MAΘ Competition Team Problem Set 13

Anders Christensen, Minjoo Kim

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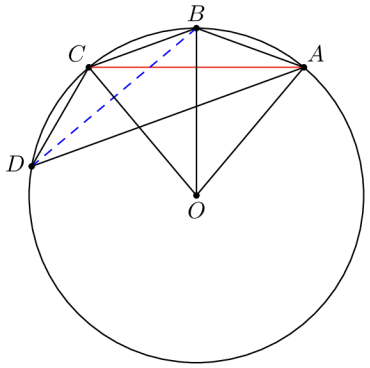
1 ABCD is an isosceles trapezoid inscribed in a circle. AB = 10, BC = 7, CD = 6, AD = 7. Find diagonal AC.

2 ABCDE is a regular pentagon with side length 1. Use Ptolemy's Theorem on quadrilateral ABCE to find the diagonal length.

3 In triangle ABC we have $AB = 7$, $AC = 8$, $BC = 9$. Point D is on the circumscribed circle of the triangle so that AD bisects angle BAC. What is the value of $\frac{AD}{CD}$?

4 Isosceles trapezoid $ABCD$ has parallel sides $\overline{AD}$ and $\overline{BC}$, with $BC < AD$ and $AB = CD$. There is a point P in the plane such that $PA = 1, PB = 2, PC = 3$, and $PD = 4$. What is $\frac{BC}{AD}$?

5 A quadrilateral is inscribed in a circle of radius $200\sqrt{2}$. Three of the sides of this quadrilateral have length 200. What is the length of the fourth side? (Hint: Consider the diagram below for an application of Ptolemy.)



6 (Challenge) Let P be a point on the circle circumscribing square $ABCD$ that satisfies $PA \cdot PC = 56$ and $PB \cdot PD = 90$. Find the area of $ABCD$.