Nishant Jindal

Q. $\tan\frac{\pi}{11} + \tan\frac{2\pi}{11} + \tan\frac{4\pi}{11} + \tan\frac{7\pi}{11} + \tan\frac{9\pi}{11} + \tan\frac{10\pi}{11} = ?$

$+\tan\left(\frac{11\pi-4\pi}{11}\right) + \tan\left(\frac{11\pi-2\pi}{11}\right) + \tan\left(\frac{11\pi-\pi}{11}\right)$

$+\tan\left(\pi-\frac{4\pi}{11}\right) + \tan\left(\pi-\frac{2\pi}{11}\right) + \tan\left(\pi-\frac{\pi}{11}\right)$

$\cancel{\tan\frac{\pi}{11}} + \cancel{\tan\frac{2\pi}{11}} + \cancel{\tan\frac{4\pi}{11}} - \cancel{\tan\frac{4\pi}{11}} - \cancel{\tan\frac{2\pi}{11}} - \cancel{\tan\frac{\pi}{11}}$

$= 0$

(1) Series जैसा Kuchh था।

(2) total 6 terms hai

(3) Last 3 terms change Karenge

(4) $\frac{10\pi}{11} \rightarrow$ Dr = 11 का half = 5.5

Nr = 10 > 5.5

(5) as Nr is gr than half of Dr ⇒ $(\pi-\theta)$ will be used

(6) $\tan\frac{10\pi}{11} = \tan\left(\frac{11\pi-\pi}{11}\right)$

(7) $\tan\left(\pi-\frac{\pi}{11}\right) = -\tan\frac{\pi}{11}$

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Nishant Jindal

Q $\cos^2\left(\frac{\pi}{16}\right)+\cos^2\left(\frac{3\pi}{16}\right)+\cos^2\left(\frac{5\pi}{16}\right)+\cos^2\left(\frac{7\pi}{16}\right)$

$\cos^2\left(\frac{\pi}{16}\right)+\cos^2\left(\frac{3\pi}{16}\right)+\cos^2\left(\frac{8\pi-3\pi}{16}\right)+\cos^2\left(\frac{8\pi-\pi}{16}\right)$

$\cos^2\left(\frac{\pi}{16}\right)+\cos^2\left(\frac{3\pi}{16}\right)+\cos^2\left(\frac{\pi}{2}-\frac{3\pi}{16}\right)+\cos^2\left(\frac{\pi}{2}-\frac{\pi}{16}\right)$

$$\underbrace{\cos^2\frac{\pi}{16}+\cos^2\left(\frac{3\pi}{16}\right)+\sin^2\left(\frac{3\pi}{16}\right)+\sin^2\frac{\pi}{16}}_{1 \quad 1}$$

$=1+1=2$

(1) Series को feel

(2) total terms $=4$

(3) Last के 2 Ko Badlenge

(4) $Nr=7$

$Dr=16 \rightarrow$ 16 Ka half $=8$

$Nr=7<8=Dr.$ Ka half

(5) as $Nr<$ half of dr.

Now change in $\left(\frac{\pi}{2}-\theta\right)$

(6) $\left(\frac{\pi}{2}-\theta\right)\equiv\left(\frac{8\pi}{16}-\theta\right)$

(7) $\cos^2\left(\frac{7\pi}{16}\right)=\cos^2\left(\frac{8\pi-\pi}{16}\right)$

$=\cos^2\left(\frac{\pi}{2}-\frac{\pi}{16}\right)=\sin^2\frac{\pi}{16}$

Nishant Jindal

Q $\sin^2\left(\frac{\pi}{18}\right)+\sin^2\left(\frac{\pi}{9}\right)+\sin^2\left(\frac{7\pi}{18}\right)+\sin^2\left(\frac{4\pi}{9}\right)$

Sahi Likha $\sin^2\left(\frac{\pi}{18}\right)+\sin^2\left(\frac{2\pi}{18}\right)+\sin^2\left(\frac{7\pi}{18}\right)+\sin^2\left(\frac{8\pi}{18}\right)$

$+\sin^2\left(\frac{9\pi-2\pi}{18}\right)+\sin^2\left(\frac{9\pi-\pi}{18}\right)$

$\sin^2\left(\frac{\pi}{18}\right)+\sin^2\frac{2\pi}{18}+\sin^2\left(\boxed{\frac{\pi}{2}}-\frac{2\pi}{18}\right)+\sin^2\left(\frac{\pi}{2}-\frac{\pi}{18}\right)$

$\sin^2\left(\frac{\pi}{18}\right)+\underbrace{\sin^2\left(\frac{2\pi}{18}\right)+\cos^2\left(\frac{2\pi}{18}\right)}_{1}+\cos^2\left(\frac{\pi}{18}\right)$

$\sin^2\left(\frac{\pi}{18}\right)+\cos^2\left(\frac{\pi}{18}\right) = 1$

$=1+1=2$

1) Last ke 2 term change

2) $\sin^2\left(\frac{8\pi}{18}\right)$

3) Nr = 8

4) Dr = $\boxed{18}$ ka half = 9

5) Nr = 8 < 9

Nr < Dr ka half

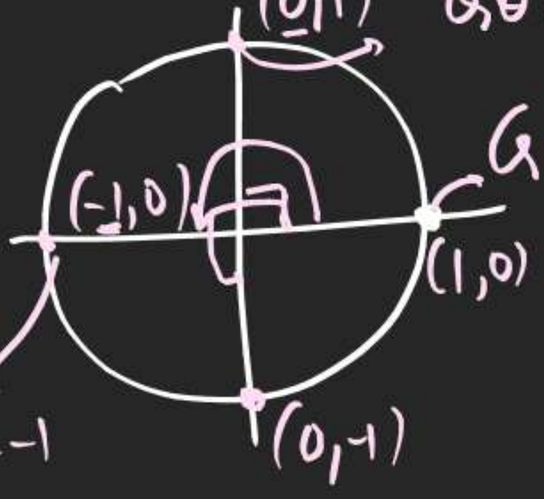
(6) $\left(\frac{\pi}{2}-\theta\right)$ me change

(7) $\left(\frac{\pi}{2}-\theta\right)=\left(\frac{9\pi}{18}-\theta\right)$

Nishant Jindal

Q $\sin\left(\frac{24\pi}{3}\right)$ then value?

$\sin(8\pi) = 0$



$\cos\theta = 0, \sin\theta = 1$

$\cos\theta = 1, \sin 0$

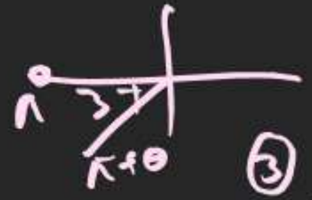
$\cos 180^\circ = -1$

$\sin 180^\circ = 0$

$\cos 270^\circ = 0$

$\sin 270^\circ = -1$

Q Value of $\sin\frac{7\pi}{4}$



$$\sin\left(\frac{4\pi+3\pi}{4}\right) = \sin\left(\pi + \frac{3\pi}{4}\right)$$

$$= -\sin\frac{3\pi}{4}$$

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

Nishant Jindal

Q $\cos\left(\frac{28\pi}{3}\right) = ?$

$\cos\left(9\pi + \frac{\pi}{3}\right)$

$-\cos\frac{\pi}{3} = -\cos 60^\circ = -\frac{1}{2}$

Q $\tan\left(\frac{11\pi}{6}\right) = ?$

$\tan\left(\frac{12\pi - \pi}{6}\right) = \tan\left(2\pi - \frac{\pi}{6}\right)$

$= -\tan\frac{\pi}{6} = -\tan 30^\circ$

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

Q $\tan\left(\frac{17\pi}{4}\right)$

$\tan\left(\frac{16\pi + \pi}{4}\right)$

$\tan\left(4\pi + \frac{\pi}{4}\right)$

$+\tan\frac{\pi}{4}$

$= 1$

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Q $\sec\left(\frac{4\pi}{3}\right)$

$\sec\left(\frac{3\pi+\pi}{3}\right)$

$\sec\left(\pi+\frac{\pi}{3}\right)$ 3

$-\sec\frac{\pi}{3}$

$= -\sec 60^\circ$

$= -2$

Q $\operatorname{cosec}\left(\frac{7\pi}{6}\right)$

$\operatorname{cosec}\left(\frac{6\pi+\pi}{6}\right)$

$\operatorname{cosec}\left(\pi+\frac{\pi}{6}\right)$ 3

$-\operatorname{cosec}\frac{\pi}{6}$

$= -\operatorname{cosec} 30^\circ$

$= -2$

Q $\tan\left(\frac{35\pi}{4}\right)$

$\tan\left(\frac{36\pi-\pi}{4}\right)$

$\tan\left(9\pi-\frac{\pi}{4}\right)$ 2

$-\tan\frac{\pi}{4}$

$= -1$

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Q $\tan\left(\frac{43\pi}{11}\right)$

$= \tan\left(\frac{44\pi-\pi}{11}\right)$

$\tan\left(4\pi-\frac{\pi}{11}\right)$

$-\tan\left(\frac{\pi}{11}\right)$

Standard formulae

1) $\sin(A+B) = \sin A \cos B + \cos A \sin B$
2) $\sin(A-B) = \sin A \cos B - \cos A \sin B$
3) $\cos(A+B) = \cos A \cos B - \sin A \sin B$
4) $\cos(A-B) = \cos A \cos B + \sin A \sin B$

Q Value of $\sin(45^\circ+\theta)\cdot\cos(15^\circ+\theta) - \cos(45^\circ+\theta)\cdot\sin(15^\circ+\theta) = ?$

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

$\sin\{(45+\theta)-(15^\circ+\theta)\} = \sin(45^\circ-15^\circ) = \sin 30^\circ = \frac{1}{2}$

Nishant Jindal

Q Find value of $\cos(45°+\theta)\cdot\cos(45°-\theta)-\sin(45°+\theta)\cdot\sin(45°-\theta)=?$

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

$=\cos((45°+\cancel{\theta})+(45°-\cancel{\theta}))=\cos 90°=0$

$\sin 0°=0$
$\boxed{\cos 0=1}$
$\sin 90°=1$
$\cos 90=0$
$\sin 180°=0$
$\boxed{\cos 180°=-1}$
$\sin 270°=-1$
$\cos 270°=0$

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

$\cos M\cdot\cos N+\sin M\cdot\sin N=\cos(M-N)$

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

$=\cos(2B)$

S.L. Loney

Q If $\sin\alpha=\frac{3}{5}$ & $\cos\beta=\frac{9}{41}$ $\alpha,\beta\in I^{st}$ Quad

find (1) $\sin(\alpha+\beta)$ (2) $\cos(\alpha-\beta)=?$

(1) $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$

$=\frac{3}{5}\cdot\frac{9}{41}+\frac{4}{5}\cdot\frac{40}{41}=\frac{27+160}{5\times 41}=\frac{133}{205}$

$\sqrt{\frac{41^2-9^2}{41^2}}=\frac{\sqrt{40^2}}{\sqrt{41^2}}$

$\sin\beta=\frac{40}{41}$

2) When $\cos\beta=\frac{9}{41}$

$\sin\beta=\sqrt{1-\cos^2\beta}$

$=\sqrt{1-\frac{9^2}{41^2}}$

(1) $\sin\alpha=\frac{3}{5}$

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

$=\sqrt{1-\frac{9}{25}}=\sqrt{\frac{16}{25}}$

$\cos\alpha=\frac{4}{5}$

② $\cos(\alpha-\beta) = \cos\alpha\cdot\cos\beta + \sin\alpha\cdot\sin\beta$

$= \frac{4}{5}\cdot\frac{9}{41} + \frac{3}{5}\cdot\frac{40}{41}$

$= \frac{36+120}{205} = \frac{156}{205}$

$\sin\alpha = \frac{3}{5} \Rightarrow \cos\alpha = \frac{4}{5}$

$\cos\beta = \frac{9}{41} \Rightarrow \sin\beta = \frac{40}{41}$

$\sin\beta = \sqrt{1-\cos^2\beta}$

$= \sqrt{1-\frac{81}{1681}}$

Q Value of $\cos 31^\circ + \cos 89^\circ + \cos 151^\circ = ?$ → 31° Ki nazar

$\cos 31^\circ + \cos(\overset{A}{120^\circ} - \overset{B}{31^\circ}) + \cos(\overset{A}{120^\circ} + \overset{B}{31^\circ})$

$= \cos 31^\circ + \{\cos 120^\circ \cos 31^\circ + \cancel{\sin 120^\circ \sin 31^\circ}\}$
$+ \{\cos 120^\circ \cos 31^\circ - \cancel{\sin 120^\circ \sin 31^\circ}\}$

$= \cos 31^\circ + 2\cos 120^\circ \cos 31^\circ$

$= \cos 31^\circ + \cancel{2}\times -\frac{1}{\cancel{2}}\cos 31^\circ = \cos 31^\circ - \cos 31^\circ = 0$

$\cos 120^\circ$
$= \cos(\frac{\pi}{2} + 30^\circ)$
$= -\sin 30^\circ$
$= -\frac{1}{2}$

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

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

Nishant Jindal

Q If $\sin\alpha \cdot \sin\beta - \cos\alpha \cdot \cos\beta + 1 = 0$

then value of $1 + \cot\alpha \cdot \tan\beta = 2$

$\sin\alpha \sin\beta - \cos\alpha \cos\beta = -1$

$\Rightarrow \cos\alpha \cos\beta - \sin\alpha \sin\beta = 1$

$\Rightarrow$ जबकि $\cos(\alpha+\beta) = 1$

$\sin(\alpha+\beta) = 0$ hota hai

Demand $= 1 + \cot\alpha \cdot \tan\beta$

$= 1 + \frac{\cos\alpha}{\sin\alpha} \cdot \frac{\sin\beta}{\cos\beta} = \frac{\sin\alpha \cdot \cos\beta + \cos\alpha \sin\beta}{\sin\alpha \cos\beta} = \frac{\sin(\alpha+\beta)}{\sin\alpha \cos\beta} = \frac{0}{\sin\alpha \cos\beta} = 0$

Correct $\sin(90-\theta) = \cos\theta$

Q $\frac{\sin 24° \cdot \cos 6° - \sin 6° \cdot \sin 66°}{\sin 21° \cdot \cos 39° - \cos 51° \cdot \sin 69°} = ?$

(1) $\cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$

$\frac{\sin 24° \cdot \cos 6° - \sin 6° \sin(90° - \boxed{24°})}{\sin 21° \cdot \cos 39° - \cos(90-39°) \sin(90-21°)}$

$\frac{\sin 24° \cdot \cos 6° - \sin 6° \cos 24°}{\sin 21° \cdot \cos 39° - \sin 39° \cdot \cos \boxed{21°}} = \frac{\sin(24° - 6°)}{\sin(21 - 39°)}$

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

$= \frac{\sin 18°}{\sin(-18°)} = \frac{\cancel{\sin 18°}}{-\cancel{\sin 18°}} = -1$

Nishant Jindal

Q $\displaystyle\sum_{K=1}^{13} \frac{1}{\sin\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)\cdot\sin\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)} = ? = \cot\frac{5\pi}{12}$

difference $= \frac{\pi}{6}$

Multiply & divide by $\sin\frac{\pi}{6}$.

$\boxed{\text{Change } \sin\frac{\pi}{6} \text{ acc to Dr.}}$

$$\sum \frac{\sin\frac{\pi}{6}}{\sin\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)\cdot\sin\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)\cdot\sin\frac{\pi}{6}}$$

$$\frac{1}{\sin\frac{\pi}{6}}\sum \frac{\sin\left\{\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)-\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)\right\}}{\sin\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)\cdot\sin\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)}$$

$\sin(A-B)$

$$\frac{1}{1/2}\sum \frac{\cancel{\sin\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)}\cdot\cos\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)}{\cancel{\sin\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)}\cdot\sin\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)} - \frac{\cos\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)\cdot\cancel{\sin\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)}}{\sin\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)\cdot\cancel{\sin\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)}}$$

$$2\sum_{K=1}^{13} \cot\left(\frac{\pi}{4}+\frac{(K-1)\pi}{6}\right)-\cot\left(\frac{\pi}{4}+\frac{K\pi}{6}\right)$$

$$=2\left\{\begin{array}{l}\cot\left(\frac{\pi}{4}+0\right)-\cancel{\cot\left(\frac{\pi}{4}+\frac{\pi}{6}\right)}\\ +\cancel{\cos\left(\frac{\pi}{4}+\frac{\pi}{6}\right)}-\cancel{\cot\left(\frac{\pi}{4}+\frac{2\pi}{6}\right)}\\ +\cancel{\cot\left(\frac{\pi}{4}+\frac{2\pi}{6}\right)}-\cancel{\cot\left(\frac{\pi}{4}+\frac{3\pi}{6}\right)}\\ \vdots \\ +\cancel{\cot\left(\frac{\pi}{4}+\frac{12\pi}{6}\right)}-\cot\left(\frac{\pi}{4}+\frac{13\pi}{6}\right)\end{array}\right.$$

$$=2\left(\cot\frac{\pi}{4}-\cot\left(\frac{\pi}{4}+\frac{13\pi}{6}\right)\right)$$

$$2\left(1-\cot\left(\frac{6\pi+52\pi}{24}\right)\right)$$

$$\cot\left(\frac{58\pi}{24}\right)=\cot\left(\frac{48\pi+10\pi}{24}\right)=\cot\left(2\pi+\frac{5\pi}{12}\right)$$

$$2\left(1-\cot\frac{5\pi}{12}\right)$$

Ans. $2\left(1-\tan 15^\circ\right)$