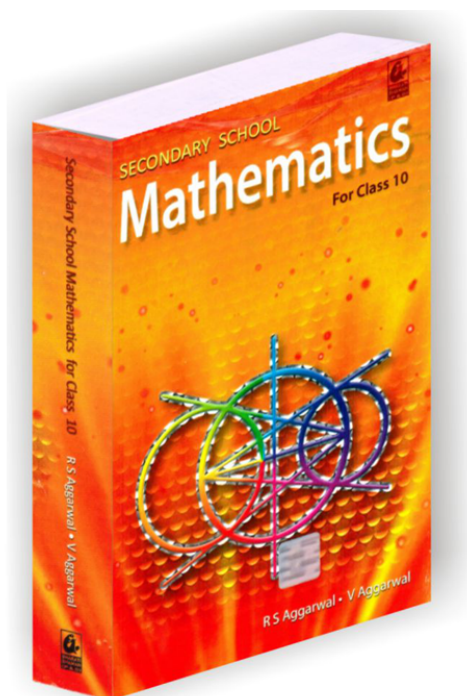


RS Aggarwal Solutions for Class 10 Maths Chapter 12–Trigonometric Ratios Of Some Complementary Angles

Class 10 - Chapter 12 Trigonometric Ratios Of Some Complementary Angles



For any clarifications or questions you can write to info@indcareer.com

Postal Address

IndCareer.com, 52, Shilpa Nagar, Somalwada Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888, **Website:** <https://www.indcareer.com>

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RS Aggarwal Solutions for Class 10 Maths Chapter 12–Trigonometric Ratios Of Some Complementary Angles

Class 10: Maths Chapter 12 solutions. Complete Class 10 Maths Chapter 12 Notes.

RS Aggarwal Solutions for Class 10 Maths Chapter 12–Trigonometric Ratios Of Some Complementary Angles

RS Aggarwal 10th Maths Chapter 12, Class 10 Maths Chapter 1 solutions

Question 1.

Solution:

(i)

$$\frac{\sin 16^\circ}{\cos 74^\circ} = \frac{\sin(90^\circ - 74^\circ)}{\cos 74^\circ} = \frac{\cos 74^\circ}{\cos 74^\circ} = 1$$

$[\because \sin(90^\circ - \theta) = \cos \theta]$

(ii)

$$\frac{\sec 11^\circ}{\operatorname{cosec} 79^\circ} = \frac{\sec(90^\circ - 79^\circ)}{\operatorname{cosec} 79^\circ} = \frac{\operatorname{cosec} 79^\circ}{\operatorname{cosec} 79^\circ} = 1$$

(iii)

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$$\frac{\tan 27^\circ}{\cot 63^\circ} = \frac{\tan(90^\circ - 63^\circ)}{\cot 63^\circ} = \frac{\cot 63^\circ}{\cot 63^\circ} = 1$$

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

(iv)

$$\frac{\cos 35^\circ}{\sin 55^\circ} = \frac{\cos 35^\circ}{\sin(90^\circ - 35^\circ)} = \frac{\cos 35^\circ}{\cos 35^\circ} = 1$$

(v)

$$\frac{\operatorname{cosec} 42^\circ}{\sec 48^\circ} = \frac{\operatorname{cosec} 42^\circ}{\sec(90^\circ - 42^\circ)} = \frac{\operatorname{cosec} 42^\circ}{\operatorname{cosec} 42^\circ} = 1$$

(vi)

$$\frac{\cot 38^\circ}{\tan 52^\circ} = \frac{\cot 38^\circ}{\tan(90^\circ - 38^\circ)} = \frac{\cot 38^\circ}{\cot 38^\circ} = 1$$

Question 2.

Solution:

(i) LHS = $\cos 81^\circ - \sin 9^\circ$

$$= \cos(90^\circ - 9^\circ) - \sin 9^\circ = \sin 9^\circ - \sin 9^\circ$$

$$= 0 = \text{RHS}$$

(ii) LHS = $\tan 71^\circ - \cot 19^\circ$

$$= \tan(90^\circ - 19^\circ) - \cot 19^\circ = \cot 19^\circ - \cot 19^\circ$$

$$= 0 = \text{RHS}$$

(iii) LHS = $\operatorname{cosec} 80^\circ - \sec 10^\circ$

$$= \operatorname{cosec}(90^\circ - 10^\circ) - \sec(10^\circ)$$

$$= \sec 10^\circ - \sec 10^\circ = 0$$

$$= \text{RHS}$$

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$$(iv) LHS = \operatorname{cosec}^2 72^\circ - \tan^2 18^\circ$$

$$\begin{aligned} &= \operatorname{cosec}^2 (90^\circ - 18^\circ) - \tan^2 18^\circ \\ &= \sec^2 18^\circ - \tan^2 18^\circ \\ &= 1 + \tan^2 18^\circ - \tan^2 18^\circ \\ &\quad [\because 1 + \tan^2 18^\circ = \sec^2 18^\circ] \\ &= 1 = RHS \end{aligned}$$

$$(v) LHS = \cos^2 75^\circ + \cos^2 15^\circ$$

$$\begin{aligned} &= \cos^2 (90^\circ - 15^\circ) + \cos^2 15^\circ \\ &\quad [\because \cos (90^\circ - \theta) = \sin \theta] \\ &= \sin^2 15^\circ + \cos^2 15^\circ = 1 = RHS \end{aligned}$$

$$(vi) LHS = \tan^2 66^\circ - \cot^2 24^\circ$$

$$\begin{aligned} &= \tan^2 66^\circ - \cot^2 (90^\circ - 66^\circ) \\ &\quad [\because \cot (90^\circ - \theta) = \tan \theta] \\ &= \tan^2 66^\circ - \tan^2 66^\circ = 0 = RHS \\ \therefore LHS &= RHS \end{aligned}$$

$$(vii) LHS = \sin^2 48^\circ + \sin^2 42^\circ$$

$$\begin{aligned} &= \sin^2 48^\circ + \sin^2 (90^\circ - 48^\circ) = \sin^2 48^\circ + \cos^2 48^\circ \\ &= 1 = RHS \end{aligned}$$

$$\therefore LHS = RHS$$

$$(viii) LHS = \cos^2 57^\circ - \sin^2 33^\circ$$

$$\begin{aligned} LHS &= \cos^2 75^\circ - \sin^2 33^\circ \\ &= \cos^2 (90^\circ - 33^\circ) - \sin^2 33^\circ \\ &= \sin^2 33^\circ - \sin^2 33^\circ = 0 = RHS \end{aligned}$$

$$(ix) LHS = (\sin 65^\circ + \cos 25^\circ)(\sin 65^\circ - \cos 25^\circ)$$

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$$\begin{aligned} &= \sin^2 65^\circ - \cos^2 25^\circ \\ &= \sin^2 65^\circ - \cos^2 (90^\circ - 65^\circ) \\ &= \sin^2 65^\circ - \sin^2 65^\circ = 0 = \text{RHS} \end{aligned}$$

Question 3.**Solution:**

(i)

$$\begin{aligned} \text{L.H.S.} &= \sin 53^\circ \cos 37^\circ + \cos 53^\circ \sin 37^\circ \\ &= \sin 53^\circ \times \cos(90^\circ - 53^\circ) + \cos 53^\circ \times \sin(90^\circ - 53^\circ) \\ &= \sin 53^\circ \times \sin 53^\circ + \cos 53^\circ \times \cos 53^\circ \\ &= \sin^2 53^\circ + \cos^2 53^\circ \\ &= 1 \\ &= \text{R.H.S.} \end{aligned}$$

(ii)

$$\begin{aligned} \text{L.H.S.} &= \cos 54^\circ \cos 36^\circ - \sin 54^\circ \sin 36^\circ \\ &= \cos 54^\circ \cos 36^\circ - \sin(90^\circ - 36^\circ) \sin(90^\circ - 54^\circ) \\ &= \cos 54^\circ \cos 36^\circ - \cos 36^\circ \cos 54^\circ \\ &= 0 \\ &= \text{R.H.S.} \end{aligned}$$

(iii)

$$\begin{aligned} \text{L.H.S.} &= \sec 70^\circ \sin 20^\circ + \cos 20^\circ \operatorname{cosec} 70^\circ \\ &= \sec(90^\circ - 20^\circ) \sin 20^\circ + \cos 20^\circ \operatorname{cosec}(90^\circ - 20^\circ) \\ &= \operatorname{cosec} 20^\circ \sin 20^\circ + \cos 20^\circ \sec 20^\circ \\ &= \frac{1}{\sin 20^\circ} \times \sin 20^\circ + \cos 20^\circ \times \frac{1}{\cos 20^\circ} \\ &= 1 + 1 \\ &= 2 \\ &= \text{R.H.S.} \end{aligned}$$

(iv)

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$$\begin{aligned}\text{L.H.S.} &= \sin 35^\circ \sin 55^\circ - \cos 35^\circ \cos 55^\circ \\ &= \sin(90^\circ - 55^\circ) \sin(90^\circ - 35^\circ) - \cos 35^\circ \cos 55^\circ \\ &= \cos 55^\circ \cos 35^\circ - \cos 35^\circ \cos 55^\circ \\ &= 0 \\ &= \text{R.H.S.}\end{aligned}$$

(v)

$$\begin{aligned}\text{L.H.S.} &= (\sin 72^\circ + \cos 18^\circ)(\sin 72^\circ - \cos 18^\circ) \\ &= \sin^2 72^\circ - \cos^2 18^\circ \\ &= \sin^2 72^\circ - \cos^2(90^\circ - 72^\circ) \\ &= \sin^2 72^\circ - \sin^2 72^\circ \\ &= 0 \\ &= \text{R.H.S.}\end{aligned}$$

(vi)

$$\begin{aligned}\text{L.H.S.} &= \tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ \\ &= \tan 48^\circ \tan 23^\circ \tan(90^\circ - 48^\circ) \tan(90^\circ - 23^\circ) \\ &= \tan 48^\circ \tan 23^\circ \cot 48^\circ \cot 23^\circ \\ &= (\tan 48^\circ \cot 48^\circ)(\tan 23^\circ \cot 23^\circ) \\ &= 1 \times 1 \\ &= 1 \\ &= \text{R.H.S.}\end{aligned}$$

Question 4.

Solution:

(i)

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$$\begin{aligned}\text{L.H.S.} &= \frac{\sin 70^\circ}{\cos 20^\circ} + \frac{\operatorname{cosec} 20^\circ}{\sec 70^\circ} - 2 \cos 70^\circ \operatorname{cosec} 20^\circ \\&= \frac{\sin 70^\circ}{\cos (90^\circ - 70^\circ)} + \frac{\operatorname{cosec} 20^\circ}{\sec (90^\circ - 20^\circ)} - 2 \cos 70^\circ \operatorname{cosec} (90^\circ - 70^\circ) \\&= \frac{\sin 70^\circ}{\sin 70^\circ} + \frac{\operatorname{cosec} 20^\circ}{\operatorname{cosec} 20^\circ} - 2 \cos 70^\circ \sec 70^\circ \\&= 1 + 1 - 2 \cos 70^\circ \times \frac{1}{\cos 70^\circ} \\&= 2 - 2 \times 1 \\&= 2 - 2 \\&= 0 \\&= \text{R.H.S.}\end{aligned}$$

(ii)

$$\begin{aligned}\text{L.H.S.} &= \frac{\cos 80^\circ}{\sin 10^\circ} + \cos 59^\circ \operatorname{cosec} 31^\circ \\&= \frac{\cos (90^\circ - 10^\circ)}{\sin 10^\circ} + \cos 59^\circ \operatorname{cosec} (90^\circ - 59^\circ) \\&= \frac{\sin 10^\circ}{\sin 10^\circ} + \cos 59^\circ \sec 59^\circ \\&= 1 + \cos 59^\circ \times \frac{1}{\cos 59^\circ} \\&= 1 + 1 \\&= 2 \\&= \text{R.H.S.}\end{aligned}$$

(iii)

$$\begin{aligned}
 \text{L.H.S.} &= \frac{2\sin 68^\circ}{\cos 22^\circ} - \frac{2\cot 15^\circ}{5\tan 75^\circ} - \frac{3\tan 45^\circ \tan 20^\circ \tan 40^\circ \tan 50^\circ \tan 70^\circ}{5} \\
 &= \frac{2\sin(90^\circ - 22^\circ)}{\cos 22^\circ} - \frac{2\cot(90^\circ - 75^\circ)}{5\tan 75^\circ} \\
 &\quad - \frac{3 \times 1 \times \tan 20^\circ \tan 40^\circ \tan(90^\circ - 40^\circ) \tan(90^\circ - 20^\circ)}{5} \\
 &= \frac{2\cos 22^\circ}{\cos 22^\circ} - \frac{2\tan 75^\circ}{5\tan 75^\circ} - \frac{3\tan 20^\circ \tan 40^\circ \cot 40^\circ \cot 20^\circ}{5} \\
 &= 2 - \frac{2}{5} - \frac{3(\tan 20^\circ \cot 20^\circ)(\tan 40^\circ \cot 40^\circ)}{5} \\
 &= 2 - \frac{2}{5} - \frac{3}{5} \\
 &= \frac{10 - 2 - 3}{5} \\
 &= \frac{5}{5} \\
 &= 1 \\
 &= \text{R.H.S.}
 \end{aligned}$$

(iv)

$$\begin{aligned}
 \text{L.H.S.} &= \frac{\sin 18^\circ}{\cos 72^\circ} + \sqrt{3} (\tan 10^\circ \tan 30^\circ \tan 40^\circ \tan 50^\circ \tan 80^\circ) \\
 &= \frac{\sin(90^\circ - 72^\circ)}{\cos 72^\circ} + \sqrt{3} \left(\tan 10^\circ \times \frac{1}{\sqrt{3}} \tan 40^\circ \tan(90^\circ - 40^\circ) \tan(90^\circ - 10^\circ) \right) \\
 &= \frac{\cos 72^\circ}{\cos 72^\circ} + \tan 10^\circ \tan 40^\circ \cot 40^\circ \cot 10^\circ \\
 &= 1 + (\tan 10^\circ \cot 10^\circ)(\tan 40^\circ \cot 40^\circ) \\
 &= 1 + 1 \\
 &= 2 \\
 &= \text{R.H.S.}
 \end{aligned}$$

(v)

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$$\begin{aligned}
 \text{L.H.S.} &= \frac{7 \cos 55^\circ}{3 \sin 35^\circ} - \frac{4(\cos 70^\circ \sec 20^\circ)}{3(\tan 5^\circ \tan 25^\circ \tan 45^\circ \tan 65^\circ \tan 85^\circ)} \\
 &= \frac{7 \cos(90^\circ - 35^\circ)}{3 \sin 35^\circ} - \frac{4[\cos 70^\circ \sec(90^\circ - 70^\circ)]}{3(\tan 5^\circ \tan 25^\circ \times 1 \times \tan(90^\circ - 25^\circ) \tan(90^\circ - 5^\circ))} \\
 &= \frac{7 \sin 35^\circ}{3 \sin 35^\circ} - \frac{4[\cos 70^\circ \sec 70^\circ]}{3(\tan 5^\circ \tan 25^\circ \times 1 \times \cot 25^\circ \cot 5^\circ)} \\
 &= \frac{7}{3} - \frac{4 \times \cos 70^\circ \times \frac{1}{\cos 70^\circ}}{3(\tan 5^\circ \cot 5^\circ)(\tan 25^\circ \cot 25^\circ)} \\
 &= \frac{7}{3} - \frac{4}{3} \\
 &= \frac{3}{3} \\
 &= 1 \\
 &= \text{R.H.S.}
 \end{aligned}$$

Question 5.

Solution:

(i)

$$\begin{aligned}
 \text{L.H.S.} &= \sin \theta \cos (90^\circ - \theta) + \sin (90^\circ - \theta) \cos \theta \\
 &= \sin \theta \sin \theta + \cos \theta \cos \theta \\
 &= \sin^2 \theta + \cos^2 \theta \\
 &= 1 \\
 &= \text{R.H.S.}
 \end{aligned}$$

(ii)

$$\begin{aligned}
 \text{L.H.S.} &= \frac{\sin \theta}{\cos(90^\circ - \theta)} + \frac{\cos \theta}{\sin(90^\circ - \theta)} \\
 &= \frac{\sin \theta}{\sin \theta} + \frac{\cos \theta}{\cos \theta} \\
 &= 1 + 1 \\
 &= 2 \\
 &= \text{R.H.S.}
 \end{aligned}$$

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(iii)

$$\begin{aligned}\text{L.H.S.} &= \frac{\sin \theta \cos(90^\circ - \theta) \cos \theta}{\sin(90^\circ - \theta)} + \frac{\cos \theta \sin(90^\circ - \theta) \sin \theta}{\cos(90^\circ - \theta)} \\&= \frac{\sin \theta \sin \theta \cos \theta}{\cos \theta} + \frac{\cos \theta \cos \theta \sin \theta}{\sin \theta} \\&= \sin^2 \theta + \cos^2 \theta \\&= 1 \\&= \text{R.H.S.}\end{aligned}$$

(iv)

$$\begin{aligned}\text{L.H.S.} &= \frac{\cos(90^\circ - \theta) \sec(90^\circ - \theta) \tan \theta}{\cos \csc(90^\circ - \theta) \sin(90^\circ - \theta) \cot(90^\circ - \theta)} + \frac{\tan(90^\circ - \theta)}{\cot \theta} \\&= \frac{\sin \theta \operatorname{cosec} \theta \tan \theta}{\sec \theta \cos \theta \tan \theta} + \frac{\cot \theta}{\cot \theta} \\&= \frac{\sin \theta \times \frac{1}{\sin \theta}}{\frac{1}{\cos \theta} \times \cos \theta} + 1 \\&= \frac{1}{1} + 1 \\&= 1 + 1 \\&= 2 \\&= \text{R.H.S.}\end{aligned}$$

(v)

$$\begin{aligned}
 \text{L.H.S.} &= \frac{\cos(90^\circ - \theta)}{1 + \sin(90^\circ - \theta)} + \frac{1 + \sin(90^\circ - \theta)}{\cos(90^\circ - \theta)} \\
 &= \frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} \\
 &= \frac{\sin^2 \theta + (1 + \cos \theta)^2}{\sin \theta(1 + \cos \theta)} \\
 &= \frac{\sin^2 \theta + (1 + \cos^2 \theta + 2 \cos \theta)}{\sin \theta(1 + \cos \theta)} \\
 &= \frac{\sin^2 \theta + \cos^2 \theta + 1 + 2 \cos \theta}{\sin \theta(1 + \cos \theta)} \\
 &= \frac{1 + 1 + 2 \cos \theta}{\sin \theta(1 + \cos \theta)} \\
 &= \frac{2 + 2 \cos \theta}{\sin \theta(1 + \cos \theta)} \\
 &= \frac{2(1 + \cos \theta)}{\sin \theta(1 + \cos \theta)} \\
 &= 2 \operatorname{cosec} \theta \\
 &= \text{R.H.S.}
 \end{aligned}$$

(vi)

$$\begin{aligned}
 \text{L.H.S.} &= \frac{\sec(90^\circ - \theta) \operatorname{cosec} \theta - \tan(90^\circ - \theta) \cot \theta + \cos^2 25^\circ + \cos^2 65^\circ}{3 \tan 27^\circ \tan 63^\circ} \\
 &= \frac{\operatorname{cosec} \theta \operatorname{cosec} \theta - \cot \theta \cot \theta + \cos^2 25^\circ + \cos^2(90^\circ - 25^\circ)}{3 \tan 27^\circ \tan(90^\circ - 27^\circ)} \\
 &= \frac{(\operatorname{cosec}^2 \theta - \cot^2 \theta) + (\cos^2 25^\circ + \sin^2 25^\circ)}{3 \tan 27^\circ \cot 27^\circ} \\
 &= \frac{1 + 1}{3} \\
 &= \frac{2}{3} \\
 &= \text{R.H.S.}
 \end{aligned}$$

(vii)

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$$\begin{aligned}\text{L.H.S.} &= \cot \theta \tan(90^\circ - \theta) - \sec(90^\circ - \theta) \operatorname{cosec} \theta + \sqrt{3} \tan 12^\circ \tan 60^\circ \tan 78^\circ \\ &= \cot \theta \cot \theta - \operatorname{cosec} \theta \operatorname{cosec} \theta + \sqrt{3} \tan 12^\circ \times \sqrt{3} \times \tan(90^\circ - 12^\circ) \\ &= (\cot^2 \theta - \operatorname{cosec}^2 \theta) + 3(\tan 12^\circ \cot 12^\circ) \\ &= -1 + 3 \\ &= 2 \\ &= \text{R.H.S.}\end{aligned}$$

Question 6.**Solution:**

(i)

$$\begin{aligned}\text{L.H.S.} &= \tan 5^\circ \tan 25^\circ \tan 30^\circ \tan 65^\circ \tan 85^\circ \\ &= \tan 5^\circ \tan 25^\circ \times \frac{1}{\sqrt{3}} \times \tan(90^\circ - 25^\circ) \tan(90^\circ - 5^\circ) \\ &= \tan 5^\circ \tan 25^\circ \times \frac{1}{\sqrt{3}} \times \cot 25^\circ \cot 5^\circ \\ &= (\tan 5^\circ \cot 5^\circ)(\tan 25^\circ \cot 25^\circ) \times \frac{1}{\sqrt{3}} \\ &= 1 \times \frac{1}{\sqrt{3}} \\ &= \frac{1}{\sqrt{3}} \\ &= \text{R.H.S.}\end{aligned}$$

(ii)

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$$\begin{aligned}\text{L.H.S.} &= \cot 12^\circ \cot 38^\circ \cot 52^\circ \cot 60^\circ \cot 78^\circ \\&= \cot 12^\circ \cot 38^\circ \cot(90^\circ - 38^\circ) \times \frac{1}{\sqrt{3}} \times \cot(90^\circ - 12^\circ) \\&= \cot 12^\circ \cot 38^\circ \tan 38^\circ \times \frac{1}{\sqrt{3}} \times \tan 12^\circ \\&= (\cot 12^\circ \tan 12^\circ)(\cot 38^\circ \tan 38^\circ) \times \frac{1}{\sqrt{3}} \\&= 1 \times \frac{1}{\sqrt{3}} \\&= \frac{1}{\sqrt{3}} \\&= \text{R.H.S.}\end{aligned}$$

(iii)

$$\begin{aligned}\text{L.H.S.} &= \cos 15^\circ \cos 35^\circ \operatorname{cosec} 55^\circ \cos 60^\circ \operatorname{cosec} 75^\circ \\&= \cos 15^\circ \cos 35^\circ \operatorname{cosec}(90^\circ - 35^\circ) \times \frac{1}{2} \operatorname{cosec}(90^\circ - 15^\circ) \\&= \cos 15^\circ \cos 35^\circ \sec 35^\circ \times \frac{1}{2} \sec 15^\circ \\&= \cos 15^\circ \cos 35^\circ \times \frac{1}{\cos 35^\circ} \times \frac{1}{2} \times \frac{1}{\cos 15^\circ} \\&= \frac{1}{2} \\&= \text{R.H.S.}\end{aligned}$$

(iv)

$$\begin{aligned}\text{L.H.S.} &= \cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 180^\circ \\&= \cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 90^\circ \dots \cos 180^\circ \\&= \cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \times 0 \times \dots \cos 180^\circ \quad (\text{Since } \cos 90^\circ = 0) \\&= 0 \\&= \text{R.H.S.}\end{aligned}$$

(v)

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$$\begin{aligned}\text{L.H.S.} &= \left(\frac{\sin 49^\circ}{\cos 41^\circ}\right)^2 + \left(\frac{\cos 41^\circ}{\sin 49^\circ}\right)^2 \\&= \left(\frac{\sin(90^\circ - 41^\circ)}{\cos 41^\circ}\right)^2 + \left(\frac{\cos(90^\circ - 49^\circ)}{\sin 49^\circ}\right)^2 \\&= \left(\frac{\cos 41^\circ}{\cos 41^\circ}\right)^2 + \left(\frac{\sin 49^\circ}{\sin 49^\circ}\right)^2 \\&= 1^2 + 1^2 \\&= 1 + 1 \\&= 2 \\&= \text{R.H.S.}\end{aligned}$$

Note : Question Modified

Question 7.

Solution:

(i) $\text{LHS} = \sin(70^\circ + \theta) - \cos(20^\circ - \theta)$

$$\begin{aligned}&\sin(70^\circ + \theta) - \cos(20^\circ - \theta) \\&= \sin[90^\circ - (20^\circ - \theta)] - \cos(20^\circ - \theta) \\&= \sin(90^\circ - \phi) - \cos \phi \text{ where } (20^\circ - \theta = \phi) \\&= \cos \phi - \cos \phi = 0\end{aligned}$$

= RHS

(ii) $\text{LHS} = \tan(55^\circ - \theta) - \cot(35^\circ + \theta)$

$$\begin{aligned}&= \tan[90^\circ - (35^\circ + \theta)] - \cot(35^\circ + \theta) \\&= \tan(90^\circ - \phi) - \cot \phi \text{ where } (35^\circ + \theta) = \phi \\&= \cot \phi - \cot \phi\end{aligned}$$

= RHS

(iii) $\text{LHS} = \operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta)$

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$$= \operatorname{cosec}(90^\circ - \phi) - \sec \phi \text{ where } 23^\circ - \theta = \phi$$

$$= \sec \phi - \sec \phi = 0$$

$$= \text{RHS}$$

$$(iv) \text{ LHS} = \operatorname{cosec}(65^\circ + \theta) \sec(25^\circ - \theta) - \tan(55^\circ - \theta) + \cot(35^\circ + \theta)$$

$$= \operatorname{cosec}[90^\circ - (25^\circ - \theta)] - \sec(25^\circ - \theta)$$

$$- \tan[90^\circ - (35^\circ + \theta)] + \cot(35^\circ + \theta)$$

$$= \sec(25^\circ - \theta) - \sec(25^\circ - \theta) - \cot(35^\circ + \theta) + \cot(35^\circ + \theta)$$

$$= 0$$

$$= \text{RHS}$$

$$(v) \text{ LHS} = \sin(50^\circ + \theta) - \cos(40^\circ - \theta) + \tan 1^\circ \tan 10^\circ \tan 80^\circ \tan 89^\circ$$

$$= \sin[90^\circ - (40^\circ - \theta)] - \cos(40^\circ - \theta) + \tan 1^\circ \tan 10^\circ \tan 20^\circ$$

$$\tan(90^\circ - 20^\circ) \tan(90^\circ - 10^\circ) \tan(90^\circ - 1^\circ)$$

$$= \cos(40^\circ - \theta) - \cos(40^\circ - \theta) + \tan 1^\circ \tan 10^\circ$$

$$\tan 20^\circ \cot 20^\circ \cot 10^\circ \cot 1^\circ$$

$$= 0 + 1 = 1$$

$$= \text{RHS}$$

Question 8.

Solution:

(i)

$$\sin 67^\circ + \cos 75^\circ$$

$$= \sin(90^\circ - 23^\circ) + \cos(90^\circ - 15^\circ)$$

$$= \cos 23^\circ + \sin 15^\circ$$

(ii)

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$$\begin{aligned}\cot 65^\circ + \tan 49^\circ \\&= \cot(90^\circ - 25^\circ) + \tan(90^\circ - 41^\circ) \\&= \tan 25^\circ + \cot 41^\circ\end{aligned}$$

(iii)

$$\begin{aligned}\sec 78^\circ + \operatorname{cosec} 56^\circ \\&= \sec(90^\circ - 12^\circ) + \operatorname{cosec}(90^\circ - 34^\circ) \\&= \operatorname{cosec} 12^\circ + \sec 34^\circ\end{aligned}$$

(iv)

$$\begin{aligned}\operatorname{cosec} 54^\circ + \sin 72^\circ \\&= \operatorname{cosec}(90^\circ - 36^\circ) + \sin(90^\circ - 18^\circ) \\&= \sec 36^\circ + \cos 18^\circ\end{aligned}$$

Question 9.

Solution:

$$A + B + C = 180^\circ$$

$$\text{So, } B + C = 180^\circ - A$$

$$\therefore \tan \frac{B+C}{2} = \tan \frac{180^\circ - A}{2} = \tan \left(90^\circ - \frac{A}{2} \right) = \cot \frac{A}{2}$$

Question 10.

Solution:

$$\begin{aligned}\cos 2\theta &= \sin 4\theta \\ \Rightarrow \sin(90^\circ - 2\theta) &= \sin 4\theta \\ \Rightarrow 90^\circ - 2\theta &= 4\theta \\ \Rightarrow 6\theta &= 90^\circ \\ \Rightarrow \theta &= 15^\circ\end{aligned}$$

Question 11.

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Solution:

$$\begin{aligned}\sec 2A &= \operatorname{cosec}(A - 42^\circ) \\ \Rightarrow \operatorname{cosec}(90^\circ - 2A) &= \operatorname{cosec}(A - 42^\circ) \\ \Rightarrow 90^\circ - 2A &= A - 42^\circ \\ \Rightarrow 3A &= 132 \\ \Rightarrow A &= 44^\circ\end{aligned}$$

Question 12.

Solution:

$$\begin{aligned}\sin 3A &= \cos(A - 26^\circ) \\ \Rightarrow \cos(90^\circ - 3A) &= \cos(A - 26^\circ) \\ \Rightarrow 90^\circ - 3A &= A - 26^\circ \\ \Rightarrow 4A &= 90 + 26 = 116 \\ \therefore A &= 29^\circ\end{aligned}$$

Question 13.

Solution:

$$\begin{aligned}\tan 2A &= \cot(A - 12^\circ) \\ \Rightarrow \cot(90^\circ - 2A) &= \cot(A - 12^\circ) \\ \Rightarrow 90^\circ - 2A &= A - 12^\circ \text{ or } 3A = 90^\circ + 12^\circ = 102^\circ \\ \text{Hence, } A &= \frac{102^\circ}{3} = 34^\circ\end{aligned}$$

Question 14.

Solution:

$$\begin{aligned}\sec 4A &= \operatorname{cosec}(A - 15^\circ) \\ \Rightarrow \operatorname{cosec}(90^\circ - 4A) &= \operatorname{cosec}(A - 15^\circ) \\ \therefore 90^\circ - 4A &= A - 15^\circ \text{ or } 5A = 90^\circ + 15^\circ = 105^\circ \\ \text{Hence, } A &= \frac{105^\circ}{5} = 21^\circ\end{aligned}$$

Question 15.

Solution:

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L.H.S.

$$\begin{aligned}&= \frac{2}{3} \operatorname{cosec}^2 58^\circ - \frac{2}{3} \cot 58^\circ \tan 32^\circ - \frac{5}{3} \tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ \\&= \frac{2}{3} \operatorname{cosec}^2 58^\circ - \frac{2}{3} \cot 58^\circ \tan(90^\circ - 58^\circ) \\&\quad - \frac{5}{3} \tan 13^\circ \tan 37^\circ \times 1 \times \tan(90^\circ - 37^\circ) \tan(90^\circ - 13^\circ) \\&= \frac{2}{3} \operatorname{cosec}^2 58^\circ - \frac{2}{3} \cot 58^\circ \cot 58^\circ - \frac{5}{3} \tan 13^\circ \tan 37^\circ \times 1 \times \cot 37^\circ \cot 13^\circ \\&= \frac{2}{3} \operatorname{cosec}^2 58^\circ - \frac{2}{3} \cot^2 58^\circ - \frac{5}{3} (\tan 13^\circ \cot 13^\circ)(\tan 37^\circ \cot 37^\circ) \\&= \frac{2}{3} (\operatorname{cosec}^2 58^\circ - \cot^2 58^\circ) - \frac{5}{3} \times 1 \times 1 \\&= \frac{2}{3} \times 1 - \frac{5}{3} \\&= \frac{2-5}{3} \\&= \frac{-3}{3} \\&= -1 \\&= \text{R.H.S.}\end{aligned}$$



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- Chapter 3–Linear Equations In Two Variables
- Chapter 4–Quadratic Equations
- Chapter 5–Arithmetic Progression
- Chapter 6–Coordinate Geometry
- Chapter 7–Triangles
- Chapter 8–Circles
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- Chapter 10–Trigonometric Ratios
- Chapter 11–T Ratios Of Some Particular Angles
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- Chapter 16–Areas of Circle, Sector and Segment
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He was born on January 2, 1946 in a village of Delhi. He graduated from Kirori Mal College, University of Delhi. After completing his M.Sc. in Mathematics in 1969, he joined N.A.S. College, Meerut, as a lecturer. In 1976, he was awarded a fellowship for 3 years and joined the University of Delhi for his Ph.D. Thereafter, he was promoted as a reader in N.A.S. College, Meerut. In 1999, he joined M.M.H. College, Ghaziabad, as a reader and took voluntary retirement in 2003. He has authored more than 75 titles ranging from Nursery to M. Sc. He has also written books for competitive examinations right from the clerical grade to the I.A.S. level.

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Postal Address

IndCareer.com
52, Shilpa Nagar,
Somalwada
Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888

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