2 \sec 31^\circ \cos 31^\circ$
 $\Rightarrow 2 \frac{1}{\cos 31^\circ} \cdot \cos 31^\circ$
 $\Rightarrow \underline{2}$

\therefore LHS = RHS.

Solution - 9 :-

(i) Sol: LHS $\Rightarrow \sec 70^\circ \sin 20^\circ - \cos 20^\circ \cdot \operatorname{cosec} 70^\circ$
 $\Rightarrow \sec 70^\circ \sin (90-70^\circ) - \cos 20^\circ \operatorname{cosec} (90-20^\circ)$
 $\Rightarrow \sec 70^\circ \cdot \cos 20^\circ - \cos 20^\circ \sec 70^\circ$
 $\Rightarrow \underline{0}$

$$\begin{aligned}
 \text{(ii) Sol: LHS} &\Rightarrow \sin^2 20^\circ + \sin^2 70^\circ - \tan^2 45^\circ \\
 &\Rightarrow \sin^2 20^\circ + \sin^2 (90-20^\circ) - \tan^2 45^\circ \\
 &\Rightarrow \sin^2 20^\circ + \cos^2 20^\circ - (1)^2 \\
 &\Rightarrow (1) - (1) \\
 &\Rightarrow 0
 \end{aligned}$$

$\therefore \text{LHS} = \text{RHS.}$

Solution - 10 :-

$$\begin{aligned}
 \text{(i) Sol: LHS} &\Rightarrow \frac{\cot 54^\circ}{\tan 36^\circ} + \frac{\tan 20^\circ}{\cot 70^\circ} - 2 \\
 &\Rightarrow \frac{\cot 54^\circ}{\tan(90-54^\circ)} + \frac{\tan 20^\circ}{\cot(90-20^\circ)} - 2 \\
 &\Rightarrow \frac{\cot 54^\circ}{\tan 36^\circ} + \frac{\tan 20^\circ}{\cot 70^\circ} - 2 \\
 &\Rightarrow 1 + 1 - 2 \\
 &\Rightarrow 0 \\
 &\therefore \text{LHS} = \text{RHS.}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Sol: LHS} &\Rightarrow \frac{\cos 80^\circ}{\sin 10^\circ} + \cos 59^\circ \operatorname{cosec} 31^\circ \\
 &\Rightarrow \frac{\cos 80^\circ}{\sin(90-80^\circ)} + \cos 59^\circ \operatorname{cosec}(90-31^\circ) \\
 &\Rightarrow \frac{\cos 80^\circ}{\cos 80^\circ} + \cos 59^\circ \sec 59^\circ \\
 &\Rightarrow 1 + 1 = 2 = \text{RHS.}
 \end{aligned}$$

Solution - 12 :-

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(i) Sol:

$$2 \left(\frac{\tan 35^\circ}{\cot 55^\circ} \right)^2 + \left(\frac{\cot 55^\circ}{\tan 35^\circ} \right) - 3 \left(\frac{\sec 40^\circ}{\operatorname{cosec} 50^\circ} \right)$$

$$\Rightarrow 2 \left[\frac{\tan 35^\circ}{\cot(90-35^\circ)} \right]^2 + \frac{\cot 55^\circ}{\tan(90-55^\circ)} - 3 \left(\frac{\sec 40^\circ}{\operatorname{cosec}(90-40^\circ)} \right)$$

$$\Rightarrow 2 \left(\frac{\tan 35^\circ}{\tan 35^\circ} \right)^2 + \frac{\cot 55^\circ}{\cot 55^\circ} - 3 \frac{\sec 40^\circ}{\sec 40^\circ}$$

$$\Rightarrow 2 + 1 - 3$$

$$\Rightarrow 0$$

(ii) Sol:

$$\frac{\sin 35^\circ \cos 55^\circ + \cos 35^\circ \sin 55^\circ}{\operatorname{cosec}^2 10^\circ - \tan^2 80^\circ}$$

$$\Rightarrow \frac{\sin 35^\circ \cdot \cos(90-35^\circ) + \cos 35^\circ \sin(90-35^\circ)}{\operatorname{cosec}^2(90-80^\circ) - \tan^2 80^\circ}$$

$$\Rightarrow \frac{\sin 35^\circ \cdot \sin 35^\circ + \cos 35^\circ \cdot \cos 35^\circ}{\sec^2 80^\circ + \tan^2 80^\circ}$$

$$\Rightarrow \frac{\sin^2 35^\circ + \cos^2 35^\circ}{\sec^2 80^\circ + \tan^2 80^\circ}$$

$$\Rightarrow \frac{1}{1}$$

$$\Rightarrow 1$$

(iii) Sol: $\sin^2 34^\circ + \sin^2 56^\circ + 2 \tan 18^\circ \cdot \tan 72^\circ - \cot^2 30^\circ$

$$\Rightarrow \sin^2 34^\circ + \sin^2 (90 - 34^\circ) + 2 \tan 18^\circ \cdot \tan (90 - 18^\circ) - \cot^2 30^\circ$$

$$\Rightarrow (\sin^2 34^\circ + \cos^2 34^\circ) + 2 \tan 18^\circ \cdot \cot 18^\circ - (\sqrt{3})^2$$

$$\Rightarrow 1 + 2 - 3$$

$$\Rightarrow 0$$

Solution - 13 :-

(i) Sol: LHS $\Rightarrow \frac{\cos \theta}{\sin(90 - \theta)} + \frac{\sin \theta}{\cos(90 - \theta)}$

$$\Rightarrow \frac{\cos \theta}{\cos \theta} + \frac{\sin \theta}{\sin \theta}$$

$$\Rightarrow 1 + 1$$

$$\Rightarrow 2$$

$$\therefore \text{LHS} = \text{RHS}$$

(ii) Sol:

$$\text{LHS} \Rightarrow \cos \theta \cdot \sin(90 - \theta) + \sin \theta \cdot \cos(90 - \theta)$$

$$\Rightarrow \cos \theta \cdot \cos \theta + \sin \theta \cdot \sin \theta$$

$$\Rightarrow \cos^2 \theta + \sin^2 \theta$$

$$\Rightarrow 1$$

$$\therefore \text{LHS} = \text{RHS}$$

(ii) Sol:

$$\text{LHS} = \frac{\tan \theta}{\tan(90^\circ - \theta)} + \frac{\sin(90^\circ - \theta)}{\cos \theta}$$

$$\Rightarrow \frac{\tan \theta}{\cot \theta} + \frac{\cos \theta}{\cos \theta}$$

$$\Rightarrow \frac{\tan \theta}{\left(\frac{1}{\tan \theta}\right)} + 1$$

$$\Rightarrow \tan^2 \theta + 1$$

$$\Rightarrow \sec^2 \theta$$

$$\therefore \text{LHS} = \text{RHS}$$

$$\left(\because \sec^2 \theta - \tan^2 \theta = 1 \right)$$

(iv) Solution - 14 :

(i) Sol:

$$\text{LHS} \Rightarrow \frac{\cos(90^\circ - A) \cdot \sin(90^\circ - A)}{\tan(90^\circ - A)}$$

$$\Rightarrow \frac{\sin A \cdot \cos A}{\cot A}$$

$$\Rightarrow \frac{\sin A \cdot \cos A}{\frac{\cos A}{\sin A}}$$

$$\Rightarrow \sin^2 A$$

$$\Rightarrow 1 - \cos^2 A$$

$$\left(\because \sin^2 A + \cos^2 A = 1 \right)$$

(ii) Sol:

$$\text{LHS} \Rightarrow \frac{\sin(90^\circ - A)}{\operatorname{cosec}(90^\circ - A)} + \frac{\cos(90^\circ - A)}{\sec(90^\circ - A)}$$

$$\Rightarrow \frac{\sin \cos A}{\sec A} + \frac{\sin A}{\operatorname{cosec} A}$$

$$\Rightarrow \frac{\cos A}{\left(\frac{1}{\cos A}\right)} + \frac{\sin A}{\left(\frac{1}{\sin A}\right)}$$

$$\Rightarrow \cos A \cdot \cos A + \sin A \cdot \sin A$$

$$\Rightarrow \cos^2 A + \sin^2 A$$

$$\Rightarrow 1$$

$$\therefore \text{LHS} = \text{RHS.}$$

Solution-15 :

$$(i) \text{ Sol: } \frac{\cos \theta}{\sin(90^\circ - \theta)} + \frac{\cos(90^\circ - \theta)}{\sec(90^\circ - \theta)} = 3 \tan^2 30^\circ$$

$$\Rightarrow \frac{\cos \theta}{\cos \theta} + \frac{\sin A}{\operatorname{cosec} \theta} = 3 \left(\frac{1}{\sqrt{3}}\right)^2$$

$$\Rightarrow 1 + \frac{\sin A}{\left(\frac{1}{\sin A}\right)} = 3 \cdot \frac{1}{3}$$

$$\Rightarrow 1 + \sin^2 A = 1$$

$$\Rightarrow \sin^2 A = 0$$

$$(ii) \text{ Sol :- } \frac{\operatorname{cosec}(90^\circ - \theta) \cdot \sin(90^\circ - \theta) \cdot \cot(90^\circ - \theta)}{\cos(90^\circ - \theta) \cdot \sec(90^\circ - \theta) \cdot \tan \theta} + \frac{\cot \theta}{\tan(90^\circ - \theta)} \quad (90)$$

$$\rightarrow \frac{\sec \theta \cdot \cos \theta \cdot \cancel{\tan \theta}}{\sin \theta \cdot \operatorname{cosec} \theta \cdot \cancel{\tan \theta}} + \frac{\cot \theta}{\cot \theta}$$

$$\Rightarrow \frac{\frac{1}{\cos \theta} \cdot \cos \theta}{\sin \theta \cdot \frac{1}{\sin \theta}} + 1$$

$$\Rightarrow 1 + 1$$

$$\Rightarrow \underline{\underline{2}}$$

Solution - 16 :-

$$(i) \text{ Sol :- } \cancel{1418} : \cos 63^\circ \cdot \sec(90^\circ - \theta) = 1$$

$$\rightarrow \cos 63^\circ \cdot \operatorname{cosec} \theta = 1$$

$$\rightarrow \cos 63^\circ = \frac{1}{\operatorname{cosec} \theta}$$

$$\Rightarrow \cos 63^\circ = \sin \theta$$

$$\Rightarrow \cos 63^\circ = \cos(90^\circ - \theta)$$

$$\therefore 90^\circ - \theta = 63^\circ$$

$$\theta = 90^\circ - 63^\circ$$

$$\theta = \underline{\underline{27^\circ}}$$

$$(ii) \quad \tan 35^\circ \cdot \cot(90^\circ - \theta) = 1$$

$$\cot(90^\circ - \theta) = \frac{1}{\tan 35^\circ}$$

$$\cot(90^\circ - \theta) = \cot 35^\circ$$

$$90^\circ - \theta = 35^\circ$$

$$\theta = 90^\circ - 35^\circ$$

$$\theta = 55^\circ$$

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