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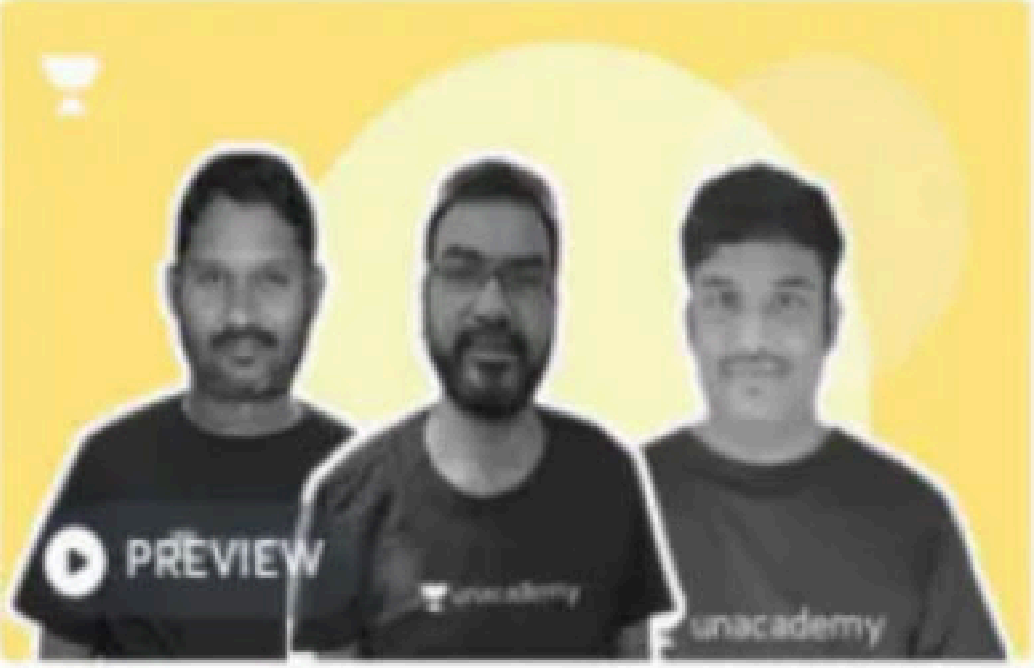

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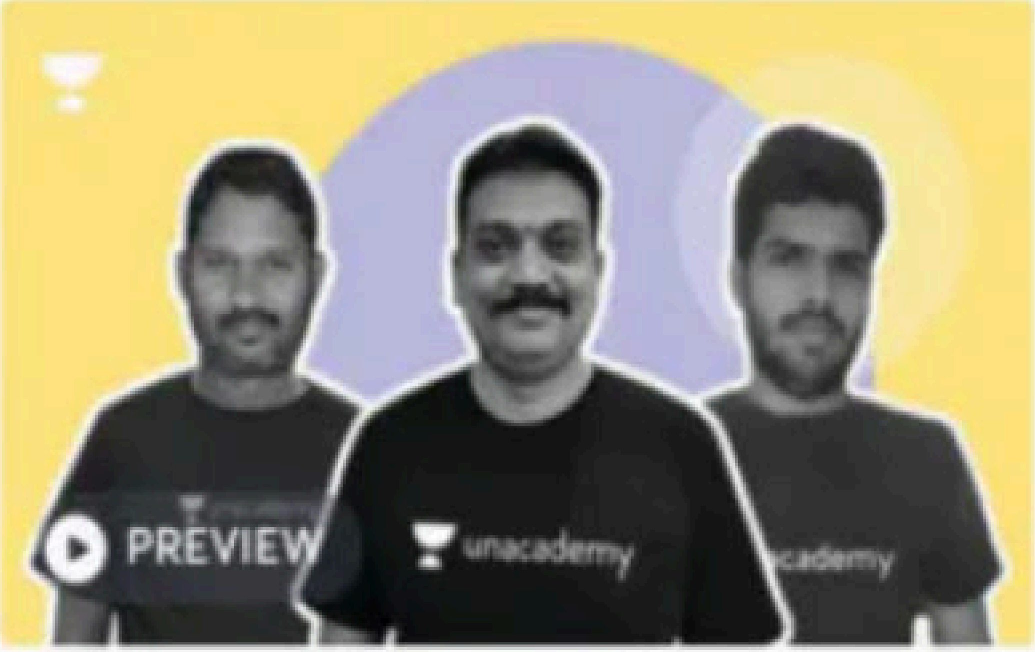

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COMPOUND ANGLES

The Angles of the forms $A+B$, $A-B$, $A+B+C$, $A-B+C$ etc are called Compound angles.

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

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

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

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

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

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

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

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

If $\underbrace{0 < \theta < \frac{\pi}{2}}$ and $2\sin\theta = \sqrt{3}\cos 10^\circ + \sin 10^\circ$

then $\theta =$

~~(a)~~ 70° (b) 50° (c) 60° (d) 40°

$\theta = 20^\circ$

$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2}\cos 10^\circ + \frac{1}{2}\sin 10^\circ$

$\Rightarrow \sin\theta = \underbrace{\sin \underset{A}{60^\circ} \cos \underset{B}{10^\circ} + \cos \underset{A}{60^\circ} \cdot \sin \underset{B}{10^\circ}} = \sin(A+B)$

$= \sin(60^\circ + 10^\circ) = \sin 70^\circ$

The value of $\tan 40^\circ + \tan 80^\circ - \sqrt{3}\tan 40^\circ \tan 80^\circ =$

(a) $\sqrt{3}$ (b) $-\sqrt{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $-\frac{1}{\sqrt{3}}$

$\tan A + \tan B - k\tan A \tan B \rightarrow$ Consider $\underline{\underline{\tan(A+B)}}$ formula

$$\tan(40^\circ + 80^\circ) = \frac{\tan 40^\circ + \tan 80^\circ}{1 - \tan 40^\circ \cdot \tan 80^\circ}$$

$-\cot 30^\circ$

$$\Rightarrow \tan 120^\circ = \frac{\tan 40^\circ + \tan 80^\circ}{1 - \tan 40^\circ \tan 80^\circ} \Rightarrow \underbrace{\tan(90^\circ + 30^\circ)} = \frac{\tan 40^\circ + \tan 80^\circ}{1 - \tan 40^\circ \tan 80^\circ}$$

$-\sqrt{3}$

$$-\cot 30^\circ = \frac{\tan 40^\circ + \tan 80^\circ}{1 - \tan 40^\circ \tan 80^\circ} \Rightarrow -\sqrt{3} + \sqrt{3}\tan 40^\circ \tan 80^\circ$$

$$= \tan 40^\circ + \tan 80^\circ$$

$$\tan 40^\circ + \tan 80^\circ - \sqrt{3}\tan 40^\circ \cdot \tan 80^\circ = -\sqrt{3}$$

(a) $\sqrt{3}$ $\quad$ ~~(b)~~ $-\sqrt{3}$ $\quad$ (c) $\frac{1}{\sqrt{3}}$ $\quad$ (d) $-\frac{1}{\sqrt{3}}$

If $\tan(A+B) = P$, $\tan(A-B) = Q$ then $\cot 2B =$

(a) $\frac{1+PQ}{P-Q}$ (b) $\frac{1+PQ}{P+Q}$ (c) $\frac{1-PQ}{P-Q}$ (d) $\frac{1-PQ}{P+Q}$

Consider $2B = (A+B) - (A-B)$

$$\tan 2B = \tan\{(A+B)-(A-B)\}$$

$$\tan 2B = \frac{\tan(A+B) - \tan(A-B)}{1+\tan(A+B)\cdot\tan(A-B)} = \frac{P-Q}{1+PQ}$$

$\cot 2B = \frac{1+PQ}{P-Q}$

$0^\circ \qquad 90^\circ$

If $0 < \theta < \frac{\pi}{2}$, $\tan\theta = \boxed{\dfrac{\cos 29^\circ + \sin 29^\circ}{\cos 29^\circ - \sin 29^\circ}}$ then

$\theta =$

(a) 16° ~~(b)~~ 74° (c) 37° (d) 8°

29°

$$\frac{\cos A + \sin A}{\cos A - \sin A} = \frac{1 + \frac{\sin A}{\cos A}}{1 - \frac{\sin A}{\cos A}} = \frac{\tan 45^\circ + \tan A}{1 - \tan 45^\circ \cdot \tan A} = \underline{\tan(45^\circ + A)}$$

$\tan(45^\circ + 29^\circ) = \tan 74^\circ$

If $\cot 20^\circ = p$ then $\dfrac{\tan 160^\circ - \tan 110^\circ}{1 + \tan 160^\circ \cdot \tan 110^\circ} =$

$\cancel{(a)}$ $\dfrac{p^2 - 1}{2p}$ (b) $\dfrac{p^2 + 1}{2p}$ (c) $\dfrac{1 - p^2}{2p}$ (d) $\dfrac{2p}{1 + p^2}$

$$= \frac{\tan(180^\circ - 20^\circ) - \tan(90^\circ + 20^\circ)}{1 + \tan(180^\circ - 20^\circ) \cdot \tan(90^\circ + 20^\circ)} = \frac{-\tan 20^\circ + \cot 20^\circ}{1 + (-\tan 20^\circ)(-\cot 20^\circ)}$$

$$= \frac{-\frac{1}{p} + p}{1 + \left(-\frac{1}{\cancel{p}}\right)(-\cancel{p})} = \frac{-1 + p^2}{2p}$$

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

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

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

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

$$= \cancel{\sin^2 A\cos^2 B} \underbrace{- 1 + \cos^2 B}_{} + \sin^2 A - \cancel{\sin^2 A\cos^2 B}$$

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

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

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

The value of $\cos^2 52\frac{1}{2}^\circ - \sin^2 22\frac{1}{2}^\circ =$

(a) $\frac{\sqrt{3}+1}{4\sqrt{2}}$ (b) $\frac{\sqrt{3}-1}{4\sqrt{2}}$ (c) $\frac{3+\sqrt{3}}{4\sqrt{2}}$ (d) $\frac{3-\sqrt{3}}{4\sqrt{2}}$ ✓

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

$$= \cos\left(52\tfrac{1}{2}^\circ + 22\tfrac{1}{2}^\circ\right)\cdot\cos\left(52\tfrac{1}{2}^\circ - 22\tfrac{1}{2}^\circ\right) = \cos 75^\circ \cdot \cos 30^\circ$$

$$\cos(45^\circ + 30^\circ) = \cos 45^\circ \cos 30^\circ - \sin 45^\circ \sin 30^\circ = \frac{1}{\sqrt{2}}\cdot\frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}}\cdot\frac{1}{2}$$

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

The value of $\dfrac{\text{Tan } 80^\circ - \text{Tan } 10^\circ}{\text{Tan } 70^\circ} =$ ✓

If $A+B = 90^\circ$

$\text{Tan } A \text{ Tan } B = 1$

a) 0 b) 1 ~~c)~~ 2 d) 3

Consider $70^\circ + 10^\circ = 80^\circ \Rightarrow \text{Tan}(70^\circ + \text{Tan } 10^\circ) = \text{Tan } 80^\circ$

$$\Rightarrow \frac{\text{Tan } 70^\circ + \text{Tan } 10^\circ}{1 - \text{Tan } 70^\circ \cdot \text{Tan } 10^\circ} = \text{Tan } 80^\circ$$

$$\Rightarrow \text{Tan } 70^\circ + \text{Tan } 10^\circ = \text{Tan } 80^\circ \left(- \text{Tan } 70^\circ \cdot \underbrace{\text{Tan } \overbrace{10^\circ \ \text{Tan } 80^\circ}^{90^\circ}}_{1} \right.$$

$$\frac{(1+\tan 13^\circ)(1+\tan 32^\circ)}{(1+\tan 12^\circ)(1+\tan 33^\circ)} = \frac{2}{2} = 1$$

2 2

$$(1+\tan A)(1+\tan B) = 2$$

~~(a) 1~~ (b) 2 (c) 3 (d) 4

$A+B=45^\circ \Rightarrow A = 45^\circ - B \Rightarrow \tan A = \tan(45^\circ - B)$

$$\Rightarrow \tan A = \frac{1-\tan B}{1+\tan B} \Rightarrow 1+\tan A = 1+\frac{1-\tan B}{1+\tan B} = \frac{1+\cancel{\tan B}+1-\cancel{\tan B}}{1+\tan B}$$

$$A + B = 45^\circ \rightarrow (1 + \tan A)(1 + \tan B) = 2$$

$$A + B = 135^\circ \rightarrow (1 + \cot A)(1 + \cot B) = 2$$

$$A + B = 225^\circ \rightarrow (1 + \tan A)(1 + \tan B) = 2$$

$$A + B = 315^\circ \rightarrow (1 + \cot A)(1 + \cot B) = 2$$

$$\sin 20^\circ + \sin 40^\circ - \sin 80^\circ =$$

(a) -1 (b) 1 (c) 2 (d) 0

$$\sin 20^\circ + \sin(60^\circ - 20^\circ) - \sin(60^\circ + 20^\circ)$$

$$= \sin 20^\circ - \{\sin(\underset{A}{60^\circ} + \underset{B}{20^\circ}) - \sin(60^\circ - 20^\circ)\} = \sin 20^\circ - 2\cos 60^\circ \cdot \sin 20^\circ$$

$$= \sin 20^\circ - 2 \cdot \frac{1}{2} \cdot \sin 20^\circ$$

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

$$= 0$$

$$\tan 70^\circ + \tan 70^\circ = \tan 80^\circ - \tan 10^\circ$$

$$\tan 80^\circ - \tan 10^\circ = 2\tan 70^\circ$$

$$\frac{\tan 80^\circ - \tan 10^\circ}{\tan 70^\circ} = 2$$