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Trigonometry

Worksheet No. 1 (Solutions)

Qn 1 LHS $\cos(510^\circ)\cos(330^\circ) + \sin(390^\circ)\cos(120^\circ)$

$$= \cos(\overset{\text{II}}{5\times90^\circ+60^\circ})\cdot\cos(\overset{\text{IV}}{360-30}) + \sin(\overset{\text{I}}{360+30^\circ})\cdot\cos(\overset{\text{II}}{180-60^\circ})$$

$$= -\sin(60^\circ)\cdot\cos(30^\circ) + \sin(30^\circ)\cdot(-\cos60^\circ)$$

$$= -\frac{\sqrt3}{2}\times\frac{\sqrt3}{2} + \frac12\left(-\frac12\right)$$

$$= -\frac34 - \frac14 = \frac{-4}{4} = -1 \quad \text{Ans}$$

Qn 2 $\cos(660^\circ)\cdot\sin(330^\circ) - \sin(420^\circ)\cos(390^\circ)$

$$= \cos(\overset{\text{IV}}{7\times90^\circ+30^\circ})\cdot\sin(\overset{\text{IV}}{360-30}) - \sin(\overset{\text{I}}{360+60^\circ})\cdot\cos(\overset{\text{I}}{360+30^\circ})$$

$$= \sin(30)(-\sin30^\circ) - \sin(60^\circ)\cos(30^\circ)$$

$$= \frac12\times\left(-\frac12\right) - \frac{\sqrt3}{2}\times\frac{\sqrt3}{2}$$

$$= -\frac14 - \frac34 = \frac{-4}{4} = -1 \quad \text{Ans}$$

Qn 3 → $\tan(225^\circ)\cot(405^\circ) + \tan(765^\circ)\cot(675^\circ)$.

$$= \tan(\overset{\text{III}}{180+45})\cdot\cot(\overset{\text{I}}{360+45}) + \tan(\overset{\text{I}}{8\times90^\circ+45})\cdot\cot(\overset{\text{IV}}{7\times90^\circ+45})$$

$$= \tan(45)\cdot\cot(45^\circ) + \tan(45)\times(-\tan45^\circ)$$

$$= 1\times1 + 1\times(-1)$$

$$= 1-1 = 0 \quad \text{Ans}$$

ULTIMATE MATHEMATICS

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Ans 4 → $\tan(720^\circ) - \cos(270^\circ) - \sin(150^\circ)\cos(120^\circ)$

$= \tan(\overset{I}{8\times 90^\circ + 0^\circ}) - \cos(\overset{III}{180+90^\circ}) - \sin(\overset{II}{180-30^\circ})\cos(\overset{II}{180-60^\circ})$

$= \tan(0^\circ) - \cos(90^\circ) - \sin(30^\circ)\times(-\cos 60^\circ)$

$= 0 - 0 - \frac{1}{2}\times(-\frac{1}{2})$

$= \frac{1}{4}$ Ans

Ans 5 → $2\sin^2(\frac{\pi}{6}) + \operatorname{cosec}^2(\frac{7\pi}{6})\cdot\cos^2(\frac{\pi}{3})$

$= 2\sin^2(30^\circ) + \operatorname{cosec}^2(\underset{III}{210^\circ})\cdot\cos^2(60^\circ)$

$= 2(\frac{1}{2})^2 + \operatorname{cosec}^2(180+30^\circ)\cdot(\frac{1}{2})^2$ (-ve nahi ayega square hai isliye)

$= 2\times\frac{1}{4} + \operatorname{cosec}^2(30^\circ)\times\frac{1}{4}$

$= \frac{1}{2} + (2)^2\times\frac{1}{4}$

$= \frac{1}{2} + 1 = 3/2$ Ans

Ans 6 $\tan(\frac{11\pi}{3}) - 2\sin(\frac{4\pi}{6}) - \frac{3}{4}\operatorname{cosec}^2(\frac{\pi}{4}) + 4\cos^2(\frac{17\pi}{6})$

$= \tan(660^\circ) - 2\sin(120^\circ) - \frac{3}{4}\operatorname{cosec}^2(45) + 4\cos^2(510)$

$= \tan(\overset{(IV)}{7\times 90^\circ+30^\circ}) - 2\sin(\overset{II}{180-60}) - \frac{3}{4}\operatorname{cosec}^2(45) + 4\cos^2(\overset{II}{5\times 90+60^\circ})$

$= -\cot(30^\circ) - 2\sin(60^\circ) - \frac{3}{4}\operatorname{cosec}^2(45) + 4\sin^2(60^\circ)$ -ve nahi ayega square hai isliye

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

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$= -\sqrt{3} - \sqrt{3} - \frac{3}{2} + 3 = -2\sqrt{3} + \frac{3}{2}$

$= \frac{3 - 4\sqrt{3}}{2}$ Ans

Ans 7 → LHS $\frac{\cos(\pi + x)\cos x}{\sin(\pi - x)\cos(\frac{\pi}{2} + x)}$

$= \frac{\overset{\text{III}}{\cos(180^\circ + x)} \cdot \cos x}{\underset{\text{II}}{\sin(180^\circ - x)} \cdot \underset{\text{II}}{\cos(90^\circ + x)}}$

$= \frac{-\cos x \cdot \cos x}{\sin x \cdot (-\sin x)}$

$= \frac{\cancel{-}\cos^2 x}{\cancel{-}\sin^2 x} = \cot^2 x$ Ans

Qn. 8 → LHS $\frac{\cos(2\pi + \theta)\ \mathrm{cosec}(2\pi + \theta)\ \tan(\frac{\pi}{2} + \theta)}{\sec(\frac{\pi}{2} + \theta)\ \cos\theta \cdot \cot(\pi + \theta)}$

$= \frac{\overset{\text{I}}{\cos(360^\circ + \theta)}\ \overset{\text{I}}{\mathrm{cosec}(360^\circ + \theta)}\ \overset{\text{II}}{\tan(90^\circ + \theta)}}{\underset{\text{II}}{\sec(90^\circ + \theta)}\ \cos\theta \cdot \underset{\text{III}}{\cot(180^\circ + \theta)}}$

$= \frac{\cancel{\cos\theta} \cdot \cancel{\mathrm{cosec}\theta}\ (-\cancel{\cot\theta})}{(-\cancel{\mathrm{cosec}\theta}) \cdot \cancel{\cos\theta} \cdot \cancel{\cot\theta}}$

$= 1 =$ RHS Ans

Qn 9 $\frac{\overset{\text{III}}{\sin(180^\circ + \theta)} \cdot \overset{\text{II}}{\cos(90 + \theta)}\ \overset{\text{III}}{\tan(270 - \theta)} \cdot \overset{\text{IV}}{\cot(360 - \theta)}}{\underset{\text{IV}}{\sin(360^\circ - \theta)}\ \underset{\text{I}}{\cos(360 + \theta)}\ \mathrm{cosec}\theta\ \underset{\text{IV}}{\cos(360^\circ - \theta)}}$

$= \frac{(-\sin\theta) \cdot (-\sin\theta) \cdot (\cot\theta) \cdot (-\cot\theta)}{(-\sin\theta) \cdot \cos\theta \cdot \mathrm{cosec}\theta \cdot \cos\theta}$

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$$= \frac{\sin^2\theta \cdot \cot^2\theta}{\sin\theta \cdot \operatorname{cosec}\theta \cdot \cos^2\theta}$$

$$= \frac{\cancel{\sin^2\theta} \cdot \frac{\cos^2\theta}{\cancel{\sin^2\theta}}}{\cancel{\sin\theta} \times \frac{1}{\cancel{\sin\theta}} \times \cancel{\cos^2\theta}}$$

$= 1$ Ans

Misprint in Qns

Qns 10. $\cos\left(\frac{3\pi}{2}+x\right)\cos(2\pi+x)\left[\cot\left(\frac{3\pi}{2}-x\right)+\cot(2\pi+x)\right]$

$= \cos(270+x)\cos(360+x)\left[\cot(270-x)+\cot(360+x)\right]$

$= \sin x \cdot \cos x\,(\tan x + \cot x)$

$= \sin x \cdot \cos x \left(\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x}\right)$

$= \cancel{\sin x \cdot \cos x}\left(\frac{\sin^2 x + \cos^2 x}{\cancel{\sin x \cos x}}\right)$

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

$= 1$ Ans

Qn 11. we have $\operatorname{cosec}(90+\theta) + x\cos\theta\cot(90+\theta) = \sin(90+\theta)$

$= +\sec\theta + x\cos\theta(-\tan\theta) = \cos\theta$

$\Rightarrow +\sec\theta - x\cancel{\cos\theta}\cdot\frac{\sin\theta}{\cancel{\cos\theta}} = \cos\theta$

$\Rightarrow +\frac{1}{\cos\theta} - x\sin\theta = \cos\theta$

$\Rightarrow \frac{1}{\cos\theta} - \cos\theta = x\sin\theta$

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

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$$\Rightarrow \frac{\sin^2\theta}{\cos\theta} = x\sin\theta$$

$$\Rightarrow x = \frac{\sin^2\theta}{\sin\theta\cdot\cos\theta} = \frac{\sin\theta}{\cos\theta}$$

$$\Rightarrow \boxed{x = \tan\theta} \quad \text{Ans}$$

Qn 12: we have

$$x\cot(90^\circ+\theta) + \tan(90+\theta)\cdot\sin\theta + \operatorname{cosec}(90^\circ+\theta) = 0$$

$$\Rightarrow x\cdot(-\tan\theta) + (-\cot\theta)\cdot\sin\theta + \sec\theta = 0$$

$$\Rightarrow -x\tan\theta - \frac{\cos\theta}{\cancel{\sin\theta}}\cdot\cancel{\sin\theta} + \frac{1}{\cos\theta} = 0$$

$$\Rightarrow -x\frac{\sin\theta}{\cos\theta} = \cos\theta - \frac{1}{\cos\theta}$$

$$\Rightarrow -x\frac{\sin\theta}{\cos\theta} = \frac{\cos^2\theta - 1}{\cos\theta}$$

$$\Rightarrow -x\frac{\sin\theta}{\cos\theta} = -\frac{(1-\cos^2\theta)}{\cos\theta}$$

$$\Rightarrow \cancel{-}x\frac{\sin\theta}{\cos\theta} = \cancel{-}\frac{\sin^2\theta}{\cos\theta}$$

$$\Rightarrow x = \frac{\sin^2\theta}{\cancel{\cos\theta}} \times \frac{\cancel{\cos\theta}}{\sin\theta}$$

$$\Rightarrow \boxed{x = \sin\theta} \quad \text{Ans}$$

Qn(13) In cyclic quadrilateral

$$A + C = 180^\circ \quad \text{and} \quad B + D = 180^\circ$$

$$\cos(180^\circ - A) + \cos(180^\circ + B) + \cos(180^\circ + C) - \sin(90^\circ + D)$$

$$= \cos C + (-\cos B) - \cos C - \cos D$$

$$= \cancel{\cos C} - \cos B - \cancel{\cos C} - \cos(180 - B) \quad \cdots \{\because B + D = 180^\circ\}$$

$$= -\cos B - (-\cos B)$$

$$= -\cancel{\cos B} + \cancel{\cos B} = 0 \quad \text{Ans}$$