Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q31

$$\sqrt{\frac{a+b}{a-b}}+\sqrt{\frac{a-b}{a+b}}=\frac{(a+b)+(a-b)}{\sqrt{(a-b)(a+b)}}$$

$$=\frac{2a}{\sqrt{a^2-b^2}}$$

$$=\frac{2}{\sqrt{1-\left(\frac{b}{a}\right)^2}}$$

$$=\frac{2}{\sqrt{1-\tan^2 x}}\ldots\ldots\ldots\ldots\left[\because \tan x=\frac{b}{a}\right]$$

$$=\frac{2\cos x}{\sqrt{\cos^2 x-\sin^2 x}}$$

$$=\frac{2\cos x}{\sqrt{\cos 2x}}$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q 32

We have,

$$\tan A = \frac{1}{7} \qquad \& \ \tan B = \frac{1}{3}$$

$$\therefore \ \cos 2A = \frac{1-\tan^2 A}{1+\tan^2 A} = \frac{1-\left(\frac{1}{7}\right)^2}{1+\left(\frac{1}{7}\right)^2} = \frac{\frac{48}{49}}{\frac{50}{49}}$$

$$= \frac{48}{50} = \frac{24}{25} \ \ldots\ldots..(A)$$

Also,

$$\sin 4B = \sin 2.2B$$

$$= 2\sin 2B \,.\, \cos 2B$$

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

$$= 4.\left(\frac{1/3}{1+\frac{1}{9}}\right).\left(\frac{1-\frac{1}{9}}{1+1/9}\right)$$

$$= \frac{4.\frac{1}{3}.\frac{8}{9}}{\frac{10}{9}\times\frac{10}{9}}$$

$$= \frac{32\times 3}{100}$$

$$= \frac{8\times 3}{25} = \frac{24}{25} \ \ldots\ldots...(B)$$

form $(A) \& (B)$

$$\cos 2A = \sin 4B$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q 33

LHS,

$$\cos 7^\circ \ \cos 14^\circ \cos 28^\circ \cos 56^\circ$$

Divide and multiply by $2\sin 7^\circ$, weget

$$\frac{1}{2\sin 7^\circ}.2\sin 7^\circ.\ \cos 7^\circ.\ \cos 14^\circ.\ \cos 28^\circ.\ \cos 56^\circ$$

$$= \frac{2\sin 14^\circ}{2.2\sin 7^\circ}.\cos 14^\circ.\ \cos 28^\circ.\ \cos 56^\circ \qquad [\because\ 2\sin A\cos A = \sin 2A]$$

$$= \frac{2\sin 28^\circ}{2.4\sin 7^\circ}.\cos 28^\circ.\ \cos 56^\circ$$

$$= \frac{2\sin 56^\circ}{2.8\sin 7^\circ}.\ \cos 56^\circ$$

$$= \frac{\sin 112^\circ}{16\sin 7^\circ}$$

$$= \frac{\sin(180^\circ - 68)}{16\sin(90^\circ - 83^\circ)}$$

$$= \frac{\sin 68^\circ}{16\cos 83^\circ}$$

= RHS

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q34

sin(a+b)= sin(a)cos(b)+sin(b)cos(a) (1)
for a=b, sin(2a)= 2 sin(a) cos(a) (2)

let a= 16 pi/15 (3)
(so 2a = 32 pi/15)

then using (3) in (2), we have
sin(2a)= 2 sin(a) cos(a)
= 2 (2 sin(a/2) cos(a/2)) cos(a)
= 2 (2 (2 sin(a/4) cos(a/4)) cos(a/2)) cos(a)
= 2 (2 (2 (2 sin(a/8) cos(a/8)) cos(a/4)) cos(a/2)) cos(a)
= 16 sin(a/8) (cos(a/8) cos(a/4) cos(a/2) cos(a))

now note sin(2a) = sin(2 pi/15) and sin(a/8)= sin(2 pi/15)
so,
cos(a/8) cos(a/4) cos(a/2) cos(a)= 1/16
or, replacing a with 16 pi/15,
cos(2pi/15)*cos(4pi/15)*cos(8pi/15)*cos(16pi/15)=1/16

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q35

$$\cos\frac{\pi}{5}\cos\frac{2\pi}{5}\cos\frac{4\pi}{5}\cos\frac{8\pi}{5} = \frac{\sin\frac{2^4\pi}{5}}{2^4\sin\frac{\pi}{5}}$$

$$\left[\because \cos A\cos 2A\cos 2^2A\cos 2^3A\ldots\ldots\cos 2^{n-1}A = \frac{\sin 2^nA}{2^n\sin A}\right]$$

$$= \frac{\sin\frac{16\pi}{5}}{16\sin\frac{\pi}{5}}$$

$$= \frac{\sin\left(3\pi+\frac{\pi}{5}\right)}{16\sin\frac{\pi}{5}}$$

$$= \frac{1\left\{-\sin\left(\frac{\pi}{5}\right)\right\}}{16\sin\frac{\pi}{5}}$$

$$= \frac{-1}{16}$$

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