

last sheet (Formula based)

Trigonometry

(त्रिकोणमिति)



$$\text{ctg} \alpha = 1$$

$$\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$$

$$\text{tg} \alpha \cdot \text{ctg} \alpha = 1$$

$$\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$$

$$\text{tg} \alpha = \frac{\sin \alpha}{\cos \alpha}$$

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

$$\text{tg} \alpha = \frac{\sin \alpha}{\cos \alpha}$$

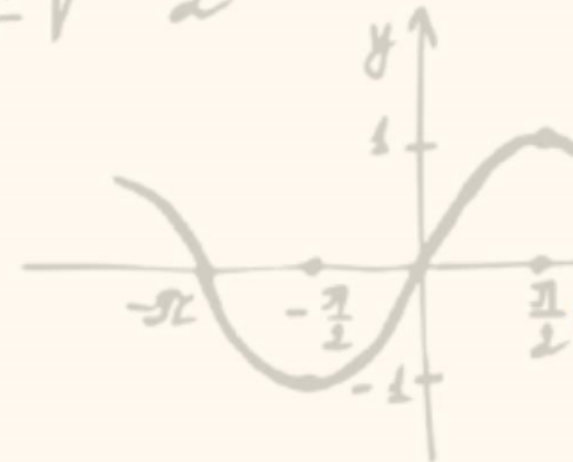
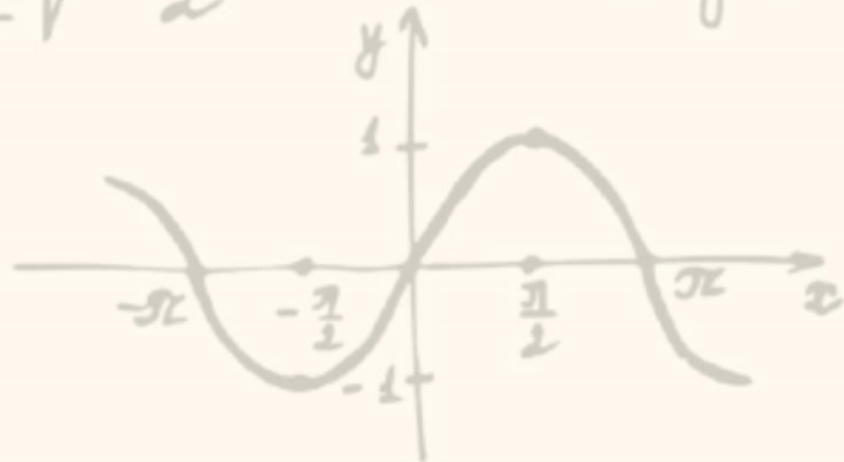
$$\sin^2 \alpha + \cos^2 \alpha = 1$$

$$\sin \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$\text{ctg} \frac{\pi}{3} = \frac{1}{\sqrt{3}}$$

$$\sin \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$\text{ctg} \frac{\pi}{3} = \frac{1}{\sqrt{3}}$$



Compound Angle formulas $\Rightarrow$



$A \neq B$

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

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

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

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

$\curvearrowright$




$$\sin(A+B) \cdot \sin(A-B) = \sin^2 A \cdot \cos^2 B - \cos^2 A \cdot \sin^2 B$$

$$= \sin^2 A \cdot (1 - \sin^2 B) - (1 - \sin^2 A) \sin^2 B$$

$$= \sin^2 A - \cancel{\sin^2 A \sin^2 B} - \sin^2 B + \cancel{\sin^2 A \sin^2 B}$$

$$= \sin^2 A - \sin^2 B$$

$$= (1 - \cos^2 A) - (1 - \cos^2 B)$$

$$= \cos^2 B - \cos^2 A$$



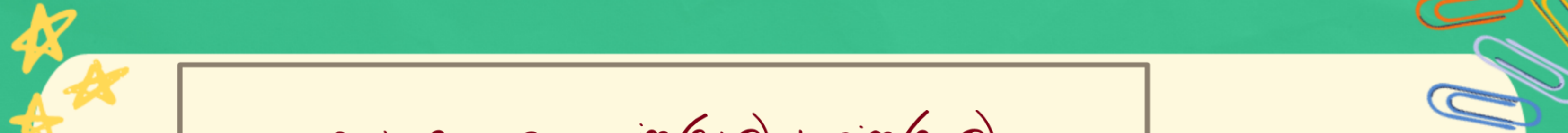
$$\sin(A+B) \cdot \sin(A-B) = \sin^2 A - \sin^2 B = \cos^2 B - \cos^2 A$$

$$\cos(A+B) \cdot \cos(A-B) = \cos^2 A - \sin^2 B = \cos^2 B - \sin^2 A$$



ee




$$2 \sin A \cdot \cos B = \sin(A+B) + \sin(A-B)$$

$$2 \cos A \cdot \sin B = \sin(A+B) - \sin(A-B)$$

$$2 \cos A \cdot \cos B = \cos(A+B) + \cos(A-B)$$

$$\# \quad 2 \sin A \cdot \sin B = \cos(A-B) - \cos(A+B)$$



C & D formulas $\Rightarrow$

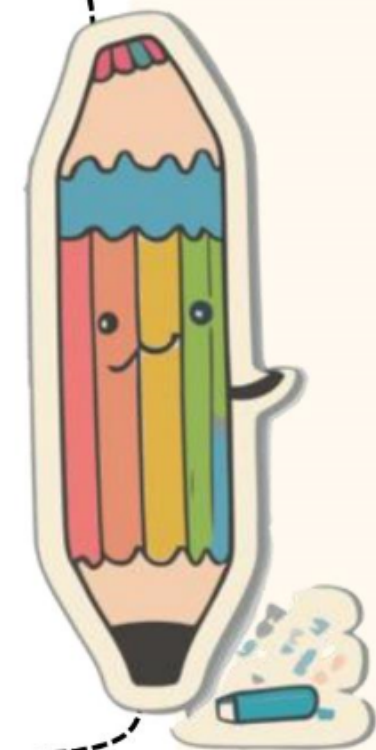
$$\cos C - \cos D = 2 \sin \frac{C+D}{2} \cdot \sin \frac{D-C}{2}$$

$$\sin(A+B) + \sin(A-B) = 2 \sin A \cdot \cos B$$

$$\sin(A+B) - \sin(A-B) = 2 \cos A \cdot \sin B$$

$$\cos(A+B) + \cos(A-B) = 2 \cos A \cdot \cos B$$

$$\cos(A-B) - \cos(A+B) = 2 \sin A \cdot \sin B$$

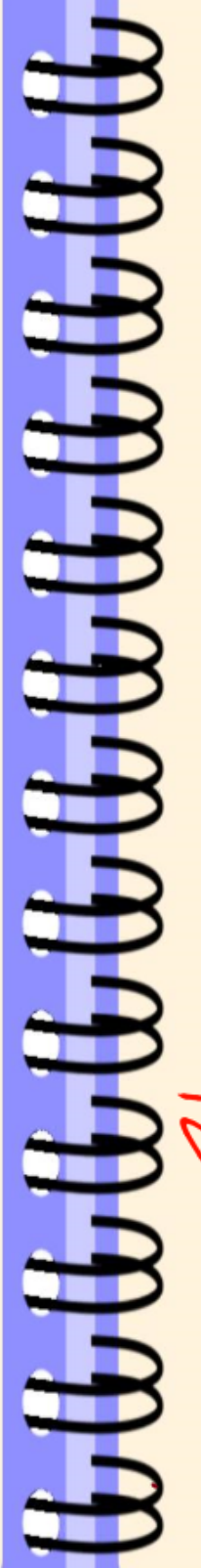


$$\sin(-\theta) = -\sin \theta$$

माना $A+B=C$

$$A-B=D$$

तो $A = \frac{C+D}{2}$ & $B = \frac{C-D}{2}$



C & D FORMULAS

$$\sin C + \sin D =$$

$$2\sin\frac{C+D}{2} \cdot \cos\frac{C-D}{2}$$

$$\sin C - \sin D =$$

$$2\cos\frac{C+D}{2} \cdot \sin\frac{C-D}{2}$$

$$\cos C + \cos D =$$

$$2\cos\frac{C+D}{2} \cdot \cos\frac{C-D}{2}$$

$$\cos C - \cos D =$$

$$2\sin\frac{C+D}{2} \cdot \sin\frac{D-C}{2}$$

#





$$\frac{\sin(A+B)}{\cos(A+B)} = \frac{\sin A \cos B + \cos A \sin B}{\cos A \cos B - \sin A \sin B}$$



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

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

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

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







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

Put $B=A$

$$\sin 2A = 2 \sin A \cdot \cos A = \frac{2 \tan A}{1 + \tan^2 A}$$



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

Put $B=A$

$$\cos 2A = \cos^2 A - \sin^2 A = 2 \cos^2 A - 1 = 1 - 2 \sin^2 A = \frac{1 - \tan^2 A}{1 + \tan^2 A}$$




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

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

$$\cos^2 A = \frac{1 + \cos 2A}{2}$$

$$\cos 2A = 1 - 2\sin^2 A$$

$$2\sin^2 A = 1 - \cos 2A$$

$$\sin^2 A = \frac{1 - \cos 2A}{2}$$





Put $B=A$

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

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$



$$\sin 3A = 3 \sin A - 4 \sin^3 A$$

$$\cos 3A =$$





$$\sin 75^\circ = \cos 15^\circ = \frac{\sqrt{3} + 1}{2\sqrt{2}}$$



$$\sin 75^\circ = \sin(45^\circ + 30^\circ) = \sin 45^\circ \cdot \cos 30^\circ + \cos 45^\circ \cdot \sin 30^\circ$$

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

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





$$\sin 15^\circ = \cos 75^\circ = \frac{\sqrt{3} - 1}{2\sqrt{2}}$$

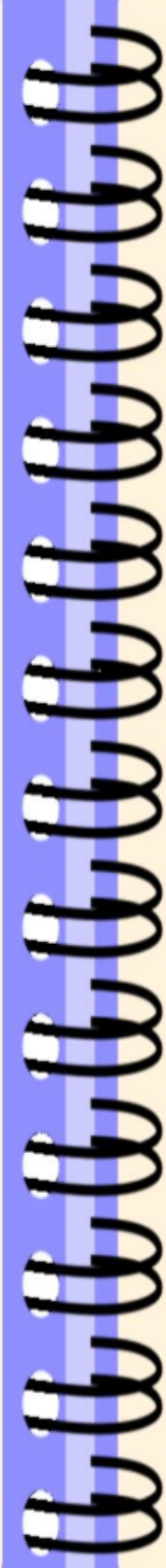


$$\sin 15^\circ = \sin(45^\circ - 30^\circ) = \sin 45^\circ \cdot \cos 30^\circ - \cos 45^\circ \cdot \sin 30^\circ$$

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

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




$$\tan 75^\circ = \cot 15^\circ = \frac{\sqrt{3}+1}{\sqrt{3}-1} = 2 + \sqrt{3}$$

$$\tan 15^\circ = \cot 75^\circ = \frac{\sqrt{3}-1}{\sqrt{3}+1} = 2 - \sqrt{3}$$

$$\operatorname{cosec} 15^\circ = \frac{1}{\sin 15} = \frac{2\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+2}{\sqrt{3}+2} = \sqrt{6} + \sqrt{2}$$


ee





13. Given that A and B are second quadrant angles, $\sin A = \frac{1}{3}$ and $\sin B = \frac{1}{5}$, then find the value of $\cos(A-B)$.

अगर A और B दूसरे चतुर्थांश के कोण हैं, $\sin A = 1/3$ और $\sin B = 1/5$ है, तो $\cos(A-B)$ का मान ज्ञात कीजिए।

[A]

$$\frac{4\sqrt{3}+1}{15}$$

[B]

$$\frac{8\sqrt{3}-1}{15}$$

[C]

$$\frac{8\sqrt{3}+1}{15}$$

[D]

$$\frac{4\sqrt{3}+1}{15}$$

$$\cos A \cdot \cos B + \sin A \cdot \sin B$$

$$-\frac{\sqrt{8}}{3} \times \frac{\sqrt{6}}{5} + \frac{1}{3} \times \frac{1}{5}$$

$$= \frac{8\sqrt{3}+1}{15}$$

$$\cos A = -\sqrt{1-\frac{1}{9}}$$

$$\cos B = -\sqrt{1-\frac{1}{25}}$$

$$\frac{4\sqrt{12}}{15\sqrt{3}}$$

1. Let ABC be a right-angled triangle with a right angle at B. If $\tan A = \sqrt{3}$, then find the value of $\sin A \cos C + \cos A \sin C$ and $\cos A \cos C - \sin A \sin C$.
मान लीजिए ABC एक समकोण त्रिभुज है जो B पर समकोण है। यदि $\tan A = \sqrt{3}$ है, तो $\sin A \cos C + \cos A \sin C$ और $\cos A \cos C - \sin A \sin C$ का मान ज्ञात कीजिए।

(SSC CGL MAINS 2024) SSC CHSL PRE 2024

[A] $\frac{\sqrt{3}}{2}, \frac{1}{2}$

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

[C] 1, 0

[D] 0

$\angle B = 90^\circ$

$A + C = 90^\circ$

$= \sin(A+C)$
 $= 1$

$= \cos(A+C)$
 $= 0$

2. What is the value of $\sin 20^\circ \cos 10^\circ + \cos 20^\circ \sin 10^\circ$?

$\sin 20^\circ \cos 10^\circ + \cos 20^\circ \sin 10^\circ$ का मान क्या है?

SSC CGL 2025 PRE

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

[B] $\frac{3}{4}$

[C] $\frac{5}{4}$

[D] $\frac{7}{8}$

$\rightarrow \sin(20^\circ + 10^\circ)$

$= \frac{1}{2}$

3. Evaluate $\cos 42^\circ \cdot \cos 18^\circ - \sin 42^\circ \cdot \sin 18^\circ$.

$\cos 42^\circ \cdot \cos 18^\circ - \sin 42^\circ \cdot \sin 18^\circ$ का मान ज्ञात कीजिए।

(RRB NTPC GRADUATE LEVEL 2025 CBT-1)

[A]

1

✓ [B] $\frac{1}{2}$

[C]

$\frac{1}{4}$

[D] $\frac{1}{3}$

$\cos(42^\circ + 18^\circ)$
 $= \frac{1}{2}$

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

4. For what value of θ (in degrees) is the following equation true?

θ (डिग्री में) के किस मान के लिए निम्नलिखित समीकरण सत्य है? **SSC CGL MAINS 2021**

$$\sin 3\theta \cos \theta - \cos 3\theta \sin \theta = \frac{1}{2}, 0 < \theta < \frac{\pi}{2}$$

[A] 45

[B] 30

[C] 60

☒ [D] 15

$$\sin(30-0) = \frac{1}{2}$$

$$\sin 20 = \sin 30^\circ$$

$$\frac{\sin(59^\circ + 31^\circ)}{\cos(20^\circ + 25^\circ)}$$

$$\leftarrow \frac{\sin 59 \cdot \cos 31 + \cos 59 \cdot \sin 31}{\cos 20 \cdot \cos 25 - \sin 20 \cdot \sin 25} = ?$$

SSC CGL MAINS 2017

5.

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

[A]

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

[B]

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

[C]

$$\sqrt{3}$$

☒ [D]

$$\sqrt{2}$$

6. Find the value of $\frac{\sin 24^\circ \cos 6^\circ - \sin 6^\circ \sin 66^\circ}{\sin 21^\circ \cos 39^\circ - \cos 51^\circ \sin 69^\circ}$ का मान ज्ञात कीजिए ?

SSC CGL MAINS 2017

[A]

2

[B] 1

[C]

0

[D] -1

$$\frac{\sin 18^\circ}{\sin(41^\circ - 39^\circ)}$$

$$\frac{\sin 18^\circ}{-\sin 18^\circ}$$

$$\sin(-\theta) = -\sin \theta$$

7. The value of $(\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ) - \frac{4 \cos^2 37^\circ - 7 + 4 \cos^2 53^\circ}{\tan^2 47^\circ + 4 - \operatorname{cosec}^2 43^\circ}$ is:

$(\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ) - \frac{4 \cos^2 37^\circ - 7 + 4 \cos^2 53^\circ}{\tan^2 47^\circ + 4 - \operatorname{cosec}^2 43^\circ}$ का मान ज्ञात करें।

SSC CGL PRE 2022

[A] 1
[C] 0

[B] -2
[D] 2

$$\frac{4-7}{4-1} = -1$$

$$1 - (-1) = 2$$

8. What is the value of $\frac{\sin(A+B)}{\sin A \cos B}$? **SSC CGL PRE 2023**

$\frac{\sin(A+B)}{\sin A \cos B}$ का मान क्या है?

☒ [A] $1 + \cot A \tan B$

☐ [C] $1 + \sin A \cos B$

☐ [B] $1 + \tan A \cot B$

☐ [D] $1 + \cot A \tan B$

$$\frac{\sin A \cos B + \cos A \sin B}{\sin A \cos B}$$

9. Find the value of $\cos\left(\frac{\pi}{4}-\theta\right).\cos\left(\frac{\pi}{4}-\varphi\right) - \sin\left(\frac{\pi}{4}-\theta\right).\sin\left(\frac{\pi}{4}-\varphi\right).$

[A] $\sin(\theta-\varphi)$

~~[B] $\sin(\theta+\varphi)$~~

[C] $\cos(\theta-\varphi)$

[D] $\cos(\theta+\varphi)$

$$\begin{aligned} &= \cos\left(\frac{\pi}{2} - (\theta + \varphi)\right) \\ &= \cos\left[90^\circ - (\theta + \varphi)\right] \\ &= \sin(\theta + \varphi) \end{aligned}$$

10. If $\sin A = \frac{3}{5}$ and $\cos B = \frac{12}{13}$, A and $B \in \left(0, \frac{\pi}{2}\right)$, find $\sin(A + B)$.

यदि $\sin A = \frac{3}{5}$ और $\cos B = \frac{12}{13}$, A और $B \in \left(0, \frac{\pi}{2}\right)$, तो $\sin(A + B)$ का मान ज्ञात कीजिए।

SSC CGL PRE 2025

- A. $\frac{56}{65}$
- B. $\frac{63}{65}$
- C. $\frac{33}{65}$
- D. $\frac{77}{85}$

$$= \sin A \cdot \cos B + \cos A \cdot \sin B$$

$$= \frac{3}{5} \times \frac{12}{13} + \frac{4}{5} \times \frac{5}{13}$$

$$= \frac{36+20}{65}$$

11. If $\cos\alpha = \frac{3}{5}$ and $\cos\beta = \frac{15}{17}$, then find the value of $\sin(\alpha + \beta)$.

यदि $\cos\alpha = \frac{3}{5}$ और $\cos\beta = \frac{15}{17}$ है, तो $\sin(\alpha + \beta)$ का मान ज्ञात कीजिए।

(RRB NTPC GRADUATE LEVEL 2025 CBT-1)

[A]

$\frac{36}{85}$

[C]

$\frac{15}{85}$

$\frac{84}{85}$

☒ [B]

$\frac{84}{85}$

[D]

$\frac{77}{85}$

$\frac{84}{85}$

12. A navigation system calculates the direction of two aircraft. Aircraft A climbs at an angle where $\sin \theta = 3/5$ and is heading NE (1st quadrant). Aircraft B descends with $\cos \varphi = -5/13$ and is heading SW (3rd quadrant). Determine $\sin(\theta + \varphi)$, the resultant elevation angle from the origin.

एक नेविगेशन सिस्टम दो विमानों की दिशा की गणना करता है। विमान A एक ऐसे कोण पर चढ़ता है जहाँ $\sin \theta = 3/5$ है और NE (पहला चतुर्थांश) की ओर बढ़ रहा है। विमान B, $\cos \varphi = -5/13$ के साथ उतरता है और SW (तीसरा चतुर्थांश) की ओर बढ़ रहा है। मूल से परिणामी उन्नयन कोण $\sin(\theta + \varphi)$ निर्धारित करें।

(DELHI POLICE HEAD CONSTABLE 2025)

[A] $-\frac{24}{65}$
[C] $\frac{36}{65}$

[B] $\frac{56}{65}$
[D] $-\frac{63}{65}$



$$\begin{aligned}\sin(\theta + \varphi) &= \sin \theta \cdot \cos \varphi + \cos \theta \cdot \sin \varphi \\ &= \frac{3}{5} \times -\frac{5}{13} + \frac{4}{5} \times -\frac{12}{13}\end{aligned}$$

14. $\sin(90 - x) \cdot \cos\{\pi - (x - y)\} + \cos(90 - x) \sin\{\pi - (y - x)\} = ?$

SSC CGL MAINS 2017

RRB NTPC UG LEVEL 2024

[A] $-\cos y$

[C] $\cos x$

[B] $-\sin y$

[D] $\tan y$

put $x=0^\circ$

$$1 \times \cos(180^\circ + y) \\ = -\cos y$$