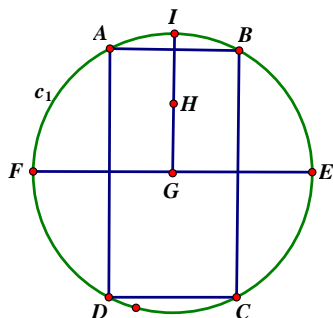# MTH 330, Final Exam, Fall 2014

Ayman Badawi
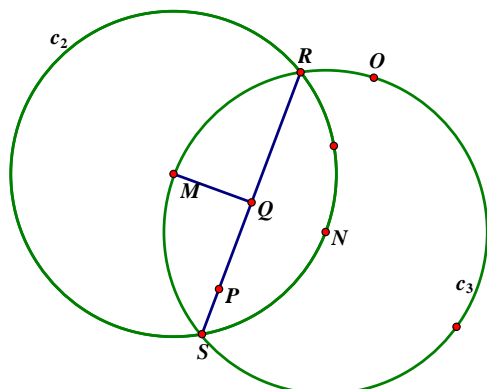
QUESTION 1. Try to be clear and neat!

Given C1 is a circle centered at G. H is the midpoint of IG. IG is perpendicular to FE. **State clearly the crucial steps** in order to construct the rectangle ABCD such that |BC| = 1.5 |CD| + |HG|. Assume only unmarked ruler and a compass are allowed in the construction.
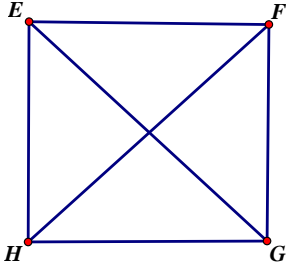

Given a line segment JK. Clearly state the crucial steps in order to locate a point L on JK such that |JK| = 5/4|JL|, i.e., |JK| = 1.25|JL|.

C2 is centered at M and with radius 3. C3 centered at N. MQ is perpendicular to RS. USE the given diagram in order to locate the inversion of O with respect to C2 and the inversion of P with repect to C2. Find the length of |MQ|.

QUESTION 2. Try to be clear and neat!

How many elements does the symmetry group of the square EFGH have?

Relabel the vertices of the given square if we apply (R_2 O $Ref\_\{FH\}$).

Relabel the vertices of the given square if we apply ($Ref\_\{EG\}$ O $Ref\_\{FH\}$)

State 3 properties of the group symmetry of a regular n-gon.

Given the line segments AB and CD. Clearly state the crucial steps in order to construct a line segment of length $\sqrt{|AB||CD|}$

QUESTION 3. a) State clearly why we cannot construct a 92 degree angle using unmarked ruler and a compass.

b) State clearly why it is possible to construct a 12 degree angle and a 96 angle angle using unmarked ruler and a compass.

c) To tile a floor, we want to use pieces pieces of a regular 12-gon with one more regular n-gon, where $n < 12$. Find all possibilities of n. EXPLAIN

d) To tile a floor, we want to use pieces pieces of a regular 8-gon with one more regular n-gon, where $n < 8$. Find all possibilities of n. EXPLAIN

e) You are given a line segment of length 1cm and two line segments, say AB and AC, such that $|AC| < |AB|$ and $|AB| > 1$. State the crucial steps in order to construct a line segment of length $\frac{|AC|}{|AB|}$.

QUESTION 4. Try to be clear and neat!
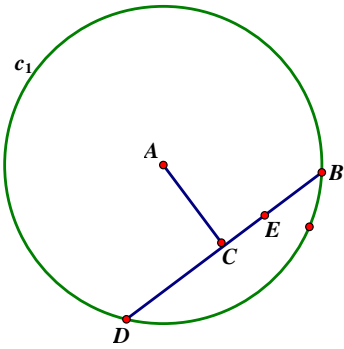
C1 is centered at A and with radius 3. AC is perpendicular to BD and |AC| = 2. Let C2 be the circle centered at O and passes through A, B, and D. Assume C2 has radius r. Locate O on the given diagram. How far is O from A? What is the value or r? How far is O from C? Let K be the inversion of O with respect to C1. Find the length of AK.
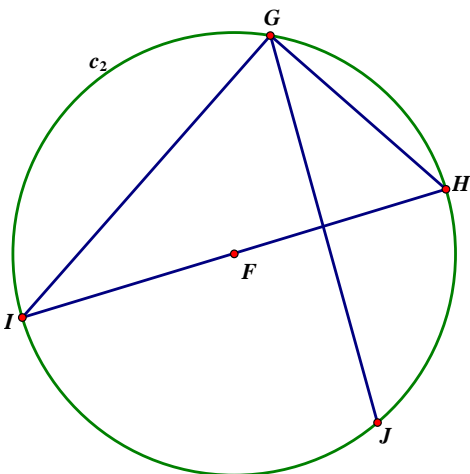
Given c2 is centered at F. The degree measurement of the arc GH (clock wise) = 72. Find the measurement of the angles GIH and GHI. If GJ is perpendicular to HI. Find the degree measurent of the arc HJ (clockwise).

QUESTION 5. Try to be clear and neat!
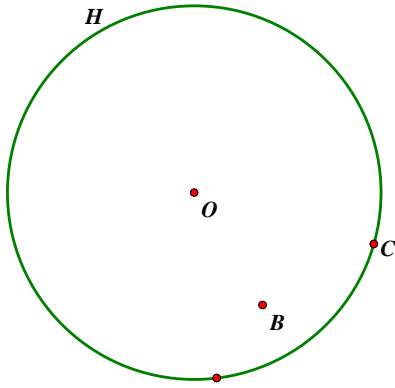
Let H be a model of the non-euclidean geometry centered at o. State the crucial steps in order to construct a non-euclidean line that passes through B and C.
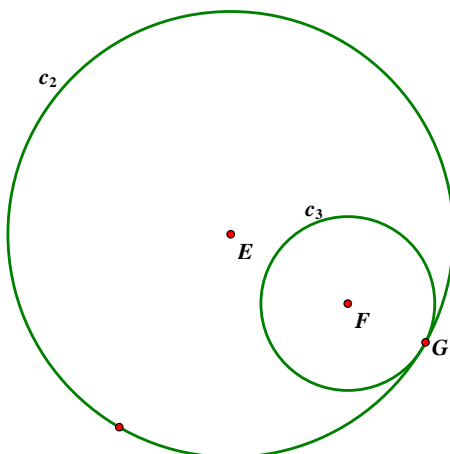
c_2 centered at E and c_3 centered at F. c_2 and c_3 intersect at one point G. E, F, G are on the same line.

Given radius of $c_2 = 4$ and $|EF| = 3$. Let c_4 be the inversion of c_3 with respect to c_2. Locate the center of c_4, say O. How far is O from E?. Find the radius of c_4.

Faculty information

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