Module MA232A, Michaelmas Term 2017
Initial Tentative Draft of Questions for Examination

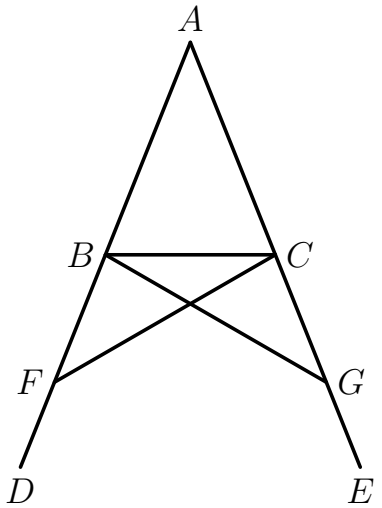
Q. (Euclid's *Elements*, Book I, Proposition 1.)
Let A and B be distinct points in the Euclidean plane. Give the specification of a Euclidean ruler and compass construction for determining a point C such that the three points A, B and C are the vertices of an equilateral triangle in the Euclidean plane, and prove the correctness of this construction through explicit application of Euclid's *Postulates* and *Common Notions*.

You may however assume, without proof, that if two circles are given in the Euclidean plane, and if one circle passes through both through points inside and also through points outside the other circle, then the two circles intersect.

Q. (Euclid's *Elements*, Book I, Proposition 2.)
Let A, B and C be distinct points in the Euclidean plane. Give the specification of a Euclidean ruler and compass construction for determining a point L such that the line segments AL and BC are equal (in length), and prove the correctness of this construction through explicit application of Euclid's *Postulates* and *Common Notions*.

You may however assume, without proof, that there exists a point D of the Euclidean plane for which ABD is an equilateral triangle.

Q. (Euclid's *Elements*, Book I, Proposition 5.)
Let ABC be an isosceles triangle in the Euclidean plane with equal sides AB and AC, and let these equal sides be produced beyond B and C to points F and G respectively, where AF and AG are equal (in length), the point B lies between A and F and the point C lies between A and G. Using repeated applications of the *SAS Congruence Rule*, together with any relevant *Postulates* or *Common Notions*, prove that the angles FBC and GCB under the base BC of the isosceles triangle are equal. Hence or otherwise, prove that the angles ABC and ACB at the base of the isosceles triangle ABC are equal.



Q. (Euclid's *Elements*, Book I, Proposition 7.)
Let ABC be a triangle in the Euclidean plane, and let D be a point of the Euclidean plane lying outside the triangle ABC where D lies

> on the same side of the line AB as the point C,
> on the same side of the line AC as the point B,
> and on the opposite side of the line BC to the point A.

Suppose that the sides AC and AD of the triangles ABC and ABD are equal. Prove that the sides BC and BD of these triangles are unequal.