Mathematics 2260H – Geometry I: Euclidean geometry
TRENT UNIVERSITY, Winter 2013

Quizzes

Quiz 1. Friday, 18 January, 2013. *(10 minutes)*

1. Suppose we are given a sphere of radius R and three great circles are drawn on this sphere. What are the possibilities for how many regions these three great circles could subdivide the (surface of the) sphere into? Explain why. *[5]*

NOTE: "Regions" are contiguous areas whose borders are pieces of those great circles and which do not have another great circle passing through them. Informally, what the question is really asking is: if we cut an orange through its centre (all the way through the orange) three times, how many pieces of rind might we have at the end?

Quiz 2. Friday, 25 January, 2013. *(10 minutes)*

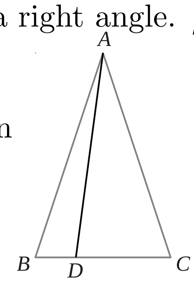
1. Given a line segment AB, use Postulates I–IV, A, and/or S to show that there is a circle with centre A whose radius is twice the length of AB. *[5]*

Quiz 3. Friday, 1 February, 2013. *(10 minutes)*

1. Assume $\triangle ABC$ is equilateral and that D is the mid-point of BC. Show that $\angle BAD = \angle CAD$ (so AD is the angle-bisector of $\angle BAC$) and that $\angle ADB$ is a right angle. *[5]*

Quiz 4. Friday, 8 February, 2013. *(10 minutes)*

1. Suppose $\triangle ABC$ is isosceles with $|AB| = |AC|$ and D is any point on BC strictly between B and C. Show that $|AD| < |AB|$. *[5]*



Quiz 5. Friday, 15 February, 2013. *(10 minutes)*

1. Without using Postulate V (or any equivalent), show that there exists a parallellogram, *i.e.* a quadrilateral $\square ABCD$ such that $AB \parallel CD$ and $AD \parallel BC$. *[5]*

Quiz 6. Friday, 1 March, 2013. *(10 minutes)*

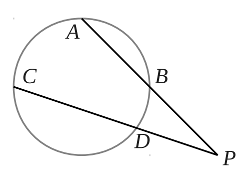
1. Suppose three squares, $\square ABCD$, $\square EFGH$, and $\square IJKL$, are given. Show that there is a square $\square MNOP$ whose area is equal to the sum of the areas of the three given squares. *[5]*

Quiz 7. Friday, 8 March, 2013. *(10 minutes)*

1. Suppose two circles intersect at (and only at!) two different points. Show that they do not have the same centre. *[5]*

Quiz 8. Friday, 15 March, 2013. *(10 minutes)*

1. Suppose that the extensions of chords AB and CD of a circle intersect in a point P outside the circle. Show that $|PA| \cdot |PB| = |PC| \cdot |PD|$. *[5]*



Quiz 9. Friday, 22 March, 2013. *(12 minutes)*

1. Suppose that in $\triangle ABC$, P is the midpoint of BC and Q and R are points on AC and AB, respectively, so that BQ and CR are the angle-bisectors of $\angle ABC$ and $\angle ACB$, respectively. Show that if AP, BQ, and CR are concurrent in a point X, then $\triangle ABC$ is isosceles. *[5]*

Quiz 10. Thursday, 28 March, 2013. *(10 minutes)*

1. Suppose that the Euler line of $\triangle ABC$ includes the vertex A. Show that the triangle is isosceles. *[5]*

Quiz 11. Friday, 5 April, 2013. *(10 minutes)*

1. Suppose the nine-point circle of $\triangle ABC$ is tangent to the side BC of the triangle. Show that $\triangle ABC$ is isosceles. *[5]*