Formulae to Transform the Product into Sum or Difference.

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

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

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

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

Let $A+B=C$ and $A-B=D$

Then, $A=\frac{C+D}{2}$ and $B=\frac{C-D}{2}$

Therefore, we find out the formulae to transform the sum or difference into product.

(5) $\sin C+\sin D = 2\sin\frac{C+D}{2}\cos\frac{C-D}{2}$

(6) $\sin C-\sin D = 2\cos\frac{C+D}{2}\sin\frac{C-D}{2}$

(7) $\cos C+\cos D = 2\cos\frac{C+D}{2}\cos\frac{C-D}{2}$

(8) $\cos C-\cos D = 2\sin\frac{C+D}{2}\sin\frac{D-C}{2} = -2\sin\frac{C+D}{2}\sin\frac{C-D}{2}$

Important Tips

☞ $\sin(60^o-\theta).\sin\theta\sin(60^o+\theta)=\frac{1}{4}\sin 3\theta$

☞ $\cos(60-\theta).\cos\theta\cos(60^o+\theta)=\frac{1}{4}\cos 3\theta$

☞ $\tan(60^o-\theta).\tan\theta\tan(60^o+\theta)=\tan 3\theta$

☞ $\cos A.\cos 2A.\cos 2^2A.\cos 2^3A.......\cos 2^{n-1}A=\frac{\sin 2^nA}{2^n\sin A}$, if $A=n\pi$

= 1, if $A=2n\pi$

= 1, if $A=(2n+1)\pi$