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CBSE Class 10- Mathematics: Chapter – 8 Introduction to Trigonometry Part 2

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Question 7:

If $\sec A = x + \frac{1}{4x}$, prove that $\sec A + \tan A = 2x \text{ or } \frac{1}{2x}$.

Answer:

$$\sec \varphi = x + \frac{1}{4x}$$

$$\Rightarrow \sec^2 \varphi = \left(x + \frac{1}{4x}\right)^2 \quad (\sec^2 \varphi = 1 + \tan^2 \varphi)$$

$$\tan^2 \varphi = \left(x + \frac{1}{4}\right)^2 - 1$$

$$\tan^2 \varphi = \left(x - \frac{1}{4}\right)^2$$

$$\tan^2 \varphi = \pm x - \frac{1}{4x}$$

$$\sec \varphi + \tan \varphi = x + \frac{1}{4x} \pm x - \frac{1}{4x}$$

$$= 2x \text{ or } \frac{1}{2x}$$

Question 8:

If A, B are acute angles and $\sin A = \cos A = \cos B$, then find the value of $A + B$.

Answer:

$$A + B = 90^\circ$$

Question 9:

(a) Solve for φ , if $\tan 5\varphi = 1$

Answer:

$$\tan 5\varphi = 1$$

$$\Rightarrow \varphi = \frac{45}{5}$$

$$\Rightarrow \varphi = 9^\circ.$$

(b) Solve for φ if $\frac{\sin \varphi}{1 + \cos \varphi} + \frac{1 + \cos \varphi}{\sin \varphi} = 4$.

Answer:

$$\frac{\sin \varphi}{1 + \cos \varphi} + \frac{1 + \cos \varphi}{\sin \varphi} = 4$$

$$\frac{\sin^2 \varphi + 1(\cos \varphi)^2}{\sin \varphi (1 + \cos \varphi)} = 4$$

$$\frac{\sin^2 \varphi + 1 + \cos^2 \varphi + 2 \cos \varphi}{\sin \varphi + \sin \varphi \cos \varphi} = 4$$

$$\frac{2 + 2 \cos \varphi}{\sin \varphi (1 + \cos \varphi)} = 4$$

$$\Rightarrow \frac{2 + (1 + \cos \varphi)}{\sin \varphi (1 + \cos \varphi)} = 4$$

$$\Rightarrow \frac{2}{\sin \varphi} = 4$$

$$\Rightarrow \sin \varphi = \frac{1}{2}$$

$$\Rightarrow \sin \varphi = \sin 30$$

$$\varphi = 30^\circ$$

Question 10:

If $\frac{\cos \alpha}{\cos \beta} = m$ and $\frac{\cos \alpha}{\sin \beta} = n$, show that $(m^2 + n^2) \cos^2 \beta = n^2$

Answer:

$$\frac{\cos \alpha}{\cos \beta} = m \quad \frac{\cos \alpha}{\sin \beta} = n$$

$$\Rightarrow m^2 = \frac{\cos^2 \alpha}{\cos^2 \beta} \quad n^2 = \frac{\cos^2 \alpha}{\sin^2 \beta}$$

$$\text{LHS} = (m^2 + n^2) \cos^2 \beta$$

$$\left[\frac{\cos^2 \alpha}{\cos^2 \beta} + \frac{\cos^2 \alpha}{\sin^2 \beta} \right] \cos^2 \beta$$

$$= \cos^2 \alpha \left(\frac{1}{\cos^2 \beta \sin^2 \beta} \right) \cos^2 \beta$$

$$= \frac{\cos^2 \alpha}{\cos^2 \beta} = n^2$$

$$\Rightarrow (m^2 + n^2) \cos^2 \beta = n^2$$

Question 11:

If $7 \cot \varphi - 3 \operatorname{cosec} \varphi = 7$, prove that $7 \cot \varphi - 3 \operatorname{cosec} \varphi = 3$

Answer:

$$7 \cot \varphi - 3 \operatorname{cosec} \varphi = 7$$

$$P. T \quad \cot \varphi - 3 \operatorname{cosec} \varphi = 3$$

$$7 \operatorname{cosec} \varphi - 3 \cot \varphi = 7$$

$$\Rightarrow 7 \operatorname{cosec} \varphi - 7 = 3 \cot \varphi$$

$$\Rightarrow 7 (\operatorname{cosec} \varphi - 1) = 3 \cot \varphi$$

$$\Rightarrow 7 (\operatorname{cosec} \varphi - 1) (\operatorname{cosec} \varphi + 1) = 3 \cot \varphi (\operatorname{cosec} \varphi + 1)$$

$$\Rightarrow 7 (\operatorname{cosec}^2 \varphi - 1) = 3 \cot \varphi (\operatorname{cosec} \varphi + 1)$$

$$\Rightarrow 7 = 3 \cot \varphi (\operatorname{cosec} \varphi + 1)$$

$$7 \cot \varphi - 3 \operatorname{cosec} \varphi = 3$$