

Foundations of Geometry Fall 2011: Homework 1

Exercise 1. (a) Explain how to bisect a segment AB (*i.e.* to find the mid-point of AB).
(b) Explain how to construct the perpendicular bisector of the segment AB .

Exercise 2. Show that two vertical angles are equal.

Exercise 3. Explain how to construct the bisector of an angle.

Exercise 4. Let L be a line and A be a point not in L .

- (a) Construct the perpendicular line to L which passes through A .
- (b) Construct the parallel to L which passes through A .

Exercise 5. Prove that if a triangle has two angles congruent then it must be isosceles.

Exercise 6. (a) Prove that the bisector of an angle $\angle BAC$ is made up of points which are equidistant from the sides of the angle (this means that D belongs to the bisector if and only if the distance from D to (AB) is equal to the distance from D to (AC)).

(b) Prove that the bisectors of the three angles of a triangle $\triangle ABC$ meet at one point I (This point is called the incenter of the triangle).

Exercise 7. Let $\triangle ABC$ be a right angled triangle at A . Use elementary area rules to prove Pythagoras Theorem: $AB^2 + AC^2 = BC^2$.