Nishant Jindal

3. $a\left(\dfrac{1-\frac{b^2}{a^2}}{1+\frac{b^2}{a^2}}\right)+b\left(\dfrac{\frac{2b}{a}}{1+\frac{b^2}{a^2}}\right)$

8. $\dfrac{\sin A}{\cos A}-\dfrac{\cos A}{\sin A}=2\dfrac{\sin^2 A-\cos^2 A}{2\sin A\cos A}=-\dfrac{2\cos 2A}{\sin 2A}=-2\cot 2A$

$\tan A-\dfrac{1}{\tan A}$

$-\dfrac{(1-\tan^2 A)}{2\tan A}2=\dfrac{-2}{\tan 2A}$

5. $\dfrac{\sin 2A}{1-\cos 2A}=\dfrac{2\sin A\cos A}{2\sin^2 A}=\cot A$

7. $\tan A+\cot A=\dfrac{\sin A}{\cos A}+\dfrac{\cos A}{\sin A}=\dfrac{1\times 2}{2\sin A\cos A}$

$2\left(\dfrac{1+\tan^2 A}{2\tan A}\right)=\tan A+\dfrac{1}{\tan A}$ $=2\operatorname{cosec} 2A.$

Nishant Jindal

1. P.T. $(4\cos^2 9^\circ - 3)(4\cos^2 27^\circ - 3) = \tan 9^\circ$

$$\frac{\cos 9^\circ(4\cos^2 9^\circ - 3)}{\cos 9^\circ}\ \frac{(4\cos^2 27^\circ - 3)\cos 27^\circ}{\cos 27^\circ} = \frac{\cancel{\cos 27^\circ}\ \overset{\sin 9^\circ}{\cos 81^\circ}}{\cos 9^\circ\ \cancel{\cos 27^\circ}} = \tan 9^\circ$$

2. P.T. $\dfrac{1+\sin 2A}{\cos 2A} = \tan\left(\dfrac{\pi}{4}+A\right)$

$$\frac{1-\cos\left(\frac{\pi}{2}+2A\right)}{\sin\left(\frac{\pi}{2}+2A\right)} = \frac{2\sin^2\left(\frac{\pi}{4}+A\right)}{2\sin\left(\frac{\pi}{4}+A\right)\cos\left(\frac{\pi}{4}+A\right)}$$

$$= \frac{(\sin A+\cos A)^2}{(\cos^2 A-\sin^2 A)} = \frac{\cos A+\sin A}{\cos A-\sin A} = \frac{1+\tan A}{1-\tan A} = \frac{\tan\frac{\pi}{4}+\tan A}{1-\tan\frac{\pi}{4}\tan A}$$

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

$$\frac{1+\dfrac{2\tan A}{1+\tan^2 A}}{\dfrac{1-\tan^2 A}{1+\tan^2 A}} = \frac{(1+\tan A)^2}{1-\tan^2 A} = \frac{1+\tan A}{1-\tan A}$$

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3: Express $\cos 5A$ in terms of $\cos A$

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

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

$$= (8\cos^5 A - 10\cos^3 A + 3\cos A) - 2\sin^2 A\cos A(3 - 4\sin^2 A)$$

$$3 - 4 + 4\cos^2 A$$

$$= (8\cos^5 A - 10\cos^3 A + 3\cos A) - 2\cos A(1 - \cos^2 A)(4\cos^2 A - 1)$$

$$= 16\cos^5 A - 20\cos^3 A + 5\cos A.$$

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4. P.T. $\cot(7.5^\circ) = (\sqrt{2}+1)(\sqrt{3}+\sqrt{2})$

$\dfrac{\cos 7.5^\circ}{\sin 7.5^\circ}$

$$\cot 7.5^\circ = \frac{1+\cos 15^\circ}{\sin 15^\circ}$$

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

$$= \frac{(2\sqrt{2}+\sqrt{3}+1)(\sqrt{3}+1)}{2} = \frac{2\sqrt{6}+2\sqrt{2}+4+2\sqrt{3}}{2}$$

$$\tan 7.5^\circ = \frac{1-\cos 15^\circ}{\sin 15^\circ}$$

$$\sqrt{3}(\sqrt{2}+1)+\sqrt{2}(1+\sqrt{2}) = \underline{\sqrt{6}}+\sqrt{2}+2+\underline{\sqrt{3}}$$

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5. If $\dfrac{\cos 3A}{\cos A} = \dfrac{1}{2}$, find $\dfrac{\sin 3A}{\sin A} = S$

$$4\cos^2 A - 3 = \frac{1}{2}$$

$$\cos^2 A = \frac{7}{8}$$

$$\Rightarrow \sin^2 A = \frac{1}{8}.$$

$$\frac{\sin 3A}{\sin A} = 3 - 4\sin^2 A = 3 - \frac{4}{8} = \frac{5}{2}.$$

$$2 = 2\frac{(\sin 3A\cos A - \cos 3A \sin A)}{2\sin A\cos A} = S - \frac{1}{2} = \frac{\sin 3A}{\sin A} - \frac{\cos 3A}{\cos A}$$

$$S - \frac{1}{2} = 2 \Rightarrow \boxed{S = \frac{5}{2}}$$

Nishant Jindal

$$\cos\theta\cos 2\theta\cos 2^2\theta\cos 2^3\theta\cdots\cos 2^{n-1}\theta$$

$$= \frac{(\sin\theta\cos\theta)\cos 2\theta\cos 2^2\theta\cos 2^3\theta\cdots\cos 2^{n-1}\theta}{\sin\theta}$$

$$= \frac{(\sin 2\theta\cos 2\theta)\cos 2^2\theta\cos 2^3\theta\cdots\cos 2^{n-1}\theta}{2\sin\theta}$$

$$= \frac{(\sin 2^2\theta\cos 2^2\theta)\cos 2^3\theta\cdots\cos 2^{n-1}\theta}{2^2\sin\theta}$$

$$\frac{\sin 2^n\theta}{2^n\sin\theta} = \frac{\sin 2^3\theta\cos 2^3\theta\cdots\cos 2^{n-1}\theta}{2^3\sin\theta}$$

Nishant Jindal

1. $\cos 36^\circ \cos 72^\circ = \dfrac{\sin 36^\circ \cos 36^\circ \cos 72^\circ}{\sin 36^\circ}$

$= \dfrac{\sin 144^\circ}{4 \sin 36^\circ}$ $\quad 144^\circ = 180^\circ - 36^\circ$ $\quad = \dfrac{1}{4}$.

2. $\cos 20^\circ \cos 40^\circ \boxed{\cos 60^\circ} \cos 80^\circ$

$\dfrac{1}{2} \; \dfrac{\sin 160^\circ}{2^3 \sin 20^\circ}$ $\quad 160^\circ = 180^\circ - 20^\circ$ $\quad = \dfrac{\sin 20^\circ}{16 \sin 20^\circ} = \dfrac{1}{16}$.

Nishant Jindal

3.

$$\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{3\pi}{7} = -\cos\frac{\pi}{7}\cos\frac{2\pi}{7}\cos\frac{4\pi}{7}$$

$$\cos\frac{3\pi}{7} \to \pi - \frac{4\pi}{7}$$

$$= \frac{-\sin\frac{8\pi}{7} = -\sin\left(\pi+\frac{\pi}{7}\right)}{8\sin\frac{\pi}{7}}$$

$$= \frac{\sin\frac{\pi}{7}}{8\sin\frac{\pi}{7}} = \frac{1}{8}$$

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$$\sin\theta^\circ \sin(60^\circ - \theta^\circ)\sin(60^\circ + \theta^\circ)$$

$$= \sin\theta\left(\sin^2 60^\circ - \sin^2\theta\right)$$

$$= \sin\theta\left(\frac{3}{4} - \sin^2\theta\right)$$

$$= \frac{3\sin\theta - 4\sin^3\theta}{4}$$

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

Nishant Jindal

$$\boxed{\begin{aligned} \sin\theta \sin\left(\frac{\pi}{3}-\theta\right)\sin\left(\frac{\pi}{3}+\theta\right) &= \frac{1}{4}\sin 3\theta \\ \cos\theta \cos\left(\frac{\pi}{3}-\theta\right)\cos\left(\frac{\pi}{3}+\theta\right) &= \frac{1}{4}\cos 3\theta \end{aligned}}$$

H.W

Ex-17 Q 10 ~~to~~ 41

Q 7 to Q.15

Ex-18