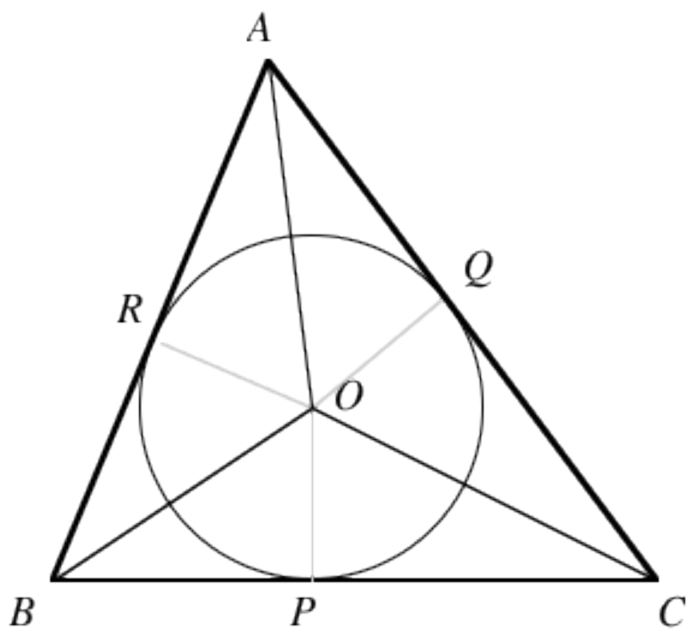
Mathematics 2260H – Geometry I: Euclidean geometry
Trent University, Winter 2012

Assignment #~~8~~ 7
Centres
Due on Thursday, 8 March, 2012.

1. Given $\triangle ABC$, show that there is an unique circle passing through all three vertices A, B, and C of the triangle. *[4]*

Note: This circle is called the *circumcircle* of $\triangle ABC$, and its centre is the triangle's *circumcentre*.

2. Suppose that a circle with centre O is tangent to the three sides of $\triangle ABC$ at points R on AB, P on BC, and Q on AC, respectively.



Show that $\angle OAB = \frac{1}{2}\angle CAB$, $\angle OBC = \frac{1}{2}\angle ABC$, and $\angle OCA = \frac{1}{2}\angle BCA$. *[6]*

Note: This circle is called the *incircle* of $\triangle ABC$, and its centre is the triangle's *incentre*. We will show later that every triangle has an (unique!) incircle, though you might well be able to work out why by yourself after working on this problem.