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कक्षा-10

गणित

अध्याय - 8

त्रिकोणमिति का परिचय

(Introduction To Trigonometry)

भाग - 8

प्रश्नावली 8.3

By : Rajendra Yadav Sir

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प्रश्नावली 8.3

(v) सर्वसमिका $\text{cosec}^2 A = 1 + \cot^2 A$ को लागू करके

$$\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \text{cosec}\, A + \cot A$$

LHS: $\dfrac{\cos A - \sin A + 1}{\cos A + \sin A - 1}$

अंश व हर में $\sin A$ से भाग करने पर:

$$\frac{\frac{\cos A}{\sin A} - \frac{\sin A}{\sin A} + \frac{1}{\sin A}}{\frac{\cos A}{\sin A} + \frac{\sin A}{\sin A} - \frac{1}{\sin A}} = \frac{\cot A - 1 + \text{cosec}\, A}{\cot A + 1 - \text{cosec}\, A}$$

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

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

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

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

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

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$$\Rightarrow \frac{(\text{cosec}A + \cot A)(1 - \text{cosec}A + \cot A)}{(\cot A - \text{cosec}A + 1)}$$

$$\Rightarrow \text{cosec}A + \cot A$$

RHS. इति सिद्धम्।

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

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

$\Rightarrow \sin^2 A + \text{cosec}^2 A + 2 \sin A \cdot \text{cosec } A + \cos^2 A + \sec^2 A + 2 \cos A \cdot \sec A$

$\Rightarrow 1 + \text{cosec}^2 A + 2 \cdot \sin A \cdot \frac{1}{\sin A} + \sec^2 A + 2 \cdot \cos A \cdot \frac{1}{\cos A}$

$\Rightarrow 1 + 2 + 2 + \text{cosec}^2 A + \sec^2 A$

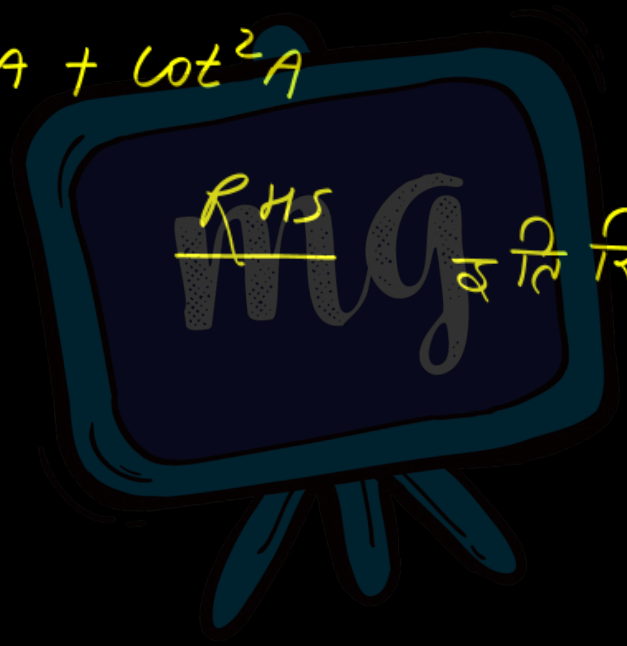
$\Rightarrow 5 + 1 + \cot^2 A + 1 + \tan^2 A$

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$\Rightarrow 5 + 1 + \cot^2 A + 1 + \tan^2 A$

$\Rightarrow 7 + \tan^2 A + \cot^2 A$



RHS इति सिद्धम्।

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(ix) $(\text{cosec } A - \sin A)(\sec A - \cos A) = \dfrac{1}{\tan A + \cot A}$

[संकेत : वाम पक्ष और दाँया पक्ष को अलग-अलग सरल कीजिए]

LHS: $(\text{cosec}A - \sin A)(\sec A - \cos A)$

$\Rightarrow \left(\dfrac{1}{\sin A} - \sin A\right)\left(\dfrac{1}{\cos A} - \cos A\right)$

$\Rightarrow \left(\dfrac{1 - \sin^2 A}{\sin A}\right)\left(\dfrac{1 - \cos^2 A}{\cos A}\right)$

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$$\Rightarrow \frac{\cos^2 A}{\sin A} \times \frac{\sin^2 A}{\cos A}$$

$$\Rightarrow \sin A \cdot \cos A$$

RHS :

$$\frac{1}{\tan A + \cot A}$$

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

$$\Rightarrow \frac{1}{\frac{\sin^2 A + \cos^2 A}{\sin A \cdot \cos A}}$$

$$\Rightarrow \frac{\sin A \cdot \cos A}{1}$$

$$\Rightarrow \sin A \cdot \cos A$$

अतः LHS = RHS

इति सिद्धम्।

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(x) $\left(\frac{1+\tan^2 A}{1+\cot^2 A}\right)=\left(\frac{1-\tan A}{1-\cot A}\right)^2=\tan^2 A$

LHS - 1 :

$$\frac{1+\tan^2 A}{1+\cot^2 A}$$

$$=\frac{\sec^2 A}{\operatorname{cosec}^2 A}$$

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

$$=\frac{\sin^2 A}{\cos^2 A}$$

$$=\tan^2 A$$

RHS

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LHS-2:

$$\left(\frac{1-\tan A}{1-\cot A}\right)^2$$

$$\Rightarrow \left(\frac{1-\frac{\sin A}{\cos A}}{1-\frac{\cos A}{\sin A}}\right)^2$$

$$\Rightarrow \left(\frac{\frac{\cos A-\sin A}{\cos A}}{\frac{\sin A-\cos A}{\sin A}}\right)^2$$

$$= \left(\frac{\cos A-\sin A}{\cos A} \times \frac{\sin A}{\sin A-\cos A}\right)^2$$

$$= \left(\frac{-(\sin A-\cos A)}{\cos A} \times \frac{\sin A}{\sin A-\cos A}\right)^2$$

$$= \left(\frac{-\sin A}{\cos A}\right)^2$$

$$= (-\tan A)^2 = \tan^2 A$$

RHS बराबर सिद्ध हुआ।

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अन्य महत्वपूर्ण प्रश्न

Q1 सिद्ध कीजिए :

(i) $(1 - \cos^2 A)\ \text{cosec}^2 A = 1$

LHS :

$(1 - \cos^2 A)\ \text{cosec}^2 A$

$\Rightarrow \sin^2 A \cdot \text{cosec}^2 A$

$\Rightarrow \cancel{\sin^2 A} \times \frac{1}{\cancel{\sin^2 A}}$

$\Rightarrow 1$

RHS

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अन्य महत्वपूर्ण प्रश्न

Q1 सिद्ध कीजिए :

(ii) $(1 + \cot^2 A) \sin^2 A = 1$

LHS :

$(1 + \cot^2 A) \cdot \sin^2 A$

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

$= \frac{1}{\sin^2 A} \cdot \sin^2 A$

$= 1$ RHS

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अन्य महत्वपूर्ण प्रश्न

Q2 सिद्ध कीजिए :

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

LHS : $\dfrac{\cos\theta}{1-\sin\theta}$

अंश व हर में $1+\sin\theta$ से गुणा करने पर :

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

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

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

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

RHS

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Q3 सिद्ध कीजिए :

$$\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \operatorname{cosec}\theta - \cot\theta$$

LHS: $\sqrt{\dfrac{1-\cos\theta}{1+\cos\theta}}$

$= \sqrt{\dfrac{1-\cos\theta}{1+\cos\theta} \times \dfrac{1-\cos\theta}{1-\cos\theta}}$

$= \sqrt{\dfrac{(1-\cos\theta)^2}{1-\cos^2\theta}}$

$= \sqrt{\dfrac{(1-\cos\theta)^2}{\sin^2 A}}$

$= \dfrac{1-\cos\theta}{\sin\theta}$

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

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

$$= \operatorname{cosec}\theta - \cot\theta$$

R.H.S.



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अन्य महत्वपूर्ण प्रश्न

Q4 सिद्ध कीजिए :

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

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Q5 सिद्ध कीजिए :

$$\frac{\sin\theta}{1-\cos\theta} = \operatorname{cosec}\theta + \cot\theta$$

LHS :

$$\frac{\sin\theta}{1-\cos\theta}$$

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

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

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

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

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

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

$$= \operatorname{cosec}\theta + \cot\theta$$

RHS

