International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435(Online) Volume 14, Issue 11, November 2025)

Trisection of an angle and its proof

Dr. Omvir Singh Chaudhary
Mathura, Uttar Pradesh

Abstract: **This method divides an arbitrary angle into three equal angles using a compass and an unmarked straightedge. In this,any angle smaller than 180 degrees can be divided into many parts or ratios. This division is proved on the basis of the principle of correlation of arcs of equal radius. In this, any arc (or angle) and straight line can be divided into desired parts by creating semicircles on the arc and straight line.**

Keywords: **Arc at the centre point, arcs of same radius, cut point on arc, semicircles on an arc and straight line, proportional division, principle of arcs.**

Research Area: Geometry

Research Paper

I. Construction

The following steps describe how to divide an angle or arc AC with sides AB and BC into three equal angles (Fig. 1):

1. We mark a point A and draw on it an arc B_1B_2 equal to the side AB.
2. Then at point B_2, draw another arc AD equal to the side AB.
3. After this, three consecutive cuts of distance slightly more than 1/6th of the distance AC of the given angle are made on the arc AD, starting from point A, namely A_1, A_2, and A_3 respectively.
4. Then three semicircles are drawn on the inside of AA_2, at point A_1, AA_3, at point A_2, and AA_5 at point A_3. The distance A–A_5 must be greater than the AC of the given angle.
5. A cut point C is made on semicircle AA_5, equal to the distance AC from point A.
6. From point C, a cut point B is made on arc B_1B_2.
7. At point B, draw an arc AC of length equal to side AB.
8. Now, by joining point B to the points A, C_1, C_2, and C by straight lines, thus three equal angles ABC, C_1BC_2 and C_2BC are formed.

II. To Prove The Trisection Method Of An Angle

This trisection method has been proved by the principle of correlation in the arcs of equal radius.

In this, the arcs of all the semicircles starting from a point divide the arcs of equal radius, starting from the same point, in the same proportion. As shown in Figure 2, an arc B_1B_2 is drawn from point A_1, then another arc AD of the same radius is drawn from point B. From point A, some cuts A_1, A_2, A_3, A_4…etc. of equal distance are made on the arc AD. Taking all these points on the centre, starting from point A, semicircles are drawn on all these points. Then similarly, starting from point B on arc B_1B_2, some cuts B_3, B_4, B_5, etc., are made at equal distance and then considering all these cuts as the centre points, many arcs are drawn starting from point A.

Here, the existence of semicircles on an arc has been described but now the existence of semicircles on a straight line is being described.

In this, starting from point A on a straight line, cuts of equal distance A_1, A_2, A_3, A_4, etc. are made as shown in Figure 3.

Then, starting from point A, draw semicircles on one side at all those cut points. These points on the arc of each semicircle are placed at angles 60°, 90°, and 120°. Then the points of those equal angles meet at point A to form three straight lines.

III. Result

We observe that in the case of semicircles formed on an arc of the same ratio, arcs of equal radius are divided in the same ratio, but arcs of semicircles are not divided in the same ratio. But in the case of arcs of semicircles formed on a straight line, the straight lines are divided in the same ratio and the arcs are also divided in the same ratio.

IV. Conclusion

By this method, an arbitrary angle or arc can be divided into several parts or proportional parts. But the angle must be lesser than 180 degrees.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435(Online) Volume 14, Issue 11, November 2025)

If the angle is larger, then it is halved or quartered, then after dividing by this method, it is doubled or quadrupled respectively.

This method can be used on any curved or straight line. In this method 'the principle of correlation in arcs of equal radius is applied.

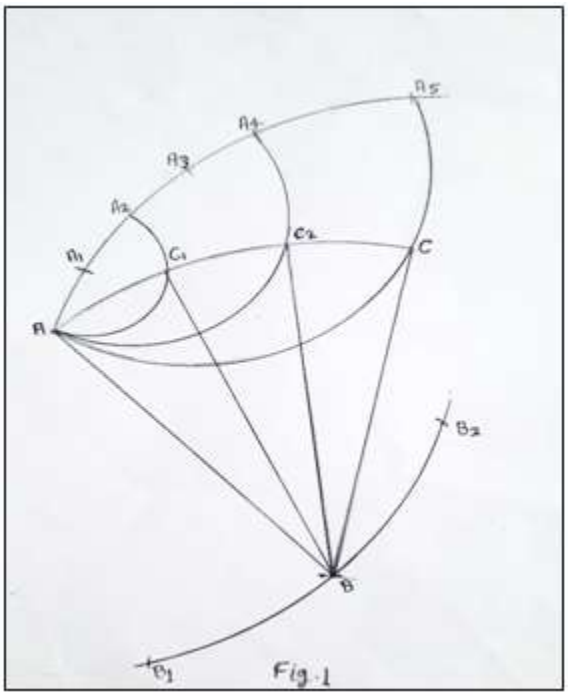

Fig-1

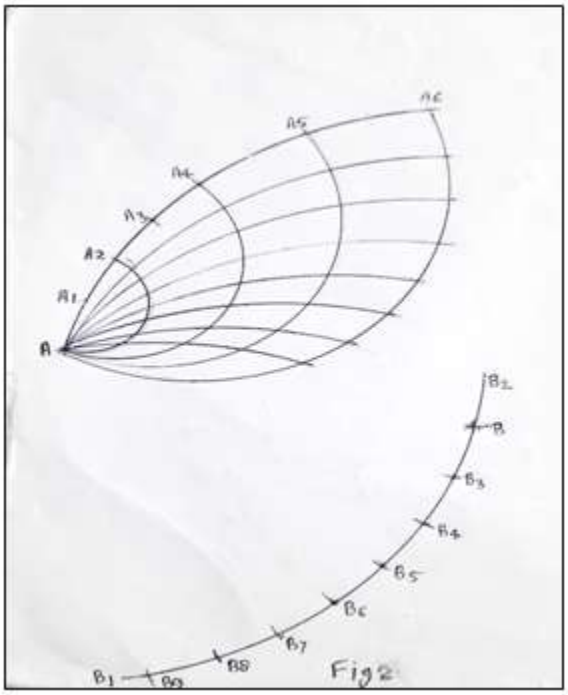

Fig 2

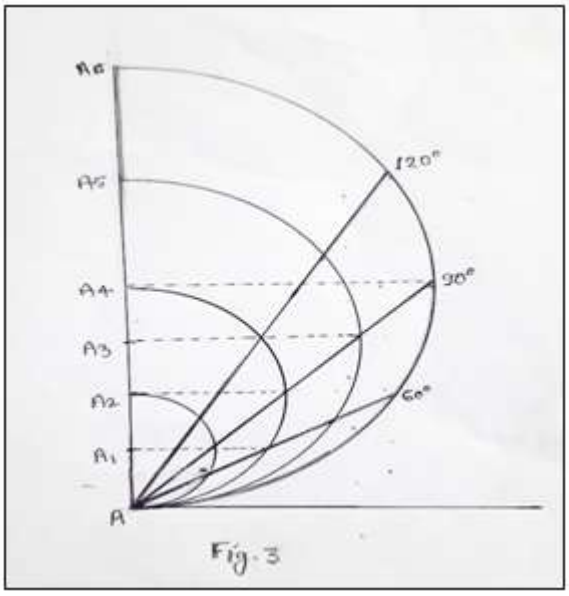

Fig-3

V. MESSAGE TO THE EDITOR

This research work is being sent to you for publication. I request you to publish this manuscript soon.

If there are any shortcomings in it, I will correct them promptly and send it back. I certify that this is my original and unpublished work.