X Elite work-8 (TRIGONOMETRY)

1) $(1+\tan^2\theta)(1-\sin\theta)(1+\sin\theta)$

(a) 0 (b) −1 (c) 1 (d) 2

2) If $2\sin^2\theta - \cos^2\theta = 2$, then the value of θ is

(a) 60° (b) 30° (c) 0° (d) 90°

3) $\dfrac{\cos^2(45^\circ+\theta)+\cos^2(45^\circ-\theta)}{\tan(60^\circ+\theta)\cdot\tan(30^\circ-\theta)} =$

(a) 0 (b) 1 (c) 2 (d) −1

4) If $\operatorname{cosec}\theta + \cot\theta = p$, then $\dfrac{p^2-1}{p^2+1} =$

(a) $\sin\theta$ (b) $\tan\theta$ (c) $\operatorname{cosec}\theta$ (d) $\cos\theta$

5) If $\tan\theta+\sec\theta = p$, then $\dfrac{p^2+1}{2p} =$

(a) $\sin\theta$ (b) $\cos\theta$ (c) $\sec\theta$ (d) $\tan\theta$

6) If $\sin\theta + 2\cos\theta = 1$, then $2\sin\theta - \cos\theta =$

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

7) $\dfrac{\sin^3\theta+\cos^3\theta}{\sin\theta+\cos\theta} + \sin\theta\cos\theta =$

(a) 0 (b) 1 (c) −1 (d) ½

8) $\sqrt{\dfrac{\sec\theta-1}{\sec\theta+1}} + \sqrt{\dfrac{\sec\theta+1}{\sec\theta-1}} =$

(a) $2\sin\theta$ (b) $2\operatorname{cosec}\theta$ (c) $2\tan\theta$ (d) $2\sec\theta$

9) $\dfrac{(1-\cot\theta)^2}{\operatorname{cosec}^2\theta} + 2\sin\theta\cos\theta$

(a) 1 (b) 0 (c) 2 (d) −2

10) $2\dfrac{\sin 43^\circ}{\cos 47^\circ} - \dfrac{\cot 30^\circ}{\tan 60^\circ} - \sqrt{2}\sin 45^\circ$

(a) 2 (b) −1 (c) 1 (d) 0

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X Elite work-8 (TRIGONOMETRY – MCQs answers)

1) $(1+\tan^2\theta)(1-\sin\theta)(1+\sin\theta) = \sec^2\theta(1-\sin^2\theta)$ $[\because \sec^2\theta = 1+\tan^2\theta$

$= \sec^2\theta \times \cos^2\theta$ $\cos^2\theta = 1-\sin^2\theta]$

$= \underline{\underline{1}}$ (c)

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

$\Rightarrow 2(1-\cos^2\theta) - \cos^2\theta = 2$ $[\because \sin^2\theta = 1-\cos^2\theta]$

$\Rightarrow 2 - 2\cos^2\theta - \cos^2\theta = 2$

$\Rightarrow 2 - 3\cos^2\theta = 2$

$\Rightarrow -3\cos^2\theta = 0$

$\Rightarrow \cos^2\theta = 0$

$\therefore \theta = 90°$ (d) $[\because \cos 90° = 0]$

3) $\dfrac{\cos^2(45°+\theta) + \cos^2(45°-\theta)}{\tan(60°+\theta)\cdot\tan(30°-\theta)}$

$= \dfrac{\sin^2(90°-45°-\theta) + \cos^2(45°-\theta)}{\cot(90°-60°-\theta)\cdot\tan(30°-\theta)}$ $[\because \sin(90°-\theta) = \cos\theta]$

$= \dfrac{\sin^2(45°-\theta) + \cos^2(45°-\theta)}{\cot(30°-\theta)\cdot\tan(30°-\theta)}$ $[\because \cot(90°-\theta) = \tan\theta]$

$= \dfrac{1}{1} = 1$ (b) $[\because \sin^2\theta + \cos^2\theta = 1;\ \cot\theta\cdot\tan\theta = 1]$

4) $\csc\theta + \cot\theta = p \rightarrow (1)$

$\dfrac{1}{\csc\theta + \cot\theta} = \dfrac{1}{p}$

$\Rightarrow \dfrac{\csc^2\theta - \cot^2\theta}{\csc\theta + \cot\theta} = \dfrac{1}{p}$ $[\because \csc^2\theta - \cot^2\theta = 1]$

$\Rightarrow \dfrac{\cancel{(\csc\theta + \cot\theta)}(\csc\theta - \cot\theta)}{\cancel{\csc\theta + \cot\theta}} = \dfrac{1}{p}$

$\Rightarrow \csc\theta - \cot\theta = \dfrac{1}{p} \rightarrow (2)$

$(1)-(2) \Rightarrow 2\cot\theta = p - \dfrac{1}{p} = \dfrac{p^2-1}{p}$

$\Rightarrow \cot\theta = \dfrac{p^2-1}{2p} \rightarrow (3)$

$(1)+(2),\ 2\csc\theta = p + \dfrac{1}{p} = \dfrac{p^2+1}{p}$

$\Rightarrow \csc\theta = \dfrac{p^2+1}{2p} \rightarrow (4)$

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$\frac{(3)}{(4)}$, $\frac{\cot\theta}{\operatorname{cosec}\theta} = \frac{\frac{p^2-1}{\cancel{2p}}}{\frac{p^2+1}{\cancel{2p}}}$

$\Rightarrow \frac{\cos\theta}{\sin\theta} \times \sin\theta = \frac{p^2-1}{p^2+1}$ [$\because \cot\theta = \cos\theta/\sin\theta$, $\operatorname{cosec}\theta = 1/\sin\theta$]

$\therefore \frac{p^2-1}{p^2+1} = \cos\theta$ (d)

5) $\tan\theta + \sec\theta = p \longrightarrow (1)$

$\frac{1}{\tan\theta+\sec\theta} = \frac{1}{p}$

$\Rightarrow \frac{\sec^2\theta - \tan^2\theta}{\sec\theta + \tan\theta} = \frac{1}{p}$

$\Rightarrow \frac{\cancel{(\sec\theta + \tan\theta)}(\sec\theta - \tan\theta)}{\cancel{\sec\theta + \tan\theta}} = \frac{1}{p}$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{p} \longrightarrow (2)$

$(1)+(2)$; $2\sec\theta = p + \frac{1}{p} = \frac{p^2+1}{p}$

$\therefore \sec\theta = \frac{p^2+1}{2p}$ (c)

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6) $\sin\theta + 2\cos\theta = 1$

$\Rightarrow (\sin\theta + 2\cos\theta)^2 = 1$ [Squaring on both sides]

$\Rightarrow \sin^2\theta + 4\cos^2\theta + 4\sin\theta\cos\theta = 1$

$\Rightarrow 4\sin\theta\cos\theta = 1 - \sin^2\theta - 4\cos^2\theta \rightarrow (1)$

Now, $(2\sin\theta - \cos\theta)^2 = 4\sin^2\theta + \cos^2\theta - 4\sin\theta\cos\theta$

$= 4\sin^2\theta + \cos^2\theta - 1 + \sin^2\theta + 4\cos^2\theta$ [from eq(1)]

$= 5\sin^2\theta + 5\cos^2\theta - 1$

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$$= 5(\sin^2\theta + \cos^2\theta) - 1$$
$$= 5 - 1 = 4 \qquad [\because \sin^2\theta + \cos^2\theta = 1]$$
$$\therefore 2\sin\theta - \cos\theta = \sqrt{4} = 2 \ (c)$$

7) $$\frac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} + \sin\theta.\cos\theta \qquad [a^3+b^3 = (a+b)(a^2+b^2-ab)]$$
$$= \frac{\cancel{(\sin\theta + \cos\theta)}(\sin^2\theta + \cos^2\theta - \sin\theta\cos\theta)}{\cancel{\sin\theta + \cos\theta}} + \sin\theta.\cos\theta$$
$$= 1 - \cancel{\sin\theta\cos\theta} + \cancel{\sin\theta\cos\theta} = 1 \ (b) \qquad [\because \sin^2\theta + \cos^2\theta = 1]$$

8) $$\sqrt{\frac{(\sec\theta - 1)^2}{(\sec\theta + 1)(\sec\theta - 1)}} + \sqrt{\frac{(\sec\theta + 1)^2}{(\sec\theta - 1)(\sec\theta + 1)}}$$
$$= \sqrt{\frac{(\sec\theta - 1)^2}{\sec^2\theta - 1}} + \sqrt{\frac{(\sec\theta + 1)^2}{\sec^2\theta - 1}} = \sqrt{\frac{(\sec\theta - 1)^2}{\tan^2\theta}} + \sqrt{\frac{(\sec\theta + 1)^2}{\tan^2\theta}}$$
$$= \frac{\sec\theta - 1}{\tan\theta} + \frac{\sec\theta + 1}{\tan\theta} = \frac{\sec\theta - 1 + \sec\theta + 1}{\tan\theta} \qquad [\because \sec^2\theta - 1 = \tan^2\theta]$$
$$= \frac{2\sec\theta}{\tan\theta} = 2 \times \frac{1}{\cos\theta} \times \frac{\cos\theta}{\sin\theta} = \frac{2}{\sin\theta} \qquad \left[\because \sec\theta = \frac{1}{\cos\theta};\ \tan\theta = \frac{\sin\theta}{\cos\theta}\right]$$
$$= 2\operatorname{cosec}\theta \ (b)$$

9) $$\left(1 - \frac{\cos\theta}{\sin\theta}\right)^2 \times \sin^2\theta + 2\sin\theta\cos\theta \qquad \left[\because \cot\theta = \frac{\cos\theta}{\sin\theta}\right.$$
$$= \left(\frac{\sin\theta - \cos\theta}{\sin\theta}\right)^2 \times \sin^2\theta + 2\sin\theta\cos\theta \qquad \left.\operatorname{cosec}\theta = \frac{1}{\sin\theta}\right]$$
$$= \frac{(\sin^2\theta + \cos^2\theta - 2\sin\theta\cos\theta) \times \cancel{\sin^2\theta}}{\cancel{\sin^2\theta}} + 2\sin\theta\cos\theta \qquad [\because \sin^2\theta + \cos^2\theta = 1]$$
$$= 1 - 2\sin\theta\cos\theta + 2\sin\theta\cos\theta$$
$$= 1 \ (a)$$

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10) $\dfrac{2\cos(90^\circ - 43^\circ)}{\cos 47^\circ} - \dfrac{\cancel{\sqrt{3}}^{1}}{\cancel{\sqrt{3}}_{1}} - \cancel{\sqrt{2}}^{1} \times \dfrac{1}{\cancel{\sqrt{2}}_{1}}$

$= \dfrac{2\cancel{\cos 47^\circ}^{1}}{\cancel{\cos 47^\circ}_{1}} - 1 - 1$ $[\because \cos(90^\circ - \theta) = \sin\theta]$

$= 2 - 2$

$= \underline{\underline{0}}$ (d)

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