Trigonometric Ratios Ex 5.2 Q8

Answer :

We have,

$$\sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + \frac{1}{2}\sin^2 90^\circ - 2\cos^2 90^\circ + \frac{1}{24}\cos^2 0^\circ \quad \ldots\ldots (1)$$

Now,

$$\sin 30^\circ = \frac{1}{2}, \cos 45^\circ = \frac{1}{\sqrt{2}}, \tan 30^\circ = \frac{1}{\sqrt{3}}, \sin 90^\circ = \cos 0^\circ = 1, \cos 90^\circ = 0$$

So by substituting above values in equation (1)

We get,

$$\sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + \frac{1}{2}\sin^2 90^\circ - 2\cos^2 90^\circ + \frac{1}{24}\cos^2 0^\circ$$

$$= \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{\sqrt{2}}\right)^2 + 4\times\left(\frac{1}{\sqrt{3}}\right)^2 + \frac{1}{2}\times(1)^2 - 2\times(0)^2 + \frac{1}{24}\times(1)^2$$

$$= \frac{1}{4}\times\frac{1}{2} + 4\times\frac{1}{3} + \frac{1}{2}\times 1 - 2\times 0 + \frac{1}{24}\times 1$$

$$= \frac{1}{8} + \frac{4}{3} + \frac{1}{2} - 0 + \frac{1}{24}$$

$$= \frac{1}{8} + \frac{4}{3} + \frac{1}{2} + \frac{1}{24}$$

LCM of 8, 3, 2 and 24 is 48

Therefore by taking LCM

We get,

$$\sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + \frac{1}{2}\sin^2 90^\circ - 2\cos^2 90^\circ + \frac{1}{24}\cos^2 0^\circ$$

$$= \frac{1\times 6}{8\times 6} + \frac{4\times 16}{3\times 16} + \frac{1\times 24}{2\times 24} + \frac{1\times 2}{24\times 2}$$

$$= \frac{6}{48} + \frac{64}{48} + \frac{24}{48} + \frac{2}{48}$$

$$= \frac{6+64+24+2}{48}$$

$$= \frac{96}{48}$$

In the above equation the first term $\frac{96}{48}$ gets reduced to 2

Therefore,

$$\sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + \frac{1}{2}\sin^2 90^\circ - 2\cos^2 90^\circ + \frac{1}{24}\cos^2 0^\circ = 2$$

Trigonometric Ratios Ex 5.2 Q9

Answer :

We have,

$$4\left(\sin^4 60^\circ + \cos^4 30^\circ\right) - 3\left(\tan^2 60^\circ - \tan^2 45^\circ\right) + 5\cos^2 45^\circ \quad \ldots\ldots (1)$$

Now,

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

So by substituting above values in equation (1)

We get,

$$4\left(\sin^4 60^\circ + \cos^4 30^\circ\right) - 3\left(\tan^2 60^\circ - \tan^2 45^\circ\right) + 5\cos^2 45^\circ$$

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

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

$$= 4\left(\frac{9}{16} + \frac{9}{16}\right) - 3(2) + 5\times\frac{1}{2}$$

$$= 4\left(\frac{9+9}{16}\right) - 6 + \frac{5}{2}$$

$$= 4\left(\frac{18}{16}\right) - 6 + \frac{5}{2}$$

Now, $\frac{18}{16}$ gets reduced to $\frac{9}{8}$

Therefore,

$$4\left(\sin^4 60^\circ + \cos^4 30^\circ\right) - 3\left(\tan^2 60^\circ - \tan^2 45^\circ\right) + 5\cos^2 45^\circ$$

$$= 4\left(\frac{9}{8}\right) - 6 + \frac{5}{2}$$

$$= \frac{36}{8} - 6 + \frac{5}{2}$$

Now, $\frac{36}{8}$ gets reduced to $\frac{9}{2}$

Therefore,

$$4\left(\sin^4 60^\circ + \cos^4 30^\circ\right) - 3\left(\tan^2 60^\circ - \tan^2 45^\circ\right) + 5\cos^2 45^\circ$$

$$= \frac{9}{2} - 6 + \frac{5}{2}$$

Now by taking LCM

We get,

$$4\left(\sin^4 60^\circ + \cos^4 30^\circ\right) - 3\left(\tan^2 60^\circ - \tan^2 45^\circ\right) + 5\cos^2 45^\circ$$

$$= \frac{9}{2} - \frac{6\times 2}{1\times 2} + \frac{5}{2}$$

$$= \frac{9}{2} - \frac{12}{2} + \frac{5}{2}$$

$$= \frac{9-12+5}{2}$$

$$= \frac{14-12}{2}$$

$$= \frac{2}{2}$$

$$= 1$$

Therefore,

$$4\left(\sin^4 60^\circ + \cos^4 30^\circ\right) - 3\left(\tan^2 60^\circ - \tan^2 45^\circ\right) + 5\cos^2 45^\circ = 1$$

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