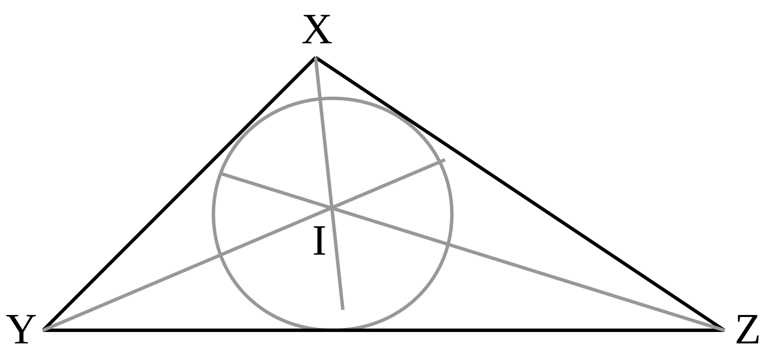
Mathematics 2260H – Geometry I: Euclidean geometry
TRENT UNIVERSITY, Fall 2018

Assignment #7
Angle Bisectors
Due on Friday, 2 November.

Suppose we bisect the internal angles of $\triangle XYZ$. If we extend the lines bisecting the angles inside the triangle, they will eventually meet at a single point.

1. Show that three internal angle bisectors of a triangle are concurrent. *[5]*



The point where the three internal angle bisectors of a triangle are concurrent is called the *incentre* of the triangle.

2. Show that the incentre of a triangle is the centre of a circle that touches each of the sides of the triangle at a single point. (This circle is the *incircle* of the triangle.) *[5]*

NOTE: This gives us three centres for a triangle so far. It is traditional to denote the centroid by G, the circumcentre by C, and the incentre by I. It is worth noticing that while the centroid and the incentre must be inside the triangle, the circumcentre could be outside the triangle.

Still to come in this course are the *orthocentre*, where the three altitudes of the triangle meet, usually denoted by H, and the centre of the nine-point circle (wait for the definition :-) of the triangle, usually denoted by N. The orthocentre and the centre of the nine-point circle may also be outside the triangle.