# Construction of a Line Perpendicular to l Through Point A

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**Theorem 11.4.** Given a line l and a point A lying on l, construct a line perpendicular to l through A.

*Proof.* Given line l and a point A, construct a circle centered at A(shot 1). Circle A will intersect line l at two points. Label these two intersections B and C. Construct a circle centered at B with a radius of BC (Shot 2). Construct another circle centered at C with radius CB (Shot 3). Label the point where circles B and C intersect D. Construct line DA (Shot 4). DA is the perpendicular bisector of the line l through point A.

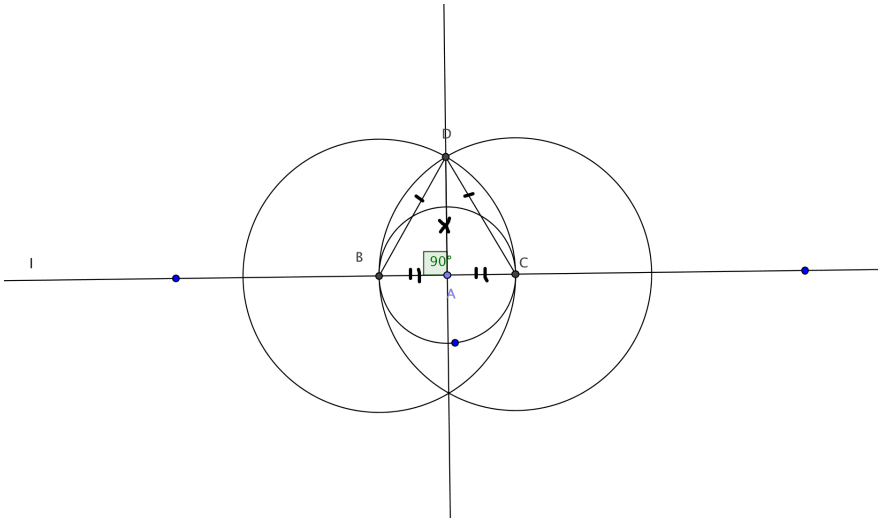


Figure 1: An image of the construction.

I will now prove that line AD is a perpendicular bisector of line l. Construct triangles ABD and ACD. Since AB and AC are both radii of circle A, we know that the two segments are congruent. Both triangles share the side AD. Since the radii of circles B and C are congruent, then sides BD and CD are congruent as well. Therefore, we have two congruent triangles by the SSS method. We know that line l will make up two right angles, so angles DAB and DAC must each be a right angle since they are congruent. Therefore, line AD is a perpendicular bisector of line l through point A. □