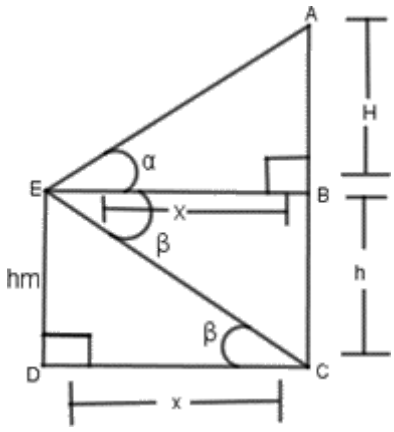
FlexiPrep

CBSE Class 10-Mathematics: Chapter – 9 Some Applications of Trigonometry Part 8 (For CBSE, ICSE, IAS, NET, NRA 2022)

Question 10:

From a window (h m high above the ground) of a house in a street, the angles of elevation and depression of the top and foot of another house on the opposite side of the street are α and β respectively, show that the height of the opposite house is $h\,(1 + \tan \alpha, \cot \beta)\, m$



Answer:

Let DE = hm

$$DC = x\ m$$

In right Δ EDC

$$\frac{h}{x} = \tan \beta$$

$$\Rightarrow \frac{h}{\tan \beta} = x \ \ldots \ (i)$$

In right Δ ABE,

$$\frac{H}{x} = \tan \alpha$$

$$\Rightarrow \frac{\frac{H}{h}}{\tan \beta} = \tan \alpha \, [\text{from} \, (i)]$$

$$\Rightarrow H \tan \beta = h \tan \alpha$$

$$\Rightarrow H = h \tan \alpha . \cot \beta$$

$$\text{AC} = H + h$$

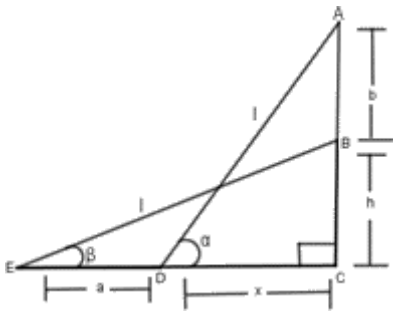
$$= h \tan \alpha . \cot \beta + h$$

$$= h \, (\tan \alpha . \cot \beta + 1)$$

Hence Proved.

Question 11:

A ladder rests against a wall at an angle α to the horizontal. Its foot is pulled away from the wall through a distance 'a' so that it slides a distance 'b' down the wall making an angle $'\beta'$ with the horizontal. Show that $\frac{a}{b} = \frac{\cos \alpha - \cos \beta}{\sin \beta - \sin \alpha}$



Answer:

In right Δ ACD ,

$$\frac{b + h}{l} = \sin \alpha \text{ and } \frac{x}{l} = \cos \alpha$$

Similarly, in right Δ BCE,

$$\sin\beta = \frac{h}{l},\ \cos\beta = \frac{a+x}{l}$$

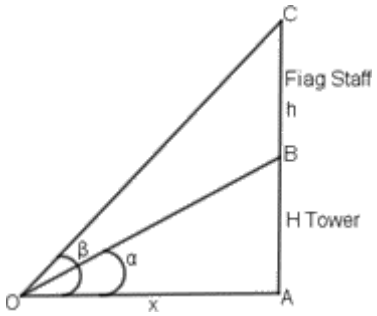
$$R.H.S = \frac{\cos\alpha - \cos\beta}{\sin\beta - \sin\alpha}$$

$$= \frac{\frac{x}{l} - \frac{a+x}{l}}{\frac{h}{l} - \frac{b+h}{l}} = \frac{\frac{x-a-x}{l}}{\frac{h-b-h}{l}} = \frac{a}{b}$$

Hence Proved.

Question 12:

A vertical tower stands on a horizontal plane and surmounted by vertical flagstaff of height h. At a point on the plane, the angles of elevation of the bottom and the top of the flagstaff are α and β respectively, Prove that the height of the tower is $\frac{h\tan\alpha}{\tan\beta - \tan\alpha}$



Answer:

Let AB = Height of tower = H

Let BC = Height of flagstaff = h

In right-angled triangle OAB and OAC,

$$\frac{x}{H} = \cot\alpha$$

$$\Rightarrow x = H\cot\alpha$$

And $\frac{x}{H+h} = \cot\beta \Rightarrow x = (H+h)\cot\beta$

Equating value of x , we get

$$H \cot \alpha = (H + h) \cot \beta$$

$$\Rightarrow H (\cot \alpha - \cot \beta) = h \cot \beta$$

$$\Rightarrow H = \frac{h \cot \beta}{\cot \alpha - \cot \beta}$$

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