Matrix Theory EE5609 - Assignment 3
Find if a triangle is isosceles triangle.

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Abstract—**This document provides a solution for finding if a traingle is isosceles given two equal altitudes of the triangle**

I. PROBLEM STATEMENT

BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

II. THEORY

By RHS theorem, in two right-angled triangles, if the length of the hypotenuse and one side of one triangle, is equal to the length of the hypotenuse and corresponding side of the other triangle, then the two triangles are congruent.
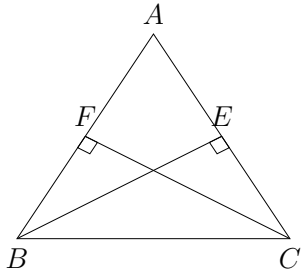

Fig. 1: Triangle with equal altitudes on two sides

III. SOLUTION

Consider the two triangles $\triangle AFC$ and $\triangle ABE$. We can observe that vertex A is common to both the traingles and the angle between the sides $\angle BAE$

and $\angle FAC$ are same. Let the two equal altitudes of the triangle be l

$$\angle BAE = \angle FAC \tag{1}$$

$$\sin \theta = \sin \theta \tag{2}$$

$$\frac{BE}{BA} = \frac{CF}{CA} \tag{3}$$

We know that the altitudes BE and CF are equal Hence we obtain

$$\frac{l}{BA} = \frac{l}{CA} \tag{4}$$

$$\therefore BA = CA \tag{5}$$

Hence the $\triangle ABC$ is an isosceles triangle with sides BA and CA of equal length.