

Trigonometry Ratio Table

$\sin 31^\circ < \sin 64^\circ$
 $6872 < 6811$

Angle (in Degrees)	0°	30°	45°	60°	90°
Angle (in Radians)	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
Sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
Cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
Tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined
Cot	Not Defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
Sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not Defined
Cosec	Not Defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

$\sin$ बढता है।

$\cos$ घटता है।

यदि $0^\circ < \theta < 45^\circ$

$$\sin \theta < \cos \theta$$

$$\sin 45^\circ < \cos 45^\circ$$

माना
यदि $45^\circ < \alpha < 90^\circ$

$$\sin \alpha > \cos \alpha$$

$$\sin 81^\circ > \cos 81^\circ$$



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

$$\begin{cases} (\sin\theta - \cos\theta)^2 = 1 - 2\sin\theta.\cos\theta = 1 - \sin 2\theta \\ (\cos\theta - \sin\theta)^2 = \end{cases}$$

$$\sqrt{1 + \sin 2\theta} = \sin\theta + \cos\theta$$

$$\sqrt{1 - \sin 2\theta} \begin{cases} \rightarrow \sin\theta - \cos\theta \\ \text{या} \\ \rightarrow \cos\theta - \sin\theta \end{cases}$$



Misc



67. If $\theta = 53^\circ$ then $\frac{1}{2}(\sqrt{1 + \sin \theta} + \sqrt{1 - \sin \theta})$ is equal to?

यदि $\theta = 53^\circ$, तो $\frac{1}{2}(\sqrt{1 + \sin \theta} + \sqrt{1 - \sin \theta})$ किसके बराबर है?

[A] $\cot \frac{\theta}{2}$

[B] $\sec \frac{\theta}{2}$

[C] $\sin \frac{\theta}{2}$

[D] $\cos \frac{\theta}{2}$

$\frac{\theta}{2} = 26.5^\circ$

$\cos \frac{\theta}{2} > \sin \frac{\theta}{2}$

$$\sqrt{1 + \sin \theta} = \sin \frac{\theta}{2} + \cos \frac{\theta}{2}$$

$$= \frac{1}{2} \left[\cancel{\sin \frac{\theta}{2} + \cos \frac{\theta}{2}} + \cancel{\cos \frac{\theta}{2} - \sin \frac{\theta}{2}} \right] \\ = \cos \frac{\theta}{2}$$

$\sin \frac{\theta}{2} - \cos \frac{\theta}{2} \times$

$\cos \frac{\theta}{2} - \sin \frac{\theta}{2} \checkmark$

67. If $\theta = 96^\circ$ then $\frac{1}{2}(\sqrt{1 + \sin \theta} + \sqrt{1 - \sin \theta})$ is equal to?

यदि $\theta = 96^\circ$, तो $\frac{1}{2}(\sqrt{1 + \sin \theta} + \sqrt{1 - \sin \theta})$ किसके बराबर है?

[A] $\cot \frac{\theta}{2}$

[B] $\sec \frac{\theta}{2}$

[C] $\sin \frac{\theta}{2}$

[D] $\cos \frac{\theta}{2}$

$$\frac{\theta}{2} = 48^\circ$$

$$\sin \frac{\theta}{2} > \cos \frac{\theta}{2}$$

$$\sqrt{1 + \sin \theta} = \sin \frac{\theta}{2} + \cos \frac{\theta}{2}$$

$$\sin \frac{\theta}{2} - \cos \frac{\theta}{2} \quad \times$$

$$\cos \frac{\theta}{2} - \sin \frac{\theta}{2} \quad \checkmark$$

68. If $1 + \cos x + \cos^2 x + \cos^3 x + \dots \infty$ terms $= 4 + 2\sqrt{3}$, then $x = ?$

यदि $1 + \cos x + \cos^2 x + \cos^3 x + \dots \infty$ पद $= 4 + 2\sqrt{3}$ हैं, तो $x = ?$

[A] 15°

[B] 30°

[C] 45°

[D] 60°

$$a=1$$
$$r=\cos x$$

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

$$\Rightarrow x = 30^\circ$$

$$\frac{1}{1-\cos x} = 4 + 2\sqrt{3}$$

$$1-\cos x = \frac{1}{4+2\sqrt{3}} \times \frac{4-2\sqrt{3}}{4-2\sqrt{3}} = \frac{4-2\sqrt{3}}{4}$$

$$\cancel{1-\cos x} = \cancel{1-\frac{\sqrt{3}}{2}}$$

$$a \quad ar \quad ar^2 \quad ar^3$$

$$(\tau < 1) \quad S_{\infty} = \frac{a}{1-\tau}$$



69. If $8\sin\theta - \cos\theta = 4$, where $0 < \theta < \pi/2$, then what is $\operatorname{cosec} \theta$ equal to?

यदि $8\sin\theta - \cos\theta = 4$, जहाँ $0 < \theta < \pi/2$, तो $\operatorname{cosec} \theta$ किसके बराबर है?

(UPSC CDS - II 2025)

[A] ~~1~~

[B] $3/2$

☒ [C] $5/3 = \operatorname{cosec} \theta$
H P

[D] 2

$4 \rightarrow B$

$$8 \times \frac{3}{5} - \frac{4}{5} = \frac{20}{5} = 4$$

70. If $A = 2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta)$ then the value of 3α such that $\cos \alpha = \sqrt{\frac{3+A}{5+A}}$ is:

यदि $A = 2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta)$ है, तो $\cos \alpha = \sqrt{\frac{3+A}{5+A}}$ करने के लिए 3α का मान ज्ञात करें।

[A] 45°

[B] 135°

[C] 180°

[D] 90°

$$\cos \alpha = \sqrt{\frac{3}{4}} = \frac{1}{2}$$

$$\alpha = 45^\circ$$

$$A = 2(1 - 3\sin^2 \theta) - 3(1 - 2\sin^2 \theta)$$

$$A = 2 - 3 = -1$$

$$\text{but } \theta = 0^\circ$$

$$A = 2 - 3 = -1$$

71. If $\frac{(1+\sin\theta-\cos\theta)}{(1+\sin\theta+\cos\theta)} + \frac{(1+\sin\theta+\cos\theta)}{(1+\sin\theta-\cos\theta)} = 4$, then which of the following values will be suitable for θ ?

यदि $\frac{(1+\sin\theta-\cos\theta)}{(1+\sin\theta+\cos\theta)} + \frac{(1+\sin\theta+\cos\theta)}{(1+\sin\theta-\cos\theta)} = 4$ है, तो θ के लिए निम्नलिखित में से कौन सा मान उपयुक्त होगा?

[A] ~~90°~~

[B] ~~60°~~

[C] ~~45°~~

[D] 30°

option से

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

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

$$\frac{\cancel{\sqrt{3}+1}}{\sqrt{3} \cdot \cancel{(\sqrt{3}+1)}}$$

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

Trigonometry ③



$$\sec^2 \theta = 1 + \tan^2 \theta \quad \checkmark$$

$$\tan^2 \theta = \sec^2 \theta - 1 \longrightarrow \tan^2 \theta = (\sec \theta - 1)(\sec \theta + 1)$$

$$\frac{\tan \theta}{(\sec \theta + 1)} = \frac{(\sec \theta - 1)}{\tan \theta}$$

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

$$\Rightarrow \sec^2 \theta - \tan^2 \theta = 1$$

$$(\sec \theta - \tan \theta)(\sec \theta + \tan \theta) = 1$$

$$(\sec \theta - \tan \theta) = \frac{1}{(\sec \theta + \tan \theta)}$$

$$\operatorname{cosec}^2 \theta = 1 + \cot^2 \theta \quad \checkmark$$

$$\cot^2 \theta = \operatorname{cosec}^2 \theta - 1 \longrightarrow \cot^2 \theta = (\operatorname{cosec} \theta - 1)(\operatorname{cosec} \theta + 1)$$

$$\frac{\cot \theta}{(\operatorname{cosec} \theta + 1)} = \frac{(\operatorname{cosec} \theta - 1)}{\cot \theta}$$

$$\operatorname{cosec}^2 \theta - \cot^2 \theta = 1$$

$$(\operatorname{cosec} \theta + \cot \theta)(\operatorname{cosec} \theta - \cot \theta) = 1$$

$$(\operatorname{cosec} \theta - \cot \theta) = \frac{1}{(\operatorname{cosec} \theta + \cot \theta)}$$

1. If A, B, C, D are the angles of a cyclic quadrilateral, then what is the value of $\sin \frac{A+C}{2} + \sin \frac{B+D}{2}$?

यदि A, B, C, D एक चक्रीय चतुर्भुज के कोण हैं, तो $\sin \frac{A+C}{2} + \sin \frac{B+D}{2}$ का मान क्या है?

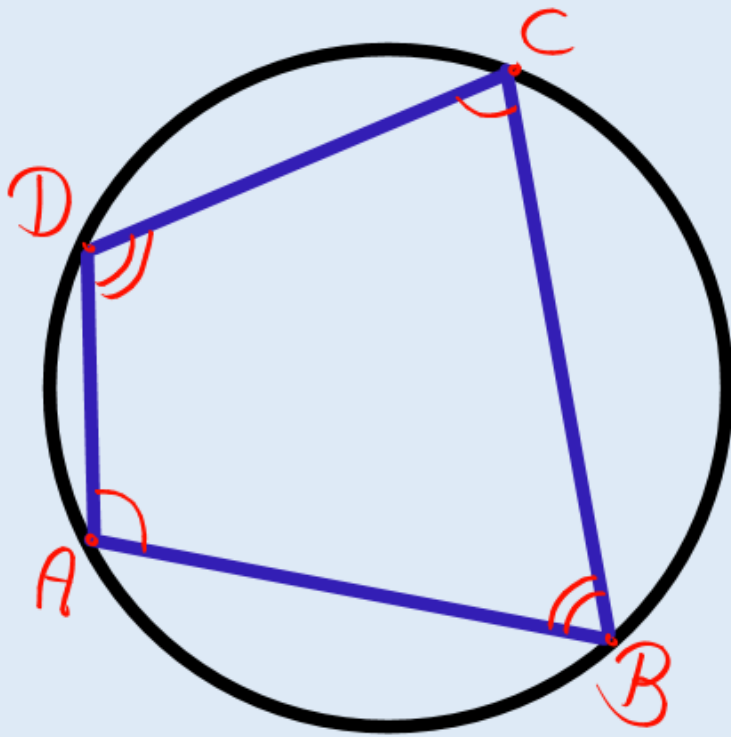
[A] 2

[B] 1

1+1

[C] 0

[D] -1



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

2. If A, B, C are acute angles and $\sin(B+C-A) = \cos(C+A-B) = \tan(A+B-C) = 1$, then what is $(A+B+C)$ equal to?

यदि A, B, C न्यून कोण हैं और $\sin(B+C-A) = \cos(C+A-B) = \tan(A+B-C) = 1$ है, तो $(A+B+C)$ किसके बराबर है?

[A] 90°

[B] 120°

[C] 135°

[D] 150°

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

$$C+A-B=0^\circ$$

$$A+B-C=45^\circ$$

3. If $1 + \cot^2\theta = \frac{625}{49}$ and θ is acute, then what is the value of $(\sin\theta + \cos\theta)^{1/2}$?

यदि $1 + \cot^2\theta = \frac{625}{49}$ और θ न्यून कोण है, $(\sin\theta + \cos\theta)^{1/2}$ का मान क्या होगा?

[A] $\frac{\sqrt{3}}{5}$

[B] $\frac{\sqrt{31}}{7}$

[C] $\frac{\sqrt{31}}{5}$

[D] $\frac{\sqrt{33}}{8}$

$$\left(\frac{7}{25} + \frac{24}{25}\right)^{\frac{1}{2}} = \frac{\sqrt{31}}{5}$$

$$\sec^2\theta = \frac{625}{49}$$

$$\sec\theta = \frac{25}{7}$$



4. If $0^\circ \leq \theta \leq 90^\circ$, and $\sec^{107}\theta + \cos^{107}\theta = 2$, then, $(\sec\theta + \cos\theta)$ is equal to:
यदि $0^\circ \leq \theta \leq 90^\circ$ और $\sec^{107}\theta + \cos^{107}\theta = 2$ है, तो $(\sec\theta + \cos\theta)$ का मान ज्ञात कीजिए।

[A] 2^{-107}

[B] 2

[C] $\frac{1}{2}$

[D] 1

5. If $\tan\theta + \cot\theta = 2$, θ is an acute angle, then find the value of $2\tan^{25}\theta + 3\cot^{20}\theta + 5\tan^{30}\theta \cot^{15}\theta$.

यदि $\tan\theta + \cot\theta = 2$ है, θ एक न्यून कोण है, तो $2\tan^{25}\theta + 3\cot^{20}\theta + 5\tan^{30}\theta \cot^{15}\theta$ का मान ज्ञात कीजिए।

$2+3+5$

(SSC CPO 2023)

[A] 12

[B] 10

[C] 8

[D] 6

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

$$\Rightarrow \tan\theta = 1$$

6. If $\tan\theta + \cot\theta = -2$, then the value of $\tan^9\theta + \cot^9\theta$ is:

यदि $\tan\theta + \cot\theta = -2$ है, तो $\tan^9\theta + \cot^9\theta$ का मान ज्ञात कीजिए।

[A] 2

[B] -1

[C] -2

[D] 0

$$\tan\theta + \frac{1}{\tan\theta} = -2$$

$$\Rightarrow \tan\theta = -1$$



7. If $\cot A = x + \frac{1}{x}$, find $\operatorname{cosec}^2 A$.

यदि $\cot A = x + \frac{1}{x}$, तो $\operatorname{cosec}^2 A$ का मान ज्ञात कीजिए.

[A] $x^2 + \frac{1}{x^2} + 1$

[C] $x^2 + \frac{1}{x^2} + 3$

[B] $x^2 + \frac{1}{x^2} + 1$

[D] $x^2 + \frac{1}{x^2} - 1$

$= 1 + \cot^2 A$

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

8. Find the value of $\cot^2 B - \operatorname{cosec}^2 B$ for $0 < B < 90^\circ$.

$0 < B < 90^\circ$ के लिए $\cot^2 B - \operatorname{cosec}^2 B$ का मान ज्ञात कीजिए।

SSC CHSL 2023 PRE

[A] 2

[C] 0

☒ [B] -1

[D] -2

9. What is the value of $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta}$.

$\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta}$ का मान ज्ञात कीजिए।

(RRB GROUP-D 2025)

[A] $\cot^2 \theta$

[B] $\tan \theta$

[C] $\operatorname{cosec}^2 \theta$

✓ [D] $\tan^2 \theta$

$$\frac{\sec^2 \theta}{\sec^2 \theta} = \tan^2 \theta$$

10. **Simplify/सरल कीजिए:**

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

SSC CPO Pre 2024

[A] $\frac{1}{\sin^2 A - \sin^4 A}$

[C] $\frac{1}{\cos^2 A - \sin^4 A}$

[B] $\frac{1}{\sin^2 A - \cos^4 A}$

[D] $\frac{1}{\cot^2 A - \tan^4 A}$

$$\frac{1}{(1 - \sin^2) \cdot \sin^2}$$

$$\begin{aligned} & \sec^2 A + \csc^2 A \\ &= \sec^2 A \times \csc^2 A \\ &= \frac{1}{\cos^2} \times \frac{1}{\sin^2} \end{aligned}$$

11. Find the value of the following expression.

निम्नलिखित व्यंजक का मान ज्ञात कीजिए।

$$\frac{(1+\sec\theta)}{\sec\theta} (1 - \cos\theta)$$

SSC CHSL 2023 PRE

✓ [A] $\sin^2\theta$

[B] $\cos^2\theta$

[C] $\cot^2\theta$

[D] $\sec^2\theta$

$$(c+1)(1-c)$$

12. **Simplify:** $\frac{1 - \sec x}{\operatorname{cosec} x \cdot \cot x}$

$\frac{1 - \sec x}{\operatorname{cosec} x \cdot \cot x}$ निम्नलिखित का सरलीकृत मान ज्ञात कीजिए:

(RRB GROUP-D 2025)

☒ [A] $(\cos x - 1) \tan^2 x$

[B] $(\cos x - 1) \cot^2 x$

[C] $(\cos x + 1) \tan^2 x$

[D] $(\cos x + 1) \cot^2 x$

$$\begin{aligned} & \frac{1 - \frac{1}{\cos x}}{\frac{1}{\sin x} \times \frac{\cos x}{\sin x}} \\ & \frac{(\cos x - 1)}{\cos x} \times \frac{\sin^2 x}{\cos x} \\ & = (\cos x - 1) \times \tan^2 x \end{aligned}$$

13. If $\frac{1}{1 - \tan \theta} + \frac{1}{1 + \tan \theta} = 3$, and θ is an acute angle, find the value of cosec θ .

यदि $\frac{1}{1 - \tan \theta} + \frac{1}{1 + \tan \theta} = 3$ है, और θ एक न्यून कोण है, तो cosec θ का मान ज्ञात कीजिए।

(RRB GROUP-D 2025)

[A] 2 ✓

[B] $\frac{1}{\sqrt{2}}$

[C] $\sqrt{2}$

[D] 1

$$\frac{2}{1 - T^2} = 3$$

$$\frac{2}{3} = 1 - T^2$$

$$T^2 = \frac{1}{3}$$

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

$$\theta = 30^\circ$$

14. $\frac{1}{\sec A(1-\tan A)} + \frac{1}{\operatorname{cosec} A(1-\cot A)}$ is equal to:
 $\frac{1}{\sec A(1-\tan A)} + \frac{1}{\operatorname{cosec} A(1-\cot A)}$ का मान कितना होगा?

(RRB NTPC 12th LEVEL 2025)

[A] $\frac{1}{\cos A \sin A}$

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

[C] $\cos A \sin A$

[D] $\cos A + \sin A$

$$\frac{(-S) \cdot (-S)}{(-S)} = \frac{C}{1-S} + \frac{S}{1-C}$$

$$= \frac{C^2}{(-S)} - \frac{S^2}{(-S)}$$

15. $\cot^2 x - \tan^2 x = ?$

[A] $4\sec^2 x \csc^2 x$

[C] $\sin 8x$

☒ [B] $4\cot^2 x \csc^2 x$

[D] $4\tan^2 x \sec^2 x$

$(\cot x + \tan x)(\cot x - \tan x)$
↓ ↓
 $\frac{\cos x}{\sin x} \times \frac{\cos x}{\sin x}$

~~$\frac{\cos x}{\sin x}$~~

16. **$\cot^4 A + \cot^2 A$ is equal to:**

$\cot^4 A + \cot^2 A$ बराबर है:

(SSC CPO 2023). RRB GROUP-D 2025

[A] $(\operatorname{cosec}^2 A - \operatorname{cosec}^4 A)$

[B] $-(\operatorname{cosec}^2 A + \operatorname{cosec}^4 A)$

[C] $(\operatorname{cosec}^4 A - \operatorname{cosec}^2 A)$

[D] $(\operatorname{cosec}^4 A + \operatorname{cosec}^2 A)$

$\cot^2 A \cdot (\cot^2 A + 1)$
 $\downarrow$
 $(\operatorname{cosec}^2 A - 1) \times \operatorname{cosec}^2 A$

17. $\sec^4 x - \sec^2 x = ?$

[A] $\tan^2 x - \tan^4 x$

[C] $\cos^4 x - \cos^2 x$

✓ [B] $\tan^2 x + \tan^4 x$

[D] $\cos^2 x - \cos^4 x$

$$\begin{array}{c} \sec^2 x \cdot (\sec^2 x - 1) \\ \downarrow \quad \downarrow \\ (1 + \tan^2 x) \times \tan^2 x \end{array}$$

18. Find the value of $\frac{(\sec^4 A - \sec^2 A)}{(\cot^2 A + \cot^4 A)} \times \frac{(\operatorname{cosec}^4 A - \operatorname{cosec}^2 A)}{(\tan^2 A + \tan^4 A)} + \cot^2 A$.

~~$\frac{(\sec^4 A - \sec^2 A)}{(\cot^2 A + \cot^4 A)} \times \frac{(\operatorname{cosec}^4 A - \operatorname{cosec}^2 A)}{(\tan^2 A + \tan^4 A)} + \cot^2 A$~~ का मान ज्ञात कीजिए।

(RRB NTPC 12th LEVEL 2025)

[A] $\cot^2 A$

[B] 0

[C] 1

☒ [D] $\operatorname{cosec}^2 A$

$$= 1 + \cot^2 A$$

19. Which of the following will satisfy $a^2 = b^2 + (ab)^2$ for the values a and b?

निम्नलिखित में से कौन a और b के लिए $a^2 = b^2 + (ab)^2$ संतुष्ट करेगा

[A] $a = \sin x, b = \cot x$ [B] $a = \cos x, b = \tan x$

[C] $a = \cot x, b = \cos x$ [D] $a = \sin x, b = \tan x$

$$a^2 - b^2 = a^2 b^2$$

$$\cancel{a}^2 - \cancel{b}^2 = \cancel{a}^2 \cdot \cancel{b}^2$$

20. Find the value of $3(\sec^2 A - 1)(\operatorname{cosec} A - 1)(\operatorname{cosec} A + 1) + 4(\operatorname{cosec}^2 A - \cot^2 A)$?

$3(\sec^2 A - 1)(\operatorname{cosec} A - 1)(\operatorname{cosec} A + 1) + 4(\operatorname{cosec}^2 A - \cot^2 A)$ का मान ज्ञात कीजिये?

(SSC CHSL MAINS 2024)

[A] 10

[B] 12

[C] 3

[D] 7

~~$3 \sec^2 A - 4$~~

21. If $\tan\theta + \cot\theta = 4$, then the ratio of $3(\tan^2\theta + \cot^2\theta)$ to $(2\operatorname{cosec}^2\theta \sec^2\theta - 4)$ will be:

यदि $\tan\theta + \cot\theta = 4$ है, तो $3(\tan^2\theta + \cot^2\theta)$ का $(2\operatorname{cosec}^2\theta \sec^2\theta - 4)$ से अनुपात ज्ञात करें।

[A] 4:3

[B] 3:4

[C] 5:4

[D] 3:2

16

$$\tan^2\theta + \cot^2\theta + 2 = 16$$

$$\sec\theta \cdot \operatorname{cosec}\theta = 4$$

$$3 \times 16 : 2 \times 4$$

$$3 : 2$$