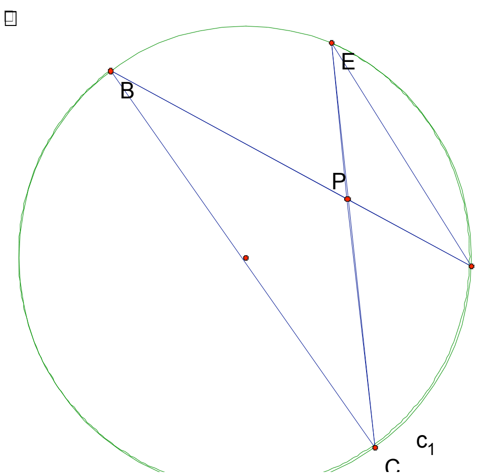
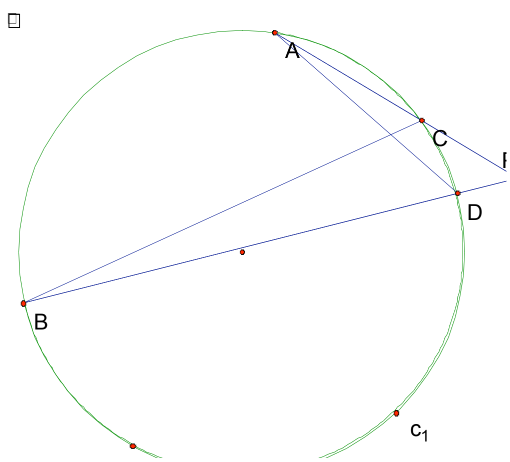
Notes 7200 Geometry
Monday, September 29, 2008

Class format: Review Questions and Answers from Homework 10

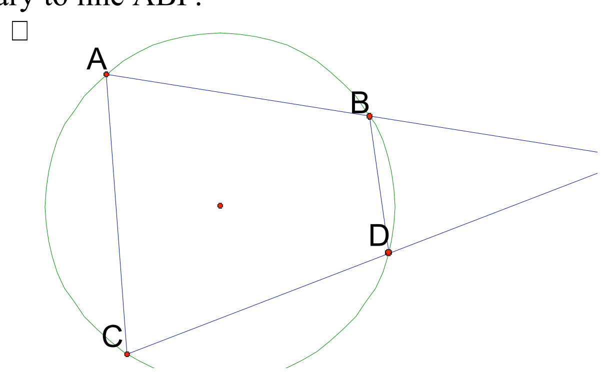
Start with Question #1
Let A, B, C, D be points on a circle c, with A not equal to B, and C not equal to D. Suppose that the lines AB and CD intersect at a point P. Then (PA)(PB) = (PC)(PD).

- Amanda Newton presents her answer from the homework, where she shows similar triangles in order to show proportional sides. This will allow you to prove the product of the segments to be equal.
- Dr. McCrory points out that there are a lot of areas that need to be addressed about this particular question.
    - There are two specific cases:
        - P inside the circle or P outside the circle

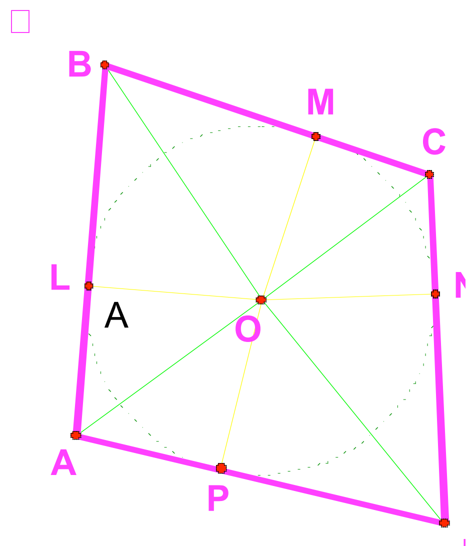




    - It is also obvious to notice that using GSP these triangles that are formed are not congruent
    - The proof uses the Arc Angle Theorem
- Eric Gold asks if there is another way to prove similarity without the Arc Angle Theorem
    - Dr. McCrory points out another way to prove similarity, to do so, he drew new construction lines AC and BD. Note that triangle PBD is similar to triangle PAC. Why? Angle C is congruent to Angle PBD because they are supplementary to line ABP.

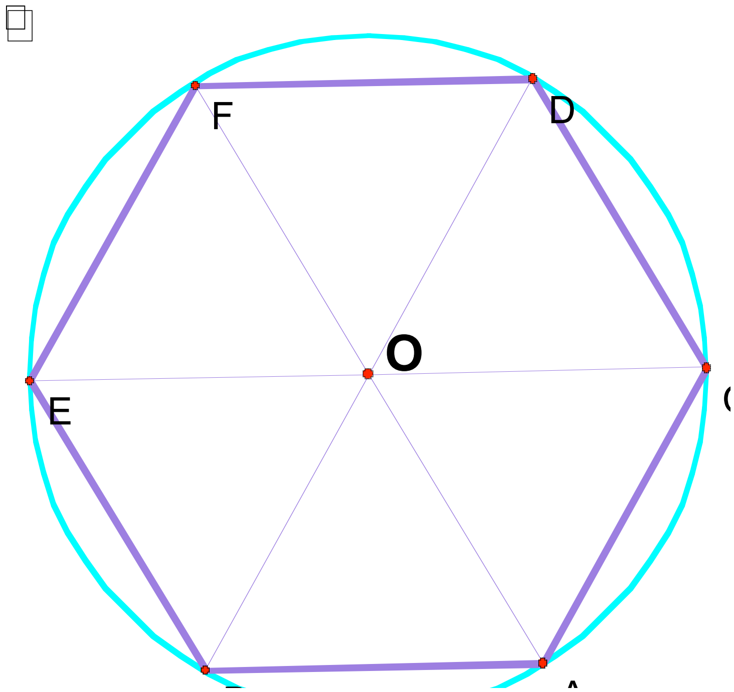


- Dr. McCrory notes that we have been spending so much time with the inscribed angle theorem, we need to go back and prove it specifically with the axioms.
    - What would happen if P was on the circle? Then, A=D or B=C
- Question #2 by Lindy Wallace
- Suppose that a quadrilateral has a circle inscribed in it; in other words, each of the four sides of the quadrilateral is tangent to the circle. Then the sum of one pair of opposite sides is equal to the sum of the other pair of opposite sides.



- She was able to prove that the triangles constructed in the interior of the quadrilateral were similar, but not congruent.
    - How could she have proven that they were congruent?
    - They share a common side, therefore, the proportion =1
        - Hence, congruent
- She also needed to prove that her constructed segments from the vertices of the quadrilateral to the center of the circle, O, were angle bisectors
    - Could have said that ALOP was a kite, and then OL and OP were the same distance
    - This would imply AO was an angle bisector
- Congruence could also have been proven using the Hypotenuse-Leg Theorem
    - This would have to be proven as it is not a basic theorem using the Pythagorean Theorem
- Finally, the four different lengths of the segments allow for the opposite sides to have the same sum
- Dr. McCrory suggested that we should measure all the segments as an experimental test for the theorem

- Question #3 by Jenny Whitt
- If an equilateral polygon is inscribed in a circle, then it is a regular polygon.



- She said that we know all of the outside segments are equal
- She constructed radii
- Used SSS to prove congruent triangles
- Using SSS, the corresponding angles within the constructed triangles are congruent
- Finding the sums of the angles, the interior angles are all congruent
  - Charnelle asks would this work for any polygon? Do you have to use induction?
  - Dr. McCrory replies no. Not for this problem. Geometrically, no simple relation for the inductive step
  - He does say that a general statement needs to be made about any equilateral polygon
  - He also pointed out that the constructed triangles will always be isosceles because two sides of the triangle will always be radii of the circle, therefore, two sides of each triangle will always be congruent.
- HOMEWORK: DUE OCT 6
  - We will spend the next two class periods working on an assignment
  - 3 groups of 8 students
  - We will be proving the basic theorems
  - Directions will be posted on the website