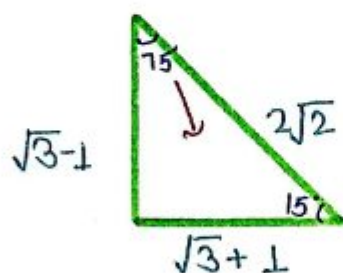


# TRIGONOMETRY

Q) What is the value of  $\sin 75^\circ + \sin 15^\circ$ ?

$\sin 75^\circ + \sin 15^\circ$  का मान क्या है?



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

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

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

$$\boxed{\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}}$$

Q)  $\sin\left(\underbrace{\frac{\pi}{4}-A}_A\right) \sin\left(\underbrace{\frac{\pi}{4}-B}_B\right) - \cos\left(\underbrace{\frac{\pi}{4}-A}_A\right) \cos\left(\underbrace{\frac{\pi}{4}-B}_B\right) = ?$

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

$$- \left[ \cos\left(\frac{\pi}{4}-A\right) \cos\left(\frac{\pi}{4}-B\right) - \sin\left(\frac{\pi}{4}-A\right) \sin\left(\frac{\pi}{4}-B\right) \right]$$

$$= -\cos\left(\frac{\pi}{4}-A + \frac{\pi}{4}-B\right)$$

$$= -\cos\left[\frac{\pi}{2} - (A+B)\right]$$

$$= \sin(A+B)$$

Q) What is the value of  $[(\sin 59^\circ \cos 31^\circ + \cos 59^\circ \sin 31^\circ) \div (\cos 20^\circ \cos 25^\circ - \sin 20^\circ \sin 25^\circ)]$ ?

$[(\sin 59^\circ \cos 31^\circ + \cos 59^\circ \sin 31^\circ) \div (\cos 20^\circ \cos 25^\circ - \sin 20^\circ \sin 25^\circ)]$   
का मान क्या है?

$$[\sin(59+31)] \div [\cos(20+25)]$$

$$\sin 90 \div \cos 45^\circ$$

$$1 \div \frac{1}{\sqrt{2}} \Rightarrow 1 \times \frac{\sqrt{2}}{1} = \sqrt{2}$$

Q) If  $\tan A = \frac{15}{8}$  and  $\tan B = \frac{7}{24}$ , then  $\tan(A+B)$ ?

यदि  $\tan A = \frac{15}{8}$  तथा  $\tan B = \frac{7}{24}$  है, तो  $\tan(A+B)$ ?

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

$$\frac{\frac{3}{3} \times \frac{15}{8} + \frac{7}{24}}{1 - \frac{15}{8} \times \frac{7}{24}} = \frac{\frac{52}{24}}{\frac{64-35}{64}}$$

$$\frac{52 \times 64}{24 \times 29} = \frac{416}{87}$$

Q)  $\cos(90-A) \cdot \sin[\pi - (A-B)] + \sin(90-A) \cos[\pi - (B-A)] = ?$

$$\sin A \cdot \sin(A-B) + \cos A \cdot -\cos(B-A)$$

$$\sin A \cdot \sin(A-B) - \cos A \cdot \cos(A-B)$$

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

$$-[\cos A \cos(A-B) - \sin A \sin(A-B)]$$

$$- \cos(A+A-B)$$

$$- \cos(2A-B)$$

Q)  $\cos(90-A) \cdot \sin[\pi + (A-B)] + \sin(90-A) \cos[\pi - (B-A)] = ?$

$$\sin A - \sin(A-B) + \cos A \cdot -\cos(B-A)$$

$$- \sin A \cdot \sin(A-B) - \cos A \cdot \cos(A-B)$$

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

$$-[\cos A \cos(A-B) + \sin A \sin(A-B)]$$

$$-[\cos(A-A+B)]$$

$$- \cos B$$

If  $A + B = 90^\circ$

$A = 90 - B$

$\hookrightarrow \sin A = \sin(90 - B)$

$\sin A = \cos B$

$\hookrightarrow \sin A = \frac{1}{\sec B}$

$\sin A \cdot \sec B = 1$

$\hookrightarrow \frac{1}{\operatorname{cosec} A} = \cos B$

$\operatorname{cosec} A \cdot \cos B = 1$

$\hookrightarrow \tan A = \tan(90 - B)$

$\tan A = \cot B$

$\hookrightarrow \tan A = \frac{1}{\tan B}$

$\tan A \cdot \tan B = 1$

$\hookrightarrow \frac{1}{\cot A} = \cot B$

$\cot A \cdot \cot B = 1$

$\hookrightarrow \sec A = \sec(90 - B)$

$\sec A = \operatorname{cosec} B$

$\hookrightarrow \sin^2 A + \sin^2 B = 1$

$\hookrightarrow \cos^2 A + \cos^2 B = 1$

Ex:-  $\sin 3x \cdot \sec 2x = 1$

$x = ?$

$5x = 90^\circ$

$x = 18^\circ$



Q) If  $\tan(x+y) \tan(x-y) = 1$ , then what will be the value of  $\tan\left(\frac{2x}{3}\right)$ ?

यदि  $\tan(x+y) \tan(x-y) = 1$ , हो, तो  $\tan\left(\frac{2x}{3}\right)$  का मान क्या होगा?

$$\therefore \tan A \cdot \tan B = 1$$

$$A + B = 90^\circ$$

$$x + y + x - y = 90$$

$$\boxed{2x = 90^\circ}$$

$$\tan\left(\frac{2x}{3}\right) = \tan\left(\frac{90^\circ}{3}\right)$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

Q) What will be the value of  $\frac{\sin 39^\circ}{\cos 51^\circ} + 2 \tan 11^\circ \tan 31^\circ \tan 45^\circ \tan 59^\circ \tan 79^\circ - 3(\sin^2 21^\circ + \sin^2 69^\circ)$

$$\frac{\sin 39^\circ}{\cos 51^\circ} + 2 \tan 11^\circ \tan 31^\circ \tan 45^\circ \tan 59^\circ \tan 79^\circ - 3(\sin^2 21^\circ + \sin^2 69^\circ) \text{ का मान कितना होगा?}$$

$$\sin 39 \sec 51 + 2 \times 1 \times 1 \times 1 - 3 \times 1$$

$$1 + 2 - 3$$

$$3 - 3 = 0$$

Q) Find the value of  $\sin^2 15^\circ + \sin^2 25^\circ + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 55^\circ + \sin^2 65^\circ + \sin^2 75^\circ$ ?

$$\sin^2 15^\circ + \sin^2 25^\circ + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 55^\circ + \sin^2 65^\circ + \sin^2 75^\circ \text{ का मान ज्ञात कीजिए।}$$

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

$$3 + \frac{1}{2} = \frac{7}{2}$$

Q)  $\tan 7^\circ \tan 23^\circ \tan 60^\circ \tan 67^\circ \tan 83^\circ$  is equal to  $\tan 7^\circ \tan 23^\circ \tan 60^\circ \tan 67^\circ \tan 83^\circ$  बराबर है -

$$1 \times 1 \times \sqrt{3}$$

$$= \sqrt{3}$$

- Q) If  $\tan 2\theta \cdot \tan 4\theta = 1$ , then what will be the value of  $\tan 3\theta$ ?  
 यदि  $\tan 2\theta \cdot \tan 4\theta = 1$ , तो  $\tan 3\theta$  का मान क्या होगा ?

$$2\theta + 4\theta = 90^\circ$$

$$6\theta = 90^\circ$$

$$\boxed{\theta = 15^\circ}$$

$$\tan 3\theta = \tan (15 \times 3)$$

$$\tan 45^\circ = 1$$

- Q) The value of  $\cot 10^\circ \cdot \cot 20^\circ \cdot \cot 60^\circ \cot 70^\circ \cot 80^\circ$  is -  
 $\cot 10^\circ \cdot \cot 20^\circ \cdot \cot 60^\circ \cdot \cot 70^\circ \cdot \cot 80^\circ$  का मान है -

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

$$\textcircled{Q} \left[ \frac{\operatorname{cosec} 31^\circ - \sec 59^\circ}{(\sin 18^\circ \div \cos 72^\circ)} \times \frac{\tan 26^\circ}{\cot 64^\circ} \right] + \left[ \frac{\tan 30^\circ + \tan 15^\circ}{(1 - \tan 30^\circ \tan 15^\circ)} \right] = \text{---}$$

$\downarrow$   
 $\tan 26^\circ \tan 64^\circ$   
 $\downarrow$   
 $\textcircled{1}$

$\downarrow$   
 $\tan (30^\circ + 15^\circ)$   
 $\tan 45^\circ$   
 $= 1$

$$\frac{\operatorname{cosec} (90 - 59) - \sec 59}{\sin 18 \div \cos 72^\circ}$$

$$\frac{\sec 59 - \sec 59}{\sin 18 \div \cos 72^\circ} = 0$$

$$0 \times 1 + 1 = 1$$

- Q) If  $\sin \alpha \sec (30^\circ + \alpha) = 1$  ( $0 < \alpha < 60^\circ$ ), then the value of  $\sin \alpha + \cos 2\alpha$  is -

यदि  $\sin \alpha \sec (30^\circ + \alpha) = 1$  ( $0 < \alpha < 60^\circ$ ), तो  $\sin \alpha + \cos 2\alpha$  का मान है -

$$\alpha + 30 + \alpha = 90^\circ$$

$$2\alpha = 60$$

$$\boxed{\alpha = 30^\circ}$$

$$\sin \alpha + \cos 2\alpha$$

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

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

Q)  $\sin^2 5^\circ + \sin^2 6^\circ + \dots + \sin^2 84^\circ + \sin^2 85^\circ = ?$

No. of terms =  $\frac{\text{last term} - \text{first term}}{\text{common diff.}} + 1$

$$\frac{85-5}{1} + 1$$

$$80 + 1 = 81$$

$$\frac{\text{No. of terms}}{2} = \frac{81}{2} = 40.5$$

II<sup>nd</sup> method

$$1 + 1 + \dots + 40 \text{ बार} + \sin^2 45^\circ$$

$$40 + \frac{1}{2}$$

$$40\frac{1}{2}$$

Q) What will be the value of  $(\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 85^\circ + \sin^2 87^\circ + \sin^2 89^\circ)$

$(\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 85^\circ + \sin^2 87^\circ + \sin^2 89^\circ)$  का मान कितना होगा ?

$$\text{No. of terms} = \frac{89-1}{2} + 1$$

$$\frac{44 \times 88}{2} + 1 = 44 + 1 = 45$$

$$= \frac{45}{2} = 22\frac{1}{2}$$

Q) If  $\sec (7\theta + 28^\circ) = \operatorname{cosec} (30^\circ - 3\theta)$ , then what will be the value of  $\theta$ ?

यदि  $\sec (7\theta + 28^\circ) = \operatorname{cosec} (30^\circ - 3\theta)$  हो, तो  $\theta$  का मान कितना होगा ?

$$\text{if } A + B = 90^\circ$$

$$\sec A = \operatorname{cosec} B$$

$$7\theta + 28 + 30 - 3\theta = 90^\circ$$

$$4\theta = 90 - 58$$

$$4\theta = 32$$

$$\theta = 8^\circ$$



- Q) If  $0 < x < \frac{\pi}{2}$  and  $\sec x = \operatorname{cosec} y$  then what will be  $\sin(x+y)$ ?  
 यदि  $0 < x < \frac{\pi}{2}$  तथा  $\sec x = \operatorname{cosec} y$  हो तो  $\sin(x+y)$  कितना होगा?

$$x+y=90^\circ$$

$$\frac{\sin(x+y)}{\sin 90^\circ}$$

- Q) The value of  $\cot \frac{\pi}{20} \cot \frac{3\pi}{20} \cot \frac{5\pi}{20} \cot \frac{7\pi}{20} \cot \frac{9\pi}{20}$  is

$\cot \frac{\pi}{20} \cot \frac{3\pi}{20} \cot \frac{5\pi}{20} \cot \frac{7\pi}{20} \cot \frac{9\pi}{20}$  का मान है -

$$A+B=90^\circ=\frac{\pi}{2}$$

$$\frac{\pi}{20} + \frac{9\pi}{20} = \frac{10\pi}{20} = \frac{\pi}{2} \quad \frac{3\pi}{20} + \frac{7\pi}{20} = \frac{10\pi}{20} = \frac{\pi}{2} \quad \cot \frac{5\pi}{20} = \cot \frac{\pi}{4}$$

$$1 \times 1 \times \cot \frac{\pi}{4}$$

$$1 \times 1 \times 1 = 1$$

- Q) Consider the following : निम्न पर विचार करें:

1.  $\frac{\cos 75^\circ}{\sin 15^\circ} + \frac{\sin 12^\circ}{\cos 78^\circ} - \frac{\cos 18^\circ}{\sin 72^\circ} = 1$   $1+1-1=1$

2.  $\frac{\cos 35^\circ}{\sin 55^\circ} - \frac{\sin 11^\circ}{\cos 79^\circ} + \frac{\cos 28^\circ \operatorname{cosec} 62^\circ}{1} = 1$   $1-1+1=1$

3.  $\frac{\sin 80^\circ}{\cos 10^\circ} - \sin 59^\circ \sec 31^\circ = 0$   $1-1=0$

$$\begin{cases} A+B=90^\circ \\ \frac{\sin A}{\cos B}=1 \end{cases}$$

Which of the above are correct?

उपरोक्त में से कौन सा सही है?

- a) 1 and 2 only
- b) 2 and 3 only
- c) 1 and 3 only
- d) 1, 2 and 3

Q) What is the value of  $\sin 24^\circ \sin 66^\circ - \cos 24^\circ \cos 66^\circ + \tan 24^\circ \tan 66^\circ - \cot 24^\circ \cot 66^\circ$ ?

$$\sin 24^\circ \sin 66^\circ - \cos 24^\circ \cos 66^\circ + \tan \underbrace{24^\circ \tan 66^\circ}_{(1)} - \cot \underbrace{24^\circ \cot 66^\circ}_{(1)}$$

का मान क्या है?

$$24 + 66 = 90^\circ$$

$$- [\cos 24^\circ \cos 66^\circ - \sin 24^\circ \sin 66^\circ] + 1 - 1$$

$$- [\cos (24 + 66)] + 0$$

$$- \cos 90^\circ = 0$$

Q) What is the value of  $\frac{\cos^2 32^\circ + \cos^2 58^\circ}{\sec^2 50^\circ - \cot^2 40^\circ} + 4 \tan 13^\circ \tan 37^\circ \tan 53^\circ \tan 77^\circ$ ?

$$\frac{\cos^2 32^\circ + \cos^2 58^\circ}{\sec^2 50^\circ - \cot^2 40^\circ} + 4 \tan 13^\circ \tan 37^\circ \tan 53^\circ \tan 77^\circ \text{ का मान क्या है?}$$

$4 \times 1 \times 1 = 4$

$$\frac{1}{\sec^2 50^\circ - \tan^2 50^\circ} + 4$$

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

$$1 + 4 = 5$$

$$\left\{ \begin{array}{l} \cot 40^\circ = \tan 50^\circ \\ \cot (90 - 50^\circ) = \tan 50^\circ \end{array} \right\}$$

Q) If  $\tan \theta \cdot \tan 2\theta = 1$ , then the value of  $\sin^2 2\theta + \tan^2 2\theta$  is:

यदि  $\tan \theta \cdot \tan 2\theta = 1$ , तो  $\sin^2 2\theta + \tan^2 2\theta$  का मान है।

$$\begin{aligned} 3\theta &= 90^\circ \\ \theta &= 30^\circ \end{aligned}$$

$$\sin^2 60^\circ + \tan^2 60^\circ$$

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

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

$$\frac{15}{4} = 3\frac{3}{4}$$

Q) If  $\theta$  is a positive acute angle, and  $\tan 2\theta \tan 3\theta = 1$ , then what is the value of  $\left(2\cos^2 \frac{5\theta}{2} - 1\right)$ ?

यदि  $\theta$  एक धनात्मक न्यूनकोण है, और  $\tan 2\theta \tan 3\theta = 1$  हो, तो  $\left(2\cos^2 \frac{5\theta}{2} - 1\right)$  का मान कितना होगा?

$$5\theta = 90^\circ$$

$$\theta = 18^\circ$$



$$2 \cos^2 \left( \frac{90}{2} \right) - 1$$

$$2 \cos^2 45^\circ - 1$$

$$2 \times \frac{1}{2} - 1 = 0$$

Q) If  $\sin(3x - 20^\circ) = \cos(3y + 20^\circ)$ , then what will be the value of  $(x+y)$ ?

यदि  $\sin(3x - 20^\circ) = \cos(3y + 20^\circ)$  हो, तो  $(x+y)$  का मान कितना होगा?

$$3x - 20 + 3y + 20 = 90$$

$$3(x+y) = 90$$

$$x+y = 30$$

Q) What is the value of  $(\sin^2 25^\circ + \sin^2 65^\circ)$ ?

$(\sin^2 25^\circ + \sin^2 65^\circ)$  का मान कितना होगा?

$$= 1$$

Q) What is the numerical value of  $\cot 18^\circ \left( \cot 72^\circ \cos^2 22^\circ + \frac{1}{\tan 72^\circ \sec^2 68^\circ} \right)$

$\cot 18^\circ \left( \cot 72^\circ \cos^2 22^\circ + \frac{1}{\tan 72^\circ \sec^2 68^\circ} \right)$  का संख्यात्मक मान कितना है?

$$\cot 18^\circ [\cot 72^\circ \cos^2 22^\circ + \cot 72^\circ \cdot \cos^2 68^\circ]$$

$$\cot 18^\circ \cdot \cot 72^\circ [\cos^2 22^\circ + \cos^2 68^\circ]$$

$$1 \times 1$$

$$1$$

Q) The value of  $(\sin^2 7\frac{1}{2}^\circ + \sin^2 82\frac{1}{2}^\circ + \tan^2 2^\circ \cdot \tan^2 88^\circ)$  is:

$(\sin^2 7\frac{1}{2}^\circ + \sin^2 82\frac{1}{2}^\circ + \tan^2 2^\circ \cdot \tan^2 88^\circ)$  का मान है;

$$1 + 1$$

$$1+1=2$$

Q) What is the value of  $\frac{\sin 43^\circ}{\cos 47^\circ} + \frac{\cos 19^\circ}{\sin 71^\circ} - 8 \cos^2 60^\circ$

$\frac{\sin 43^\circ}{\cos 47^\circ} + \frac{\cos 19^\circ}{\sin 71^\circ} - 8 \cos^2 60^\circ$  का मान बताइए:

$$1+1-8 \times \left(\frac{1}{2}\right)^2$$

$$2 - \cancel{8} \times \frac{1}{4}$$

$$2 - 2 = 0$$

Q) What is  $2 \operatorname{cosec}^2 23^\circ \cot^2 67^\circ - \sin^2 23^\circ - \sin^2 67^\circ - \cot^2 67^\circ$  equal to?

$2 \operatorname{cosec}^2 23^\circ \cot^2 67^\circ - \sin^2 23^\circ - \sin^2 67^\circ - \cot^2 67^\circ$  किसके बराबर है?

$$2 \operatorname{cosec}^2 23^\circ \cot^2 67^\circ - \cot^2 67^\circ - (\sin^2 23^\circ + \sin^2 67^\circ)$$

$$2 \times \operatorname{cosec}^2 23^\circ \cdot \tan^2 23^\circ$$

$$2 \times \frac{1}{\sin^2 23^\circ} \times \frac{\sin^2 23^\circ}{\cos^2 23^\circ}$$

$$2 \sec^2 23^\circ$$

$$2 \sec^2 23^\circ - 1 - \frac{\cot^2 67^\circ}{\tan^2 23^\circ}$$

$$\sec^2 23^\circ + \sec^2 23^\circ - \tan^2 23^\circ - 1$$

$$\sec^2 23^\circ + 1 - 1$$

$$\sec^2 23^\circ$$

1. What is the value of  $\sin^2 21 + \sin^2 69$ ?

$\sin^2 21 + \sin^2 69$  का मान क्या है?

- (a) 0
- (b) 2
- (c) 0.5
- (d) 1

2. What is the value of  $\frac{\cos 37^\circ}{\sin 53^\circ}$ ?

$\frac{\cos 37^\circ}{\sin 53^\circ}$  का मान क्या होगा?

- (a)  $1/2$
- (b)  $1/\sqrt{2}$
- (c) 0
- (b) 1

3. What is the value of  $\frac{4}{3}(\sin^2 35^\circ + \sin^2 55^\circ)$ ?

$\frac{4}{3}(\sin^2 35^\circ + \sin^2 55^\circ)$  का मान क्या है?

- (a)  $8/9$
- (b)  $4/3$
- (c)  $3/4$
- (d)  $2/3$

4.  $\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{2\sin^2 63^\circ + 1 + 2\sin^2 27^\circ}$

- (a)  $1/2$
- (b)  $4/3$
- (c) 2
- (d) 1

5.  $(\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ) \cdot \frac{4\cos^2 37^\circ - 7 + 4\cos^2 53^\circ}{\tan^2 47^\circ + 4 - \operatorname{cosec}^2 43^\circ} = ?$

- (a) 1
- (b) -2
- (c) 0
- (d) 2

6.  $\frac{\tan 13^\circ \tan 36^\circ \tan 45^\circ \tan 54^\circ \tan 77^\circ}{2\sec^2 60^\circ (\sin^2 60^\circ - 3\cos 60^\circ + 2)} = ?$

- (a)  $-\frac{1}{4}$
- (b)  $-\frac{1}{10}$
- (c)  $\frac{1}{10}$
- (d)  $\frac{1}{4}$

7. The value of  $\tan^2 48^\circ - \operatorname{cosec}^2 42^\circ + \operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta)$  is



$\tan^2 48^\circ - \operatorname{cosec}^2 42^\circ + \operatorname{cosec}(67 + \theta) - \sec(23^\circ - \theta)$  का मान ज्ञात कीजिए।

- (a) -1
- (b) 0
- (c) 1
- (d) -2

8. If  $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \tan^2 66^\circ \cdot \tan^2 24^\circ = \frac{y}{2}$

then the value of  $y$  is:

यदि  $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \tan^2 66^\circ \cdot \tan^2 24^\circ = \frac{y}{2}$

है, तो  $y$  का मान ज्ञात करें।

- (a) 4
- (b) -4
- (c) 8
- (d) -8

9.  $\frac{1 - \tan A}{1 + \tan A} = \frac{\tan 3^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 87^\circ}{\tan 27^\circ \tan 39^\circ \tan 51^\circ \tan 60^\circ \tan 63^\circ}$ , then the value of  $\cot A$  is:

$\frac{1 - \tan A}{1 + \tan A} = \frac{\tan 3^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 87^\circ}{\tan 27^\circ \tan 39^\circ \tan 51^\circ \tan 60^\circ \tan 63^\circ}$  है, तो  $\cot A$  का मान ज्ञात

कीजिए।

- (a) 3
- (b) 2
- (c) 1
- (d) 4

10.  $\tan(63^\circ - \theta) - \cot(27^\circ + \theta) + \frac{\operatorname{cosec}^2 70^\circ - \tan^2 20^\circ}{\sec^2 37^\circ - \cot^2 53^\circ} = ?$

- (a) 2
- (b) 3
- (c) 0
- (d) 1

## ANSWER SHEET

|   |   |   |   |   |   |   |   |   |    |
|---|---|---|---|---|---|---|---|---|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| D | D | B | B | D | C | A | D | B | D  |

# Worksheet solution

sol 1

$$\sin^2 21 + \sin^2 69$$

$$\sin^2 21 + \sin^2 (90^\circ - 21^\circ)$$

$$\sin^2 21 + \cos^2 21 = 1$$

sol 2

$$\frac{\cos 37^\circ}{\sin 53^\circ} = \frac{\cos (90^\circ - 37^\circ)}{\sin 53^\circ} = \frac{\sin 53^\circ}{\sin 53^\circ} = 1$$

sol 3

$$= \frac{4}{3} (\sin^2 35 + \underbrace{\sin^2 55}_{\cos^2 (90 - 35)})$$

$$= \frac{4}{3} (\sin^2 35 + \cos^2 35) = \frac{4}{3}$$

sol 4

$$= \frac{(\cos 9^\circ + \sin 81^\circ) (\sec 9^\circ + \operatorname{cosec} 81^\circ)}{2 \sin^2 63^\circ + 1 + 2 \sin^2 27^\circ}$$

$$= \frac{[\cos 9^\circ + \sin (90^\circ - 9^\circ)] [\sec 9^\circ + \operatorname{cosec} (90^\circ - 9^\circ)]}{2 \sin^2 63^\circ + 1 + 2 \sin^2 (90^\circ - 27^\circ)}$$

$$= \frac{(\cos 9^\circ + \cos 9^\circ) (\sec 9^\circ + \sec 9^\circ)}{1 + 2 \sin^2 63^\circ + 2 \cos^2 63^\circ}$$

$$= \frac{(2 \cos 9^\circ) \cdot (2 \sec 9^\circ)}{1 + 2 (\sin^2 63^\circ + \cos^2 63^\circ)}$$

$$= \frac{2 \cos 9^\circ \times \frac{2}{\cos 9^\circ}}{1 + 2} = \frac{4}{3}$$

Sol 5

$$(\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ)$$

$$= \frac{4 \cos^2 37^\circ - 7 + 4 \cos^2 53^\circ}{\tan^2 47^\circ + 4 - \operatorname{cosec}^2 43^\circ}$$

$$A + B = 90^\circ$$

$$\text{Hence } \sin A = \cos B, \sec B = \operatorname{cosec} A$$

$$= \sin^2 37 + \cos^2 37 - \frac{4(\sin^2 37 + \cos^2 37) - 7}{-(\sec^2 47^\circ - \tan^2 47^\circ) + 4}$$

$$= 1 - \frac{4 - 7}{(-) + 4} = 1 + \frac{3}{4} = \frac{7}{4}$$

Sol 6

$$\frac{\tan 13^\circ \cdot \tan 36^\circ \tan 45^\circ \tan 54^\circ \tan 77^\circ}{2 \sec^2 60^\circ (\sin^2 60^\circ - 3 \cos 60^\circ + 2)}$$

$$A + B = 90^\circ$$

Hence

$$\tan A \cdot \tan B = 1$$

$$= \frac{\tan 13^\circ \cdot \tan 77^\circ \tan 36^\circ \tan 54^\circ \tan 45^\circ}{2 \sec^2 60^\circ (\sin^2 60^\circ - 3 \cos 60^\circ + 2)}$$

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

$$= \frac{1}{2 \times 4 \left( \frac{3}{4} - \frac{3}{2} + 2 \right)} = \frac{1}{10}$$



Sol 7

$$\begin{aligned}
& \tan^2 48^\circ - \operatorname{cosec}^2 42^\circ + \operatorname{cosec} (17^\circ + \theta) - \sec (23^\circ - \theta) \\
&= \tan^2 48^\circ - \operatorname{cosec}^2 (90^\circ - 48^\circ) + \operatorname{cosec} (90^\circ - (23^\circ - \theta)) - \sec (23^\circ - \theta) \\
&= \tan^2 48^\circ - \sec^2 48^\circ + \sec (23^\circ - \theta) - \sec (23^\circ - \theta) \\
&= -(\sec^2 48^\circ - \tan^2 48^\circ) + 0 \\
&= -1
\end{aligned}$$

Sol 8

$$\begin{aligned}
& 4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \tan^2 66^\circ \cdot \tan^2 24^\circ \\
&= \frac{y}{2}
\end{aligned}$$

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

$$\operatorname{cosec} (90^\circ - 33^\circ) = \sec 33^\circ$$

$$4(\sec^2 33^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \tan^2 66^\circ \cdot \tan^2 24^\circ = \frac{y}{2}$$

$$(\because \tan^2 A \cdot \tan^2 (90^\circ - A) = 1)$$

$$4 - 0 + y = \frac{y}{2}$$

$$y = -8$$

Sol 9

$$\frac{1 - \tan A}{1 + \tan A} = \frac{\tan 3^\circ \cdot \tan 15^\circ \cdot \tan 30^\circ \cdot \tan 75^\circ \cdot \tan 87^\circ}{\tan 27^\circ \cdot \tan 39^\circ \cdot \tan 51^\circ \cdot \tan 60^\circ \cdot \tan 63^\circ}$$

माना  $\tan A \cdot \tan B = 1$

$$A + B = 90^\circ$$

$$\frac{1 - \tan A}{1 + \tan A} = \frac{\tan 30^\circ}{\tan 60^\circ}$$

$$\frac{1 - \tan A}{1 + \tan A} = \frac{\frac{1}{\sqrt{3}}}{\frac{1}{\sqrt{3}}} = \frac{1}{3}$$

Apply Componendo and dividendo:

$$\tan A = \frac{1}{2} \Rightarrow \cot A = 2$$

**Sol 10**

$$\tan(63^\circ - \theta) - \cot(27^\circ + \theta) + \frac{\operatorname{cosec}^2 70^\circ - \tan^2 20^\circ}{\sec^2 37^\circ - \cot^2 53^\circ}$$

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

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

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

$$= \tan[90^\circ - (27^\circ + \theta)] - \cot(27^\circ + \theta) +$$

$$\frac{\operatorname{cosec}^2(90^\circ - 20^\circ) - \tan^2 20^\circ}{\sec^2(90^\circ - 53^\circ) - \cot^2 53^\circ}$$

$$= \cot(27^\circ + \theta) - \cot(27^\circ + \theta) + \frac{\sec^2 20^\circ - \tan^2 20^\circ}{\operatorname{cosec}^2 53^\circ + \cot^2 53^\circ}$$

$$= 0 + 1 = 1$$