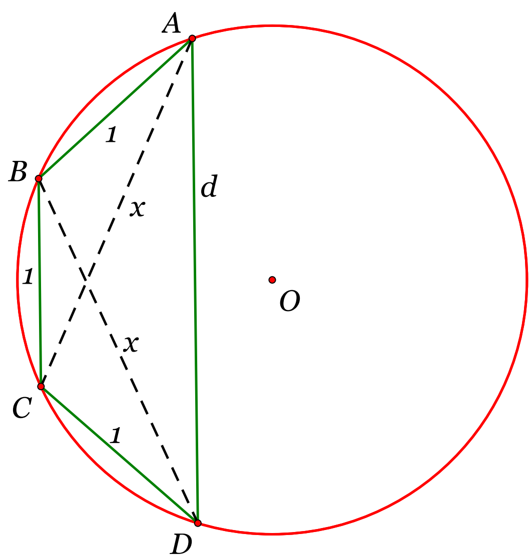
MATH 341 — FALL 2011
ASSIGNMENT 9

Due October 31, 2011

9.1 [*Geometry for College Students* by Martin Isaacs, page 72, 2D.2] A quadrilateral with side lengths 1, 1, 1, and d is inscribed in a circle. Find a formula for the radius R of the circle in terms of d. Check your formula by computing R directly when $d = 1$. HINT: Prove that the diagonals of the quadrilateral must be equal.



9.2 Find the area of a cyclic quadrilateral whose sides have lengths 9, 10, 10. and 21.

9.3 Find the area of a cyclic quadrilateral whose sides have lengths 7, 15, 20. and 24.

9.4 Use *GeoGebra* do complete this problem. Take an arbitrary convex quadrilateral, $\square ABCD$. Using the diagonals find the orthocenter of each of the four triangles. Connect the orthocenters in order giving you another convex quadrilateral, call it $\square PQRS$.

(a) Find the area of $\square ABCD$.

(b) Find the area of $\square PQRS$.

(c) Find the ratio $K_{ABCD} : K_{PQRS}$.

9.5 Again using *GeoGebra* take an arbitrary convex quadrilateral, $\square ABCD$. Use the diagonals and construct the quadrilaterals as above for the

- circumcenter and

- incenter.

For each of these,

(a) Find the area of $\square ABCD$.

(b) Find the area of $\square PQRS$.

(c) Find the ratio $K_{ABCD} : K_{PQRS}$.

Are any of these ratios constant?

9.6 To what familiar result does Ptolemy's theorem lead when the cyclic quadrilateral is a rectangle? Prove your result.

9.7 [Challenge Question] Using *GeoGebra* start with a triangle ΔABC and construct a point D so that the convex quadrilateral $\square ABCD$ is bicentric.
Challenge: Find a technique that will work for any triangle and prove that it works.