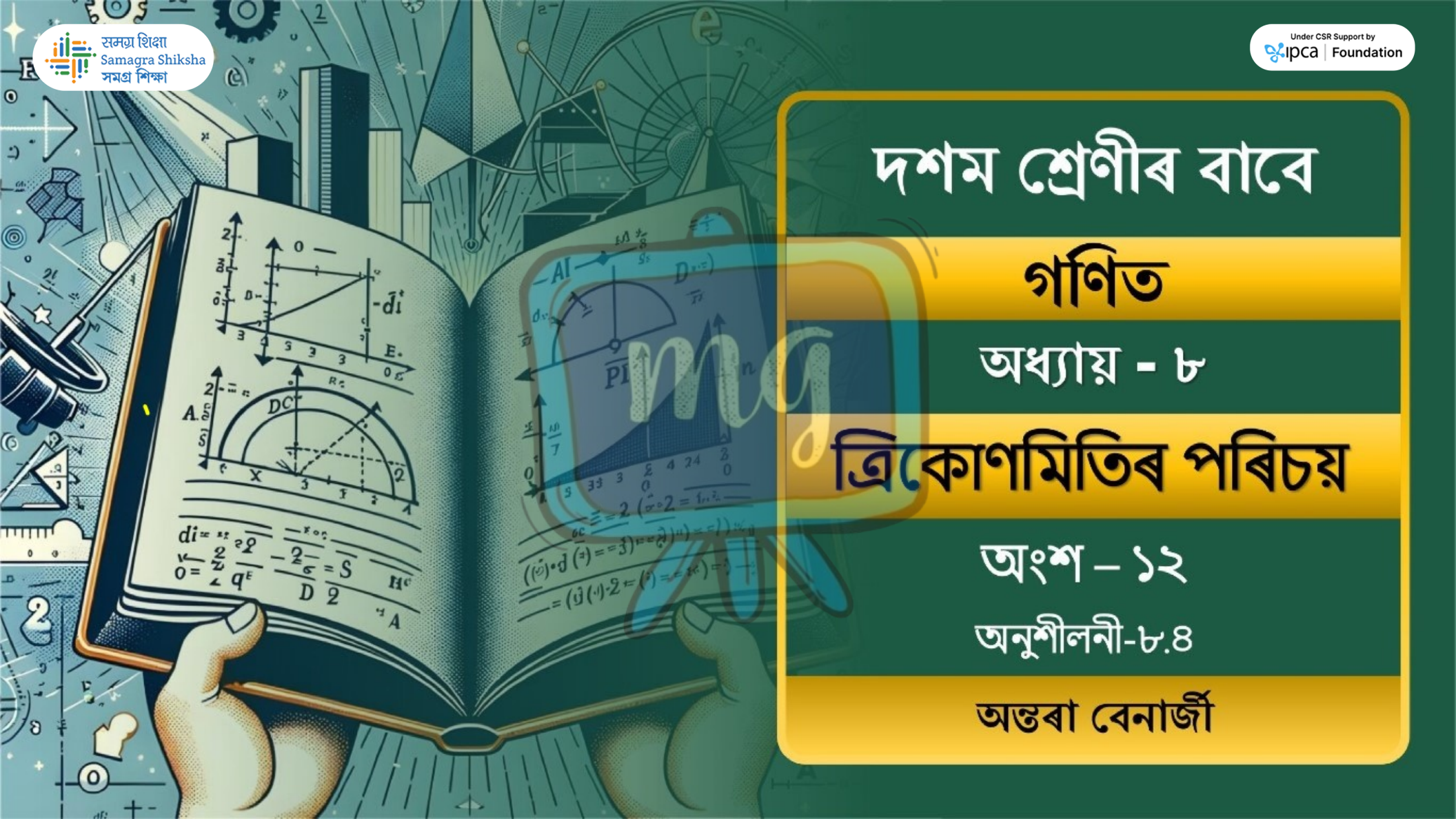

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দশম শ্ৰেণীৰ বাবে

গণিত

অধ্যায় - ৮

ত্ৰিকোণমিতিৰ পৰিচয়

অংশ – ১২

অনুশীলনী-৮.৪

অন্তৰা বেনার্জী

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(iii) $\dfrac{\tan\theta}{1-\cot\theta}+\dfrac{\cot\theta}{1-\tan\theta}=1+\sec\theta\,\operatorname{cosec}\theta$

[ইংগিত : ইয়াত থকা পদবোৰ $\sin\theta$ আৰু $\cos\theta$ প্ৰকাশ কৰা]

$$LHS=\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$$

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

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$$= \frac{\frac{\sin\theta}{\cos\theta}}{\frac{\sin\theta - \cos\theta}{\sin\theta}} + \frac{\frac{\cos\theta}{\sin\theta}}{\frac{\cos\theta - \sin\theta}{\cos\theta}}$$

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

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

$$= \frac{\sin^2\theta \cdot \sin\theta - \cos^2\theta \cdot \cos\theta}{\sin\theta \cos\theta(\sin\theta - \cos\theta)}$$

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$$= \frac{\sin^3\theta - \cos^3\theta}{\sin\theta\cos\theta(\sin\theta - \cos\theta)}$$

$a^3 - b^3 = (a-b)(a^2+b^2+ab)$

$$= \frac{(\sin\theta - \cos\theta)(\sin^2\theta + \cos^2\theta + \sin\theta\cdot\cos\theta)}{\sin\theta\cdot\cos\theta(\sin\theta - \cos\theta)}$$

$a = \sin\theta$

$b = \cos\theta$

$$= \frac{1 + \sin\theta\cdot\cos\theta}{\sin\theta\cdot\cos\theta}$$

$$= \frac{1}{\sin\theta\cdot\cos\theta} + \frac{\sin\theta\cdot\cos\theta}{\sin\theta\cdot\cos\theta}$$

$$= \operatorname{cosec}\theta\cdot\sec\theta + 1 \quad = 1 + \sec\theta\cdot\operatorname{cosec}\theta = \text{RHS}.$$

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(iv) $\dfrac{1+\sec A}{\sec A} = \dfrac{\sin^2 A}{1-\cos A}$

[ইংগিত : বাওঁপক্ষ আৰু সোঁপক্ষ বেলেগে সৰল কৰা।]

$$LHS = \frac{1+\sec A}{\sec A}$$

$$= \frac{1+\frac{1}{\cos A}}{\frac{1}{\cos A}}$$

$$= \frac{\frac{\cos A+1}{\cos A}}{\frac{1}{\cos A}} = 1+\cos A$$

$$RHS = \frac{\sin^2 A}{1-\cos A}$$

$$= \frac{1-\cos^2 A}{1-\cos A}$$

$$= \frac{(1+\cos A)(1-\cos A)}{(1-\cos A)}$$

$$= 1+\cos A$$

$\sin^2 A+\cos^2 A=1$
$\Rightarrow \sin^2 A = 1-\cos^2 A$

$LHS = RHS$.

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(v) $\frac{cosA-sinA+1}{cosA+sinA-1} = cosecA + cotA$, $cosec^2A = 1 + cot^2A$ অভেদৰ সহায়ত কৰা।

$$LHS = \frac{CosA - SinA + 1}{CosA + SinA - 1}$$

$$= \frac{\frac{CosA}{SinA} - \frac{SinA}{SinA} + \frac{1}{SinA}}{\frac{CosA}{SinA} + \frac{SinA}{SinA} - \frac{1}{SinA}}$$

$$= \frac{CotA - 1 + CosecA}{CotA + 1 - CosecA}$$

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$$= \frac{\cot A + \operatorname{cosec} A - 1}{\cot A + 1 - \operatorname{cosec} A}$$

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

$1 + \cot^2 A = \operatorname{cosec}^2 A$

$\Rightarrow 1 = \operatorname{cosec}^2 A - \cot^2 A$

$$= \frac{(\cot A + \operatorname{cosec} A) - (\operatorname{cosec} A + \cot A)(\operatorname{cosec} A - \cot A)}{\cot A + 1 - \operatorname{cosec} A}$$

$$= \frac{(\cot A + \operatorname{cosec} A)(1 - \operatorname{cosec} A + \cot A)}{(\cot A + 1 - \operatorname{cosec} A)}$$

$$= \cot A + \operatorname{cosec} A = \text{RHS}.$$

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(vi) $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$

$$\text{LHS} = \sqrt{\frac{1+\sin A}{1-\sin A}}$$

$$= \sqrt{\frac{(1+\sin A)(1+\sin A)}{(1-\sin A)(1+\sin A)}}$$

$$= \sqrt{\frac{(1+\sin A)^2}{1-\sin^2 A}} = \sqrt{\frac{(1+\sin A)^2}{\cos^2 A}}$$

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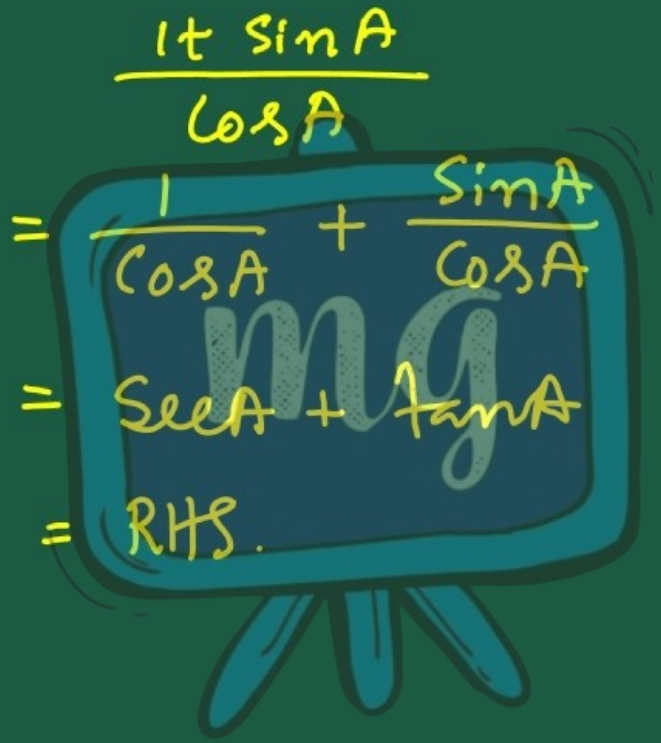

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(vii) $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$

$$LHS = \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$$

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

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

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

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

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

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

$$= \frac{\sin\theta}{\cos\theta}$$

$$= \tan\theta$$

$$= \text{RHS}.$$

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(viii) $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

$$\text{LHS.} = (\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$$

$$= \sin^2 A + \operatorname{cosec}^2 A + 2 \sin A \cdot \operatorname{cosec} A + \cos^2 A + \sec^2 A + 2 \cdot \cos A \cdot \sec A$$

$$= (\sin^2 A + \cos^2 A) + 1 + \cot^2 A + 2 \sin A \cdot \frac{1}{\sin A} + (1 + \tan^2 A) + 2 \cdot \cos A \cdot \frac{1}{\cos A}$$

$$= 1 + 1 + 1 + 2 + 2 + \cot^2 A + \tan^2 A$$

$$= 7 + \tan^2 A + \cot^2 A = \text{RHS}.$$