Assignment 4

Sairam V C Rebbapragada

***Abstract*—This document uses the concepts of Intercept theorem, Isosceles triangle in proving a statement.**

Download latex-tikz codes from

https://github.com/Sairam13001/AI5006/blob/master/Assignment_4/assignment_4.tex

1 Problem

D is a point on side BC of a $\triangle ABC$ such that $\frac{BD}{CD} = \frac{AB}{AC}$. Prove that AD is the bisector of ∠BAC

2 Explanation

SSS PROPERTY : Two triangles are similar if their corresponding sides are in proportion. For example two triangles $\triangle ABC$ and $\triangle XYZ$ can be said to be similar if :

$$\frac{\|\mathbf{A}-\mathbf{B}\|}{\|\mathbf{X}-\mathbf{Y}\|} = \frac{\left\|\mathbf{B}-\mathbf{C}\right\|}{\|\mathbf{Y}-\mathbf{Z}\|} = \frac{\left\|\mathbf{A}-\mathbf{C}\right\|}{\|\mathbf{X}-\mathbf{Z}\|} \tag{2.0.1}$$

If two triangles are similar, then corresponding angles are equal.

3 Solution

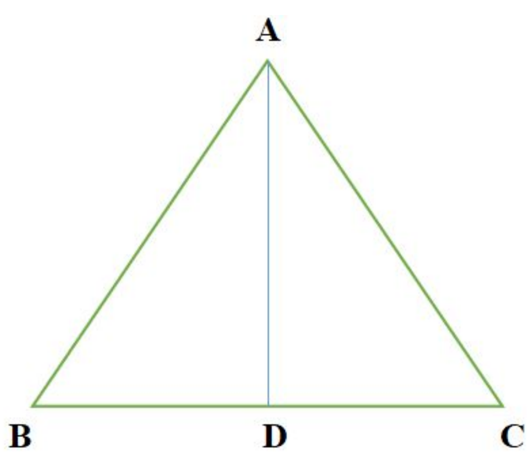

Fig. 0: Construction

Given that :

$$\frac{\|\mathbf{B}-\mathbf{D}\|}{\left\|\mathbf{C}-\mathbf{D}\right\|} = \frac{\|\mathbf{A}-\mathbf{B}\|}{\left\|\mathbf{A}-\mathbf{C}\right\|} \tag{3.0.1}$$

In triangles $\triangle ABD$ and $\triangle ACD$,

$$\frac{\|\mathbf{A}-\mathbf{B}\|}{\left\|\mathbf{A}-\mathbf{C}\right\|} = \frac{\|\mathbf{B}-\mathbf{D}\|}{\left\|\mathbf{C}-\mathbf{D}\right\|} = \frac{\|\mathbf{A}-\mathbf{D}\|}{\|\mathbf{A}-\mathbf{D}\|} \tag{3.0.2}$$

From SSS property we can see that these two triangles are similar. So, the corresponding angles are equal. Thus, we can say that :

$$\angle DAB = \angle DAC \tag{3.0.3}$$

Hence it is proved that AD is the bisector of ∠BAC