Trigonometric Ratios Ex 5.2 Q16

Answer :

We have,

$$4\left(\sin^4 30^\circ+\cos^2 60^\circ\right)-3\left(\cos^2 45^\circ-\sin^2 90^\circ\right)-\sin^2 60^\circ \quad \ldots\ldots (1)$$

Now,

$\sin 30^\circ=\cos 60^\circ=\dfrac{1}{2}$, $\sin 90^\circ=1$, $\cos 45^\circ=\dfrac{1}{\sqrt{2}}$, $\sin 60^\circ=\dfrac{\sqrt{3}}{2}$

So by substituting above values in equation (1)

We get,

$$4\left(\sin^4 30^\circ+\cos^2 60^\circ\right)-3\left(\cos^2 45^\circ-\sin^2 90^\circ\right)-\sin^2 60^\circ$$

$$=4\left(\left(\frac{1}{2}\right)^4+\left(\frac{1}{2}\right)^2\right)-3\left(\left(\frac{1}{\sqrt{2}}\right)^2-(1)^2\right)-\left(\frac{\sqrt{3}}{2}\right)^2$$

$$=4\left(\frac{1^4}{2^4}+\frac{1^2}{2^2}\right)-3\left(\frac{1^2}{\left(\sqrt{2}\right)^2}-1\right)-\frac{\left(\sqrt{3}\right)^2}{2^2}$$

$$=4\left(\frac{1}{16}+\frac{1}{4}\right)-3\left(\frac{1}{2}-1\right)-\frac{3}{4}$$

LCM of 16 and 4 in the first term of above expression is 16 and

Similarly LCM of 2 and 1 in the second term of above expression is 2

Therefore,

$$4\left(\sin^4 30^\circ+\cos^2 60^\circ\right)-3\left(\cos^2 45^\circ-\sin^2 90^\circ\right)-\sin^2 60^\circ$$

$$=4\left(\frac{1}{16}+\frac{1\times 4}{4\times 4}\right)-3\left(\frac{1}{2}-\frac{1\times 2}{1\times 2}\right)-\frac{3}{4}$$

$$=4\left(\frac{1}{16}+\frac{4}{16}\right)-3\left(\frac{1}{2}-\frac{2}{2}\right)-\frac{3}{4}$$

$$=4\left(\frac{1+4}{16}\right)-3\left(\frac{1-2}{2}\right)-\frac{3}{4}$$

$$=4\left(\frac{5}{16}\right)-3\left(\frac{-1}{2}\right)-\frac{3}{4}$$

Now in the second term of the above expression $-3\times -1=+3$

Therefore,

$$4\left(\sin^4 30^\circ+\cos^2 60^\circ\right)-3\left(\cos^2 45^\circ-\sin^2 90^\circ\right)-\sin^2 60^\circ$$

$$=4\left(\frac{5}{16}\right)+\frac{3}{2}-\frac{3}{4}$$

Now, in the above expression 4 cancels 16 and 4 remains in the denominator of first term

Therefore,

$$4\left(\sin^4 30^\circ+\cos^2 60^\circ\right)-3\left(\cos^2 45^\circ-\sin^2 90^\circ\right)-\sin^2 60^\circ$$

$$=\frac{5}{4}+\frac{3}{2}-\frac{3}{4}$$

Now by taking LCM =4 in the above expression

We get,

$$4\left(\sin^4 30^\circ + \cos^2 60^\circ\right) - 3\left(\cos^2 45^\circ - \sin^2 90^\circ\right) - \sin^2 60^\circ$$

$$= \frac{5}{4} + \frac{3\times 2}{2\times 2} - \frac{3}{4}$$

$$= \frac{5}{4} + \frac{6}{4} - \frac{3}{4}$$

$$= \frac{5+6-3}{4}$$

$$= \frac{11-3}{4}$$

$$= \frac{8}{4}$$

Now, in the above expression $\frac{8}{4}$ gets reduced to 2

Therefore,

$$4\left(\sin^4 30^\circ + \cos^2 60^\circ\right) - 3\left(\cos^2 45^\circ - \sin^2 90^\circ\right) - \sin^2 60^\circ = 2$$

Trigonometric Ratios Ex 5.2 Q17

Answer :

We have,

$$\frac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ} \quad \ldots\ldots (1)$$

Now,

$\tan 60^\circ = \cot 30^\circ = \sqrt{3}$, $\cos 45^\circ = \frac{1}{\sqrt{2}}$, $\sec 30^\circ = \frac{2}{\sqrt{3}}$, $\sec 60^\circ = 2$, $\operatorname{cos}ec 30^\circ = 2$, $\cos 90^\circ = 0$

So by substituting above values in equation (1)

We get,

$$\frac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$$

$$= \frac{\left(\sqrt{3}\right)^2 + 4\left(\frac{1}{\sqrt{2}}\right)^2 + 3\left(\frac{2}{\sqrt{3}}\right)^2 + 5(0)^2}{2+2-\left(\sqrt{3}\right)^2}$$

$$= \frac{3 + \frac{4}{2} + 3\left(\frac{4}{3}\right) + 0}{4-3}$$

Now,

3 gets cancel in numerator and we get,

$$\frac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$$

$$= \frac{3 + \frac{4}{2} + 4}{1}$$

$$= \frac{7 + \frac{4}{2}}{1}$$

Now, $\frac{4}{2}$ in the numerator get reduced to 2and we get,

$$\frac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$$

$$= \frac{7 + 2}{1}$$

$$= \frac{9}{1}$$

$$= 9$$

Therefore,

$$\boxed{\frac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ} = 9}$$

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