X Elite work - 7 TRIGONOMETRY

1) If $\operatorname{Cosec}\theta = \frac{3}{2}$, then the value of $2(\operatorname{cosec}^2\theta + \cot^2\theta) =$

(a) 5 (b) 6 (c) 7 (d) $\frac{7}{5}$

2) $5\tan^2\theta - 5\sec^2\theta =$

(a) −5 (b) 5 (c) 0 (d) 1

3) If $\cot\theta = \frac{15}{8}$, then $\frac{(3+3\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(3-3\cos\theta)} =$

(a) 25/64 (b) 64/225 (c) 225/64 (d) −225/64

4) If $4\sin\theta = 3$ and $\sqrt{\frac{\operatorname{Cosec}^2\theta - \cot^2\theta}{\sec^2\theta - 1}} + 2\cot\theta = \frac{\sqrt{7}}{x} + \cos\theta$, then the value of x =

(a) 1/3 (b) 5/3 (c) 4/3 (d) 3/4

5) If $\sin\theta + \operatorname{Cosec}\theta = 2$, then the value of $\sin^2\theta + \operatorname{Cosec}^2\theta =$

(a) 1 (b) 0 (c) 3 (d) 2

6) If $\sin\theta + \cos\theta = 1$, then the value of $\sin\theta . \cos\theta =$

(a) 1 (b) 0 (c) −1 (d) 2

7) If $\cot\theta + \frac{1}{\cot\theta} = 2$, then $\cot^2\theta + \frac{1}{\cot^2\theta} =$

(a) 1 (b) 2 (c) −1 (d) −2

8) $\cot^4\theta - \operatorname{Cosec}^4\theta + \cot^2\theta + \operatorname{Cosec}^2\theta =$

(a) 0 (b) 1 (c) −1 (d) 2

9) $\frac{\cos 80^\circ}{\sin 10^\circ} + 2\cos 59^\circ . \operatorname{Cosec} 31^\circ - 3\tan 49^\circ . \tan 41^\circ =$

(a) 0 (b) 1 (c) 3/2 (d) −1

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

(a) −2 (b) 2 (c) 0 (d) 1

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1) $\operatorname{cosec}\theta = \frac{3}{2}$

$2(\operatorname{cosec}^2\theta + \cot^2\theta) = 2(\operatorname{cosec}^2\theta + \operatorname{cosec}^2\theta - 1)$

$= 2(2\operatorname{cosec}^2\theta - 1)$ [$\because \cot^2\theta = \operatorname{cosec}^2\theta - 1$]

$= 2\left(\cancel{2}^{1} \times \frac{9}{\cancel{4}_{2}} - 1\right)$

$= \cancel{2}^{1}\left(\frac{9-2}{\cancel{2}_{1}}\right) = 7$ (c)

2) $5\tan^2\theta - 5\sec^2\theta = 5(\tan^2\theta - \sec^2\theta)$

$= 5 \times -1$

$= -5$ (a) [$\because \sec^2\theta - \tan^2\theta = 1$]

3) $\cot\theta = \frac{15}{8}$ (given)

$\frac{(3+3\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(3-3\cos\theta)} = \frac{\cancel{3}^{1}(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta) \times \cancel{3}_{1}(1-\cos\theta)}$

$= \frac{1-\sin^2\theta}{1-\cos^2\theta} = \frac{\cos^2\theta}{\sin^2\theta} = \cot^2\theta = \left(\frac{15}{8}\right)^2 = \frac{225}{64}$ (c)

[$\cos^2\theta = 1-\sin^2\theta$; $\sin^2\theta = 1-\cos^2\theta$]

4) $4\sin\theta = 3$

$\sin\theta = \frac{3}{4} \rightarrow (1)$

$\cos\theta = \sqrt{1-\sin^2\theta}$

$\cos\theta = \sqrt{1 - 9/16} = \sqrt{\frac{7}{16}} = \frac{\sqrt{7}}{4} \rightarrow (2)$

$\sqrt{\frac{\operatorname{cosec}^2\theta - \cot^2\theta}{\sec^2\theta - 1}} + 2\cot\theta = \frac{\sqrt{7}}{x} + \cos\theta$ [$\because \operatorname{cosec}^2\theta - \cot^2\theta = 1$]

$\Rightarrow \sqrt{\frac{1}{\tan^2\theta}} + 2\cot\theta = \frac{\sqrt{7}}{x} + \cos\theta$ [$\because \tan^2\theta = \sec^2\theta - 1$]

$\Rightarrow \sqrt{\cot^2\theta} + 2\cot\theta = \frac{\sqrt{7}}{x} + \cos\theta$ [$\because \cot\theta = 1/\tan\theta$]

$\Rightarrow \cot\theta + 2\cot\theta = \frac{\sqrt{7}}{x} + \cos\theta$

$\Rightarrow 3\cot\theta = \frac{\sqrt{7}}{x} + \cos\theta$

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$\Rightarrow 3\dfrac{\cos\theta}{\sin\theta} = \dfrac{\sqrt{7}}{x} + \cos\theta$

$\Rightarrow \cancel{3} \times \dfrac{\sqrt{7}}{\cancel{4}} \times \dfrac{\cancel{4}}{\cancel{3}} = \dfrac{\sqrt{7}}{x} + \dfrac{\sqrt{7}}{4}$

$\Rightarrow \sqrt{7} - \dfrac{\sqrt{7}}{4} = \dfrac{\sqrt{7}}{x}$

$\Rightarrow \dfrac{3\cancel{\sqrt{7}}}{4} = \dfrac{\cancel{\sqrt{7}}}{x}$

$\therefore x = \dfrac{4}{3}$ (c)

5) $\sin\theta + \operatorname{cosec}\theta = 2$

$\Rightarrow (\sin\theta + \operatorname{cosec}\theta)^2 = 4$

$\Rightarrow \sin^2\theta + \operatorname{cosec}^2\theta + 2\sin\theta.\operatorname{cosec}\theta = 4$

$\Rightarrow \sin^2\theta + \operatorname{cosec}^2\theta + 2 = 4$ $[\because \sin\theta.\operatorname{cosec}\theta = 1]$

$\therefore \sin^2\theta + \operatorname{cosec}^2\theta = 2$ (d)

6) $\sin\theta + \cos\theta = 1$

$\Rightarrow (\sin\theta + \cos\theta)^2 = 1$

$\Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 1$

$\Rightarrow 1 + 2\sin\theta\cos\theta = 1$ $[\because \sin^2\theta + \cos^2\theta = 1]$

$2\sin\theta\cos\theta = 0$

$\therefore \sin\theta\cos\theta = 0$ (b)

7) $\left(\cot\theta + \dfrac{1}{\cot\theta}\right)^2 = 2^2$

$\Rightarrow \cot^2\theta + \dfrac{1}{\cot^2\theta} + 2 \times \cancel{\cot\theta} \times \dfrac{1}{\cancel{\cot\theta}} = 4$

$\Rightarrow \cot^2\theta + \dfrac{1}{\cot^2\theta} = 2$ (b)

8) $(\cot^4\theta - \operatorname{cosec}^4\theta) + (\cot^2\theta + \operatorname{cosec}^2\theta)$

$= (\cot^2\theta + \operatorname{cosec}^2\theta)(\cot^2\theta - \operatorname{cosec}^2\theta) + (\cot^2\theta + \operatorname{cosec}^2\theta)$

$= (\cot^2\theta + \operatorname{cosec}^2\theta)[\cot^2\theta - \operatorname{cosec}^2\theta + 1]$

$= (\cot^2\theta + \operatorname{cosec}^2\theta)((\cot^2\theta + 1) - \operatorname{cosec}^2\theta)$

$= (\cot^2\theta + \operatorname{cosec}^2\theta)(\operatorname{cosec}^2\theta - \operatorname{cosec}^2\theta)$

$= (\cot^2\theta + \operatorname{cosec}^2\theta) \times 0$

$= 0$ (a)

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9) $\frac{\cos 80°}{\sin 10°} + 2\cos 59°.\operatorname{cosec} 31° - 3\tan 49°.\tan 41°$

$= \frac{\sin(90°-80°)}{\sin 10°} + 2\sin(90°-59°).\operatorname{cosec} 31° - 3\cot(90°-49°).\tan 41°$

$= \frac{\cancel{\sin 10°}}{\cancel{\sin 10°}} + 2\sin 31°.\operatorname{cosec} 31° - 3\cot 41°.\tan 41°$

$= 1 + 2 - 3$ [$\because \sin(90°-\theta) = \cos\theta$; $\sin\theta.\operatorname{cosec}\theta = 1$;

$= 3 - 3 = 0$ (a) $\tan\theta.\cot\theta = 1$]

10) $\left(\frac{\sin 47°}{\sin(90°-43°)}\right)^2 + \left(\frac{\cos 43°}{\cos(90°-47°)}\right)^2 - 2\times\left(\frac{1}{\sqrt{2}}\right)^2$ [$\cos 45° = 1/\sqrt{2}$]

$= \left(\frac{\cancel{\sin 47°}}{\cancel{\sin 47°}}\right)^2 + \left(\frac{\cancel{\cos 43°}}{\cancel{\cos 43°}}\right)^2 - \cancel{2}\times\frac{1}{\cancel{2}}$ [$\because \sin(90°-\theta) = \cos\theta$, $\cos(90°-\theta) = \sin\theta$]

$= 1 + 1 - 1$

$= 1$ (d)

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