X ELITE BATCH WORK – 6 (No reduction in topics) (TRIGONOMETRY – MCQs)

1) $\left(\frac{\sin 47^\circ}{\cos 43^\circ}\right)^2 + \left(\frac{\cos 43^\circ}{\sin 47^\circ}\right)^2 - 4\cos^2 45^\circ =$ ____

(a) 1 (b) 0 (c) 2 (d) −1

2) $\frac{\cos(90^\circ-\theta)\cdot\cos\theta}{\tan\theta} + \cos^2(90^\circ-\theta) =$ ____

(a) 1 (b) −1 (c) 0 (d) none of these

3) $[\cos(90^\circ-\theta)+(\sin 90^\circ-\theta)]^2 + [\sin(90^\circ-\theta)-\cos(90^\circ-\theta)]^2 =$ ____

(a) 0 (b) 1 (c) 2 (d) −1

4) If $\tan 30^\circ = \frac{1}{\sqrt{3}}$, then using $\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$, $\tan 60^\circ =$ ____

(a) $1/\sqrt{3}$ (b) $\sqrt{3}$ (c) 0 (d) not defined

5) $2\frac{\sin 43^\circ}{\cos 47^\circ} - \frac{\cot 30^\circ}{\tan 60^\circ} - \sqrt{2}\sin 45^\circ =$ ____

(a) 2 (b) −2 (c) $\sqrt{2}$ (d) 0

6) If $x = a\cos^3\theta$, $y = b\sin^3\theta$, then $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} =$ ____

(a) 1/3 (b) 2/3 (c) 3/2 (d) 1

7) $\cot 18^\circ . \cot 39^\circ . \cot 51^\circ . \cot 60^\circ . \cot 72^\circ =$ ____

(a) $\sqrt{3}$ (b) $2/\sqrt{3}$ (c) $1/\sqrt{3}$ (d) 1

8) $\sec^4\theta(1-\sin^2\theta) - \tan^2\theta =$ ____

(a) 0 (b) 1 (c) −1 (d) none of these

9) If $\operatorname{cosec}\theta - \sin\theta = a$; $\sec\theta - \cos\theta = b$; then $a^2b^2(a^2+b^2+3) =$ ____

(a) 3 (b) −3 (c) 1 (d) −1

10) If $\tan\theta = \frac{2}{\sqrt{5}}$, then $\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}$

(a) 1/3 (b) 5/7 (c) 1/9 (d) $\sqrt{5}/9$

X Elite work – 6 (Answers)

1) $\left(\frac{\cos(90°-47°)}{\sin 43°}\right)^2 + \left(\frac{\sin(90°-43°)}{\sin 47°}\right)^2 - 4\cos^2 45°$

$[\because \cos(90°-\theta)=\sin\theta;\ \sin(90°-\theta)=\cos\theta]$

$= \left(\frac{\cancel{\cos 43°}^{1}}{\cancel{\cos 43°}_{1}}\right)^2 + \left(\frac{\cancel{\sin 47°}^{1}}{\cancel{\sin 47°}_{1}}\right)^2 - 4\times\left(\frac{1}{\sqrt{2}}\right)^2 \quad [\because \cos 45° = \frac{1}{\sqrt{2}}]$

$= 1+1-\frac{4}{2} = 2-\frac{4}{2} = 2-2 = \underline{0}$ (b)

2) $\frac{\cancel{\sin\theta}^{1}\cdot\cos\theta}{\frac{\cancel{\sin\theta}_{1}}{\cos\theta}} + \sin^2\theta \quad [\because \cos(90°-\theta)=\sin\theta;\ \tan\theta=\sin\theta/\cos\theta]$

$= \cos^2\theta + \sin^2\theta$

$= \underline{1}$ (a) $[\because \sin^2\theta+\cos^2\theta=1]$

3) $(\sin\theta+\cos\theta)^2 + (\cos\theta-\sin\theta)^2 \quad [\because \cos(90°-\theta)=\sin\theta;\ \sin(90°-\theta)=\cos\theta]$

$= \sin^2\theta+\cos^2\theta+2\sin\theta\cos\theta+\cos^2\theta+\sin^2\theta-2\sin\theta\cos\theta$

$= 2(\sin^2\theta+\cos^2\theta) = \underline{2}$ (c) $[\because \sin^2\theta+\cos^2\theta=1]$

4) $\theta = 30°$

$\tan 2\theta = \tan 60° = \tan 2\times 30° = \frac{2\tan 30°}{1-\tan^2 30°}$

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

$= \frac{2}{\frac{\sqrt{3}}{2}} = \frac{\cancel{2}^{1}}{\cancel{\sqrt{3}}}\times\frac{\cancel{3}^{\sqrt{3}}}{\cancel{2}_{1}} = \underline{\sqrt{3}}$ (b)

5) $2\times\frac{\cos(90°-43°)}{\cos 47°} - \frac{\sqrt{3}}{\sqrt{3}} - \sqrt{2}\times\frac{1}{\sqrt{2}} \quad [\because \cos(90°-\theta)=\sin\theta;\ \cot 30°=\sqrt{3};\ \tan 60°=\sqrt{3};\ \sin 45°=1/\sqrt{2}]$

$= 2\times\frac{\cancel{\cos 47°}^{1}}{\cancel{\cos 47°}_{1}} - 1 - 1$

$= 2-2$

$= \underline{0}$ (d)

6) $x = a\cos^3\theta$

$\frac{x}{a} = \cos^3\theta$

$\left(\frac{x}{a}\right)^{\frac{2}{3}} = (\cos^3\theta)^{\frac{2}{3}} = \cos^{3\times\frac{2}{3}}\theta = \cos^2\theta$ //

$y = b\sin^3\theta$

$\frac{y}{b} = \sin^3\theta$

$\left(\frac{y}{b}\right)^{\frac{2}{3}} = (\sin^3\theta)^{\frac{2}{3}} = \sin^{3\times\frac{2}{3}}\theta = \sin^2\theta$ //

$\therefore \left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = \cos^2\theta + \sin^2\theta = \underline{1}$ (d)

7) $(\cot 18^\circ \cdot \cot 72^\circ)\cdot(\cot 39^\circ \cdot \cot 51^\circ)\cdot \cot 60^\circ$

$= [\tan(90^\circ - 18^\circ)\cdot \cot 72^\circ][\tan(90^\circ - 39^\circ)\cdot \cot 51^\circ] \times \frac{1}{\sqrt{3}}$

$[\tan(90^\circ - \theta) = \cot\theta;\ \cot 60^\circ = 1/\sqrt{3}]$

$= (\tan 72^\circ \cdot \cot 72^\circ)(\tan 51^\circ \cdot \cot 51^\circ) \times \frac{1}{\sqrt{3}}$

$= 1 \times 1 \times \frac{1}{\sqrt{3}}$ $[\because \tan\theta \cdot \cot\theta = 1]$

$= \frac{1}{\sqrt{3}}$ (c)

8) $\sec^4\theta \times \cos^2\theta - \tan^2\theta$ $[\because 1 - \sin^2\theta = \cos^2\theta]$

$= \frac{\sec^4\theta}{\sec^2\theta} - \tan^2\theta$ $[\because \cos\theta = \frac{1}{\sec\theta}]$

$= \sec^2\theta - \tan^2\theta$ $[\because \sec^2\theta - \tan^2\theta = 1]$

$= \underline{1}$ (b)

9) $a = \operatorname{cosec}\theta - \sin\theta = \frac{1}{\sin\theta} - \sin\theta = \frac{1 - \sin^2\theta}{\sin\theta}$

$= \frac{\cos^2\theta}{\sin\theta}$ $[\because \cos^2\theta = 1 - \sin^2\theta]$

$a^2 = \frac{\cos^4\theta}{\sin^2\theta}$

$b = \sec\theta - \cos\theta = \frac{1}{\cos\theta} - \cos\theta = \frac{1-\cos^2\theta}{\cos\theta}$

$= \frac{\sin^2\theta}{\cos\theta}$ $[\sin^2\theta = 1-\cos^2\theta]$

$b^2 = \frac{\sin^4\theta}{\cos^2\theta}$

$\therefore a^2b^2(a^2+b^2+3) = \frac{\cos^4\theta}{\sin^2\theta} \times \frac{\sin^4\theta}{\cos^2\theta}\left(\frac{\cos^4\theta}{\sin^2\theta} + \frac{\sin^4\theta}{\cos^2\theta} + 3\right)$ (×cos²θ, ×sin²θ, ×sin²θ cos²θ)

$= \cos^2\theta \times \sin^2\theta \left(\frac{\cos^6\theta + \sin^6\theta + 3\sin^2\theta\cos^2\theta}{\sin^2\theta\cos^2\theta}\right)$

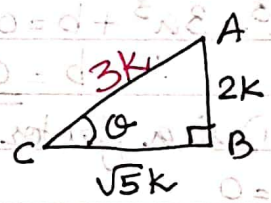
$[a^3+b^3 = (a+b)^3 - 3ab(a+b)]$

$= (\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta\cos^2\theta(\sin^2\theta+\cos^2\theta) + 3\sin^2\theta\cos^2\theta$

$= 1 - 3\sin^2\theta\cos^2\theta + 3\sin^2\theta\cos^2\theta$

$= 1$ (c)

10) $\tan\theta = \frac{2k}{\sqrt{5}k}$



$AC^2 = AB^2 + BC^2$
$= 4k^2 + 5k^2$
$= 9k^2$
$AC = 3k$

$\operatorname{Cosec}\theta = \frac{3k}{2k} = \frac{3}{2}$

$\sec\theta = \frac{3k}{\sqrt{5}k} = \frac{3}{\sqrt{5}}$

$\therefore \frac{\operatorname{Cosec}^2\theta - \sec^2\theta}{\operatorname{Cosec}^2\theta + \sec^2\theta} = \frac{\frac{9}{4}\frac{\times5}{\times5} - \frac{9}{5}\frac{\times4}{\times4}}{\frac{9}{4}\frac{\times5}{\times5} + \frac{9}{5}\frac{\times4}{\times4}} = \frac{\frac{45-36}{20}}{\frac{45+36}{20}} = \frac{9}{81}$

$= \frac{1}{9}$ (c)