MAΘ Competition Team Problem Set 15

Anders Christensen, Minjoo Kim

March 27, 2026

Problem 1. Dom Min pulls up to the Cartesian function for his birthday party. He is at point $(4, 1)$, but his birthday cake is at $(6, 7)$. What is the minimum distance he must traverse to get to his birthday cake? What does this reveal about the minimum path between two points?

Problem 2. Point A and B are both on the same side of line ℓ, where A is 3 units away from ℓ and B is 5 units away from ℓ. The foot of the perpendicular from A to ℓ and the foot of the perpendicular from B to ℓ are 8 units apart. Find the minimum value of $PA + PB$ for a point P on ℓ.

Problem 3. Point P is inside equilateral triangle ABC such that $PA = 3$, $PB = 4$, $PC = 5$. Rotate the triangle 60° about vertex A, mapping $B \to C$, and $P \to P'$. Find the measure of $\angle APB$ and the perimeter of the triangle.

Problem 4. Triangles $\triangle ABC$ and $\triangle A'B'C'$ lie in the coordinate plane with vertices $A(0, 0)$, $B(0, 12)$, $C(16, 0)$, $A'(24, 18)$, $B'(36, 18)$, $C'(24, 2)$. A rotation of m degrees clockwise around the point (x, y) where $0 < m < 180$, will transform $\triangle ABC$ to $\triangle A'B'C'$. Find $m + x + y$.

Problem 5. The opposite sides of a hexagon $ABCDEF$ are parallel. If $BC - EF = ED - AB = AF - CD > 0$, show that all angles in $ABCDEF$ must be equiangular.

Problem 6 (Challenge). Points D and E are on sides AB and AC of ΔABC respectively with $\angle ABD = 20^\circ, \angle DBC = 60^\circ, \angle ACE = 30^\circ$ and $\angle ECB = 50^\circ$. Find $\angle EDB$. (Hint: A little birdie told me something about a perpendicular bisector...)