## Trigonometric Ratios of Compound Angles Ex 7.1 Q31

We have,

$$\tan\alpha = x+1 \text{ and } \tan\beta = x-1$$

Now, $2\cot(\alpha-\beta)$

$$= \frac{2}{\tan(\alpha-\beta)}$$

$$= \frac{2}{\dfrac{\tan\alpha - \tan\beta}{1+\tan\alpha\tan\beta}}$$

$$= \frac{2(1+\tan\alpha\tan\beta)}{\tan\alpha - \tan\beta}$$

$$= \frac{2\big[1+(x+1)(x-1)\big]}{x+1-(x-1)}$$

$$= \frac{2\big[1+x^2-1\big]}{x+1-x+1}$$

$$= \frac{2\times x^2}{2} = x^2$$

$\therefore \qquad 2\cot(\alpha-\beta) = x^2$

Hence proved

## Trigonometric Ratios of Compound Angles Ex 7.1 Q32

Let the two parts of the angle be $\theta$ and $\theta - \varnothing$.

$\tan(\theta - \varnothing) = \lambda\tan\varnothing$   [According to question]

$\Rightarrow \dfrac{\tan(\theta - \varnothing)}{\tan\varnothing} = \dfrac{\lambda}{1}$

$\Rightarrow \dfrac{\tan(\theta - \varnothing)}{\tan\varnothing} = \dfrac{\lambda}{1}$

$\Rightarrow \dfrac{\tan(\theta - \varnothing)+\tan\varnothing}{\tan(\theta - \varnothing)-\tan\varnothing} = \dfrac{\lambda+1}{\lambda-1}$   [Using Componendo and Dividendo]

$\Rightarrow \dfrac{\dfrac{\tan\theta - \tan\varnothing}{1+\tan\theta.\tan\varnothing}+\tan\varnothing}{\dfrac{\tan\theta - \tan\varnothing}{1+\tan\theta.\tan\varnothing}-\tan\varnothing} = \dfrac{\lambda+1}{\lambda-1}$

$\Rightarrow \dfrac{\dfrac{\tan\theta - \tan\varnothing + \tan\varnothing(1+\tan\theta.\tan\varnothing)}{1+\tan\theta.\tan\varnothing}}{\dfrac{\tan\theta - \tan\varnothing - \tan\varnothing(1+\tan\theta.\tan\varnothing)}{1+\tan\theta.\tan\varnothing}} = \dfrac{\lambda+1}{\lambda-1}$

$\Rightarrow \dfrac{\tan\theta - \tan\varnothing + \tan\varnothing + \tan\theta.\tan^2\varnothing}{\tan\theta - \tan\varnothing - \tan\varnothing - \tan\theta.\tan^2\varnothing} = \dfrac{\lambda+1}{\lambda-1}$

$\Rightarrow \dfrac{\tan\theta + \tan\theta.\tan^2\varnothing}{\tan\theta - 2\tan\varnothing - \tan\theta.\tan^2\varnothing} = \dfrac{\lambda+1}{\lambda-1}$

$\Rightarrow \underline{\tan\quad}$

## Trigonometric Ratios of Compound Angles Ex 7.1 33

$$\tan \theta = \frac{\sin \alpha - \cos \alpha}{\sin \alpha + \cos \alpha}$$

$$\Rightarrow \tan \theta = \frac{\tan \alpha - 1}{\tan \alpha + 1} \text{ [Dividing both Numerator and Denominator by } \cos \alpha]$$

$$\Rightarrow \tan \theta = \frac{\tan \alpha - \tan \frac{\pi}{4}}{1 + \tan \frac{\pi}{4} . \tan \alpha}$$

$$\Rightarrow \tan \theta = \tan \left( \alpha - \frac{\pi}{4} \right)$$

$$\Rightarrow \theta = \alpha - \frac{\pi}{4} \quad \text{[Removing } \tan \text{ from both sides]}$$

$$\Rightarrow \cos \theta = \cos \left( \alpha - \frac{\pi}{4} \right) \text{[Taking } \cos \text{ on both sides]}$$

$$\Rightarrow \cos \theta = \cos \alpha . \cos \frac{\pi}{4} + \sin \alpha . \sin \frac{\pi}{4}$$

$$\Rightarrow \cos \theta = \cos \alpha . \frac{1}{\sqrt{2}} + \sin \alpha . \frac{1}{\sqrt{2}}$$

$$\Rightarrow \cos \theta = \frac{\cos \alpha + \sin \alpha}{\sqrt{2}}$$

$$\Rightarrow \sqrt{2} \cos \theta = \sin \alpha + \cos \alpha$$

*Hence Proved*

Trigonometric Ratios of Compound Angles Ex 7.1 Q34

*RHS,*

$$\frac{p+q}{1-pq}$$

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

$$= \frac{\dfrac{\tan A + \tan B}{1 - \tan A.\tan B} + \dfrac{\tan A - \tan B}{1 + \tan A.\tan B}}{1 - \dfrac{\tan A + \tan B}{1 - \tan A.\tan B} . \dfrac{\tan A - \tan B}{1 + \tan A.\tan B}}$$

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

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

$$= \frac{2\tan A + 2\tan A.\tan^2 B}{(1 - \tan^2 A)(1 + \tan^2 B)} = \frac{2\tan A(1 + \tan^2 B)}{(1 - \tan^2 A)(1 + \tan^2 B)} = \frac{2\tan A}{1 - \tan^2 A} = \tan 2A = LHS$$

*Hence Proved*

********** END *********