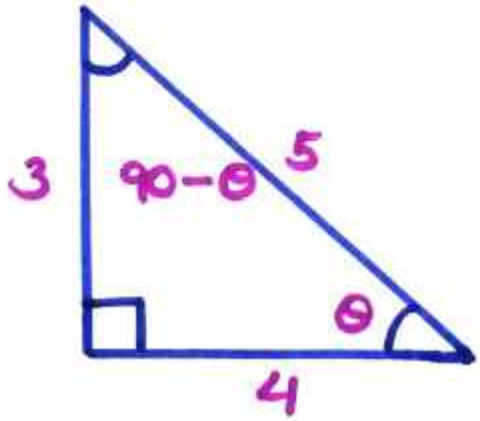
रेल रक्षक बैंच | TRIGONOMETRY | MATHS

Angle (In degree)	0°	30°	45°	60°	90°	180°	270°	360°
Angle (in Radius)	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
Sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
Cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	1
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined	0	not defined	0
Cot	NOT Defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	not defined	0	not defined
Sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined	-1	not defined	1
Cosec	NOT Defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	not defined	-1	not defined

* Change of T-Ratio / त्रिकोणमिति-अनुपात का परिवर्तन
90°, 270°.... (90° के odd multiple पर change) 180°, 360° .... no change (90° के even multiple पर no change)

Sin ↔ Cos, tan ↔ Cot, Sec ↔ Cosec



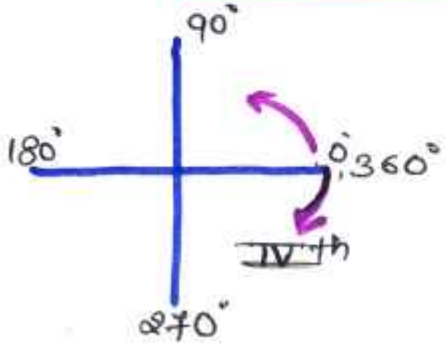
$\sin(90°-\theta) = \frac{4}{5} = \cos\theta$.

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2nd quadrant
Sin
Cosec

$\sin(90^\circ+\theta) = \cos\theta$
$\cos(90^\circ+\theta) = -\sin\theta$
$\tan(90^\circ+\theta) = -\cot\theta$
$\cot(90^\circ+\theta) = -\tan\theta$
$\sec(90^\circ+\theta) = -\operatorname{cosec}\theta$
$\operatorname{cosec}(90^\circ+\theta) = \sec\theta$

$\cos(-\theta) = \cos\theta$
$\sin(-\theta) = -\sin\theta$
$\tan(-\theta) = -\tan\theta$
$\cot(-\theta) = -\cot\theta$
$\sec(-\theta) = \sec\theta$
$\operatorname{cosec}(-\theta) = -\operatorname{cosec}\theta$



$\cos(0-\theta) = \cos\theta$
$\sin(0-\theta) =$
$\tan(0-\theta) =$

$\cos(-60^\circ) \Rightarrow \cos 60^\circ = \frac{1}{2}$ //
$\sin(-60^\circ) \Rightarrow -\sin 60^\circ = \frac{-\sqrt{3}}{2}$ //

+ FORMULA

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

$\sin 18^\circ = \frac{\sqrt{5}-1}{4}$, $\cos 18^\circ = \frac{\sqrt{10+2\sqrt{5}}}{4}$
$\cos 36^\circ = \frac{\sqrt{5}+1}{4}$, $\sin 36^\circ = \frac{\sqrt{10-2\sqrt{5}}}{4}$

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

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

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

TRIGONOMETRY

Q. $\sin 75°$

$\Rightarrow \sin(45°+30°) \Rightarrow \sin 45° \cdot \cos 30° + \cos 45° \cdot \sin 30°$

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

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

1. If $\tan A = \frac{4}{3}$, $0 \leq A \leq 90°$, then find the value of $\sin A$.

यदि $\tan A = \frac{4}{3}$, $0 \leq A \leq 90°$, है, तो $\sin A$ का मान क्या होगा?

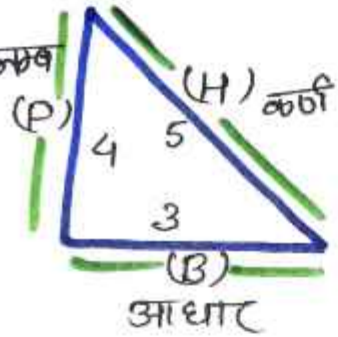
(a) $\frac{4}{5}$

(b) $\frac{3}{5}$

(c) $\frac{3}{4}$

(d) $\frac{4}{3}$

Solve:



$\tan A = \frac{4}{3}$

$\sin A = ?$

$\sin A = \frac{\text{लम्ब}}{\text{कर्ण}} \Rightarrow \frac{4}{5}$ ✓

Sin θ	Cos θ	Tan θ
ल / क	T / क	ल / T

Sin θ	Cos θ	Tan θ
P / H	B / H	P / B

2. If $\sin\theta = \left(\frac{9}{41}\right)$, $0° < \theta < 90°$ then what is the value of $\cot\theta$?

यदि $\sin\theta \left(\frac{9}{41}\right)$, $0° < \theta < 90°$ तो $\cot\theta$ का मान क्या होगा?

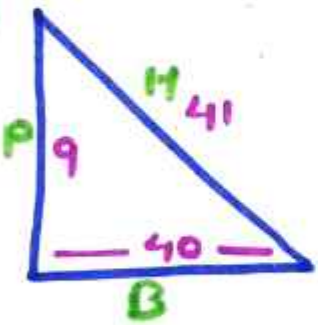
(a) $\frac{40}{9}$

(b) $\frac{35}{8}$

(c) $\frac{39}{9}$

(d) $\frac{47}{8}$

Solve:



$\sqrt{41^2 - 9^2}$

$\Rightarrow \sqrt{50 \times 32}$

$\Rightarrow \sqrt{1600}$

$\Rightarrow 40$

$\tan\theta \Rightarrow \frac{\text{लम्ब}}{\text{आधार}}$, $\cot = \frac{\text{आधार}}{\text{लम्ब}}$

$\frac{40}{9}$ ✓

Sin θ ↓	Cos θ ↓	Tan θ ↓
ल (P)	T (B)	ल (P)
क (H)	क (H)	T (B)
Cosec θ ↑	Sec θ ↑	cot θ ↑

TRIGONOMETRY

3. If $\tan A = \frac{2}{5}$ find the value of $\frac{\sec^2 A}{\text{cosec}^2 A}$.

यदि $\tan A = \frac{2}{5}$ है, तो $\frac{(\sec^2 A)}{\text{cosec}^2 A}$ का मान ज्ञात कीजिए।

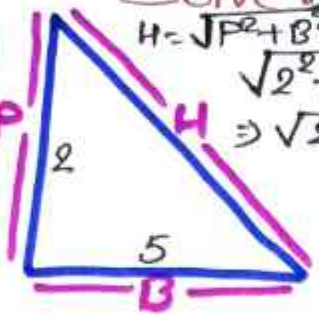
(a) $\frac{3}{5}$

(b) $\frac{4}{25}$

(c) $\frac{2}{5}$

(d) $\frac{9}{25}$

Solve :-



$H = \sqrt{P^2 + B^2}$

$\sqrt{2^2 + 5^2}$

$\Rightarrow \sqrt{29}$

$\tan A = \frac{2}{5}$

$\sec A = \frac{\text{कर्ण}}{\text{आधार}} \frac{(H)}{(B)}$

$\text{Cosec} A = \frac{\text{कर्ण}}{\text{लम्ब}} \frac{(H)}{(P)}$

$\Rightarrow \frac{\left(\frac{\sqrt{29}}{5}\right)^2}{\left(\frac{\sqrt{29}}{2}\right)^2} \Rightarrow \frac{\frac{29}{25}}{\frac{29}{4}}$

$\Rightarrow \frac{4 \times 4}{25 \times 29} \Rightarrow \frac{4}{25}$ ✓

4. If $\sin\beta = \frac{1}{3}$, $(\sec\beta - \tan\beta)^2$ is equal to.

यदि $\sin\beta = \frac{1}{3}$ है, तो $(\sec\beta - \tan\beta)^2$ किसके बराबर है?

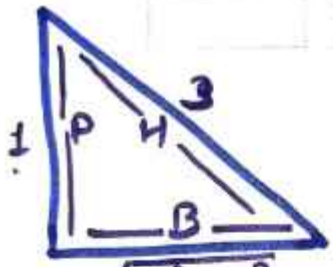
(a) $\frac{1}{3}$

(b) $\frac{1}{2}$

(c) $\frac{2}{3}$

(d) $\frac{3}{4}$

Solve :-



$\sqrt{3^2 - 1^2}$

$\sqrt{8} \Rightarrow 2\sqrt{2}$

$\left(\frac{\text{कर्ण}}{\text{आधार}} - \frac{\text{लम्ब}}{\text{आधार}}\right)^2$

$\frac{\text{लाम्ब}}{\text{कर्ण}}$

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

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

✱ पाइथागोरस की प्रमेय

$H^2 = P^2 + B^2$

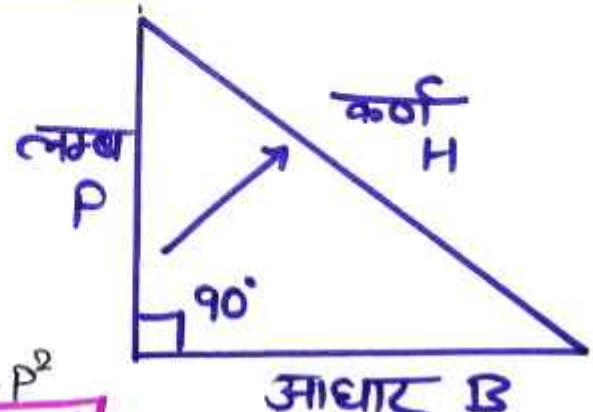
$H = \sqrt{P^2 + B^2}$

$P^2 = H^2 - B^2$

$P = \sqrt{H^2 - B^2}$

$B^2 = H^2 - P^2$

$B = \sqrt{H^2 - P^2}$



5. If $\cos\theta = \frac{\sqrt{3}}{2}$, then $\tan^2\theta \cos^2\theta = ?$

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यदि $\cos\theta = \frac{\sqrt{3}}{2}$ है, तो $\tan^2\theta \cos^2\theta = ?$

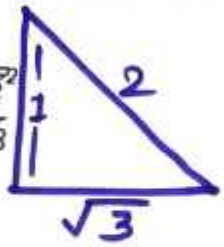
(a) $\frac{1}{\sqrt{3}}$

(b) $\frac{1}{4}$

(c) $\frac{1}{2}$

(d) $\sqrt{3}$

Solve :-



$\sqrt{2^2-\sqrt{3}^2}$

$\sqrt{4-3}$

$=1$

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

$\left(\frac{\text{लम्ब}}{\text{आधार}}\right)^2 \times \left(\frac{\text{आधार}}{\text{कर्ण}}\right)^2$

$\left(\frac{1}{\sqrt{3}}\right)^2 \times \left(\frac{\sqrt{3}}{2}\right)^2 \Rightarrow \frac{1}{4}$ //

Sin Cos tan.
लाल
कका

7. $\tan\theta = \frac{3}{4}$, find the value of expression $\frac{1+\sin\theta}{1-\sin\theta}$:

यदि $\tan\theta = \frac{3}{4}$ अभिव्यक्ति $\frac{1+\sin\theta}{1-\sin\theta}$ का मान ज्ञात कीजिए।

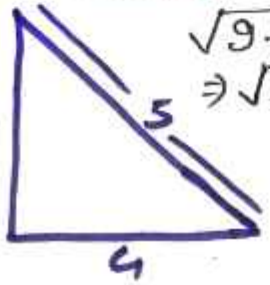
(a) 4

(b) 3

(c) 8

(d) 6

Solve :



$\sqrt{9+16}$

$\Rightarrow \sqrt{25}$

$\tan\theta = \frac{3}{4}$

$\frac{1+\frac{3}{5}}{1-\frac{3}{5}} \Rightarrow \frac{\frac{8}{5}}{\frac{2}{5}} \Rightarrow \frac{40}{10} \Rightarrow 4.$ //

लाल
कका.

8. Evaluate the following : / निम्नलिखित का मूल्यांकन करें।

(a) $\frac{5\sqrt{2}+3\sqrt{3}}{4}$

(b) $\frac{3\sqrt{2}+5\sqrt{3}}{4}$

(c) $\frac{5\sqrt{2}+3\sqrt{3}}{6}$

(d) $\frac{3\sqrt{2}+5\sqrt{3}}{6}$

$\sqrt{18} = \sqrt{2\times3\times3}$

$\Rightarrow 3\sqrt{2}$

Solve :

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

$\Rightarrow \frac{\sqrt{3}}{2} + \frac{\sqrt{2}+\sqrt{3}}{\sqrt{6}}$

$\Rightarrow \frac{\sqrt{18}+2\sqrt{2}+2\sqrt{3}}{2\sqrt{6}}$

$\Rightarrow \frac{3\sqrt{2}+2\sqrt{2}+2\sqrt{3}}{2\sqrt{6}}$

$\Rightarrow \frac{(5\sqrt{2}+2\sqrt{3})}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$

$\Rightarrow \frac{5\sqrt{2}+2\sqrt{18}}{2\times6}$

$\Rightarrow \frac{5\sqrt{2\times2\times3}+2\sqrt{3\times3\times2}}{12}$

$\Rightarrow \frac{5\times2\sqrt{3}+2\times3\sqrt{2}}{12}$

$\Rightarrow \frac{10\sqrt{3}+6\sqrt{2}}{12}$

$\Rightarrow \frac{5\sqrt{3}+3\sqrt{2}}{6}$ //

9. What is the value of $\sin 30° + \cos 30° + \tan 30°$.

$\sin 30° + \cos 30° + \tan 30°$ का मान क्या है?

(a) $\frac{5+\sqrt{3}}{2\sqrt{3}}$

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(b) $\frac{5-\sqrt{3}}{2\sqrt{3}}$

(c) $\frac{5+\sqrt{3}}{\sqrt{3}}$

(d) $\frac{5-\sqrt{3}}{\sqrt{3}}$

Solve:-

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

$\Rightarrow \frac{(1+\sqrt{3})}{2}+\frac{1}{\sqrt{3}} \Rightarrow \frac{\sqrt{3}+3+2}{2\sqrt{3}} \Rightarrow \frac{5+\sqrt{3}}{2\sqrt{3}}$ ✓

10. Find the value of the given expression.
दिए गए व्यंजक का मान ज्ञात करें।

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

(a) $\frac{2}{3}$ ✓

(b) $\frac{3}{2}$

(c) $\frac{\sqrt{2}}{3}$

(d) $\frac{3}{\sqrt{2}}$

Solve:-

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

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

$\Rightarrow \frac{4}{3}+\frac{9}{4}-\frac{8}{3}-\frac{1}{4}$

$\Rightarrow \frac{4}{3}-\frac{8}{3}+\frac{9}{4}-\frac{1}{4} \Rightarrow \frac{4-8}{3}+\frac{9-1}{4} \Rightarrow -\frac{4}{3}+\frac{8}{4}$

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

11. Find the exact value of $\cos 120^\circ$.
$\cos 120^\circ$ का सटीक मान ज्ञात कीजिए।

(a) -0.5

(b) 0

(c) 0.5

(d) 1.

Solve:-

$\cos(90+30)$

$\Rightarrow -\sin 30^\circ$

$\Rightarrow -\frac{1}{2} \Rightarrow -0.5$. ✓