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by randomusername

1 Consider a company of $n \geq 4$ people, where everyone knows at least one other person, but everyone knows at most $n-2$ of the others. Prove that we can sit four of these people at a round table such that all four of them know exactly one of their two neighbors. (Knowledge is mutual.)

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2 We are given an acute triangle ABC, and inside it a point P, which is not on any of the heights AA_1, BB_1, CC_1. The rays AP, BP, CP intersect the circumcircle of ABC at points A_2, B_2, C_2. Prove that the circles AA_1A_2, BB_1B_2 and CC_1C_2 are concurrent.

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3 Let K be a closed convex polygonal region, and let X be a point in the plane of K. Show that there exists a finite sequence of reflections in the sides of K, such that K contains the image of X after these reflections.
