Mathematics 2260H – Geometry I: Euclidean geometry

Trent University, Winter 2014

Quizzes

Quiz #0. Friday, 10 January, 2014 *[15 minutes]*

A baby plane geometry, which we'll call *Quattro*, is defined as follows:

- *Quattro* has exactly four points.
- Any two points of *Quattro* are connected by exactly one line of *Quattro*.
- Every line of *Quattro* has only two points of *Quattro* on it.

1. Draw a picture of *Quattro*. *[2]*
2. How many lines does *Quattro* have? *[1.5]*
3. How many triangles are there in *Quattro*? *[1.5]*

Bonus: What geometry do you think *Quattro* would want to be when all grown up? *[0.5]*

Quiz #1. Friday, 17 January, 2014 *[10 minutes]*

1. Three lines in the hyperbolic plane divide up the hyperbolic plane into a number of regions. What are the possible values of this number? Illustrate each possibility. *[5]*

Quiz #2. Friday, 24 January, 2014 *[10 minutes]*

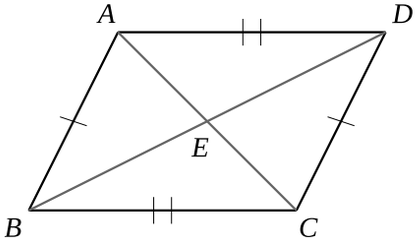
1. Show that, given a line AB, there is a line CD such that $|CD| = 3|AB|$ Justify each step in your construction using Euclid's five Postulates (plus, if necessary, Postulates A and S). *[5]*

Quiz #3. Friday, 31 January, 2014 *[10 minutes]*

1. Show that the Angle-Side-Side (ASS) congruence criterion does not work in general. That is, find triangles $\triangle ABC$ and $\triangle DEF$ such that $\angle ABC = \angle DEF$, $|AB| = |DE|$, and $|AC| = |DF|$, but $\triangle ABC \ncong \triangle DEF$. *[5]*

Quiz #4. Friday, 7 February, 2014 *[15 minutes]*

Suppose ABCD is a quadrilateral such that $|AB| = |CD|$ and $|AD| = |CB|$, and let E be the point of intersection of the diagonals AC and BD, as in the diagram below.

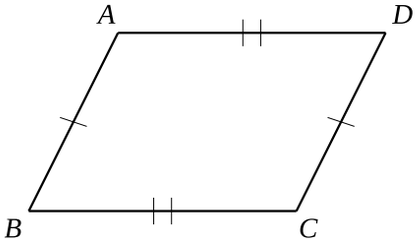


1. Show that $\triangle ABC \cong \triangle CDA$ and $\triangle ABD \cong \triangle CDB$. *[2]*
2. Show that E is the midpoint of the diagonals AC and of BD. *[3]*

Note/Hint: You may us the Angle-Side-Angle congruence criterion for triangles in your solution to question 2.

Quiz #5. Friday, 14 February, 2014 *[10 minutes]*

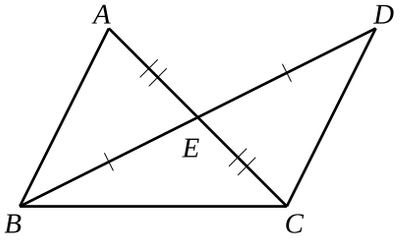
Suppose ABCD is a quadrilateral such that $|AB| = |CD|$ and $|AD| = |BC|$, as in the diagram below.



1. Show that $AB \parallel CD$ and $AD \parallel BC$. *[5]*

Quiz #6. Friday, 28 February, 2014 *[10 minutes]*

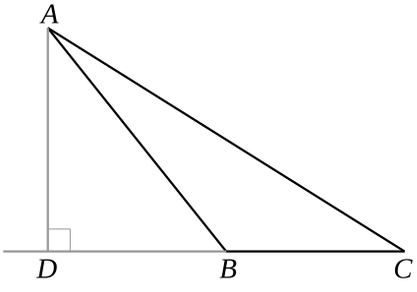
Suppose A and D are points on the same side of BC and such that the point of intersection, E, of AC and BD is the midpoint of both AC and BD, as in the diagram below.



1. Show that $\triangle ABC$ and $\triangle DBC$ have equal areas. *[5]*

Quiz #7. Friday, 7 March, 2014 *[10 minutes]*

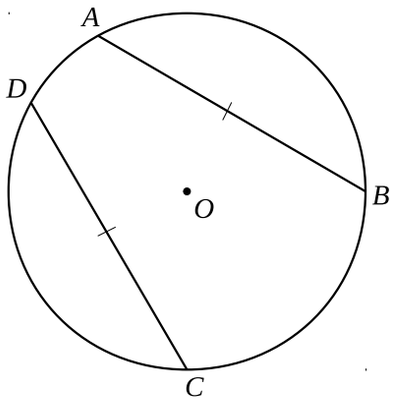
Suppose $\triangle ABC$ has an obtuse angle at B and the altitude from A meets (the extension of) BC at D, as in the diagram below.



1. Show that if $|AC|^2 = |AB|^2 + 3|BC|^2$, then $|DB| = |BC|$. *[5]*

Quiz #8. Friday, 14 March, 2014 *[10 minutes]*

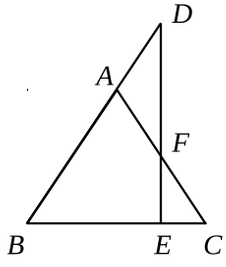
1. Suppose AB and CD are two chords of a circle with centre O such that $|AB| = |CD|$, as in the diagram below.



Show that AB and CD are the same distance from O. *[5]*

Quiz #9. Friday, 21 March, 2014 *[10 minutes]*

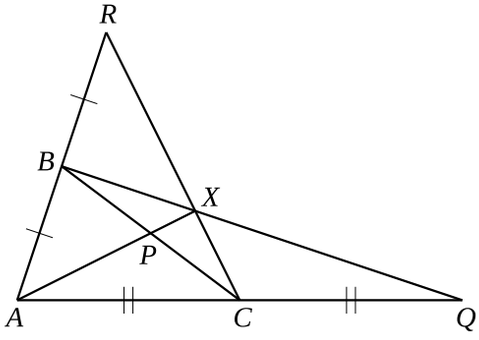
1. Suppose $\triangle ABC$ is equilateral, with sides 4 *shazbats* long. Let E be the point between B and C which is 3 *shazbats* from B, F be the midpoint of AC, and D be the point where EF meets AB.



Determine $|AD|$. *[5]*

Quiz #10. Friday, 28 March, 2014 *[10 minutes]*

1. Suppose AR is a line segment with midpoint B, and AQ is another line segment with midpoint C, meeting the first line segment at A. Let X be the point of intersection of QB and RC, and let P be the point of intersection of AX and BC.



Show that P is the midpoint of BC. *[5]*

Quiz #11. Friday, 4 April, 2014 *[10 minutes]*

1. Suppose that the Euler line of $\triangle ABC$ is also the angle bisector of $\angle BAC$. Show that $\triangle ABC$ is isosceles. *[5]*