DU Mathsoc Problem Solving: Set 8

Date: 10/11/2026

∼Beginners Paper∼

For any assistance or inquiries about the problem sets, please email me at: quizmaster.maths@csc.tcd.ie.

Problem 1. Find natural numbers x and y for which $x^2(y+1)^2 + y^2(x+1)^2 + 2xy = 2025 + x^2y^2$.

Problem 2. In a group of 6 people, some pairs know each other. Show that there are two people in the group who know the same number of people in the group.

Problem 3. Five points are chosen in the plane, each with whole-number coordinates. Show that the midpoint of some two of them also has whole-number coordinates.

Problem 4. Show that if you pick any 5 whole numbers, then two of them have a difference that is divisible by 4.

Problem 5. University faculty S offers the modules $\{S_1, S_2, \ldots, S_8\}$. Faculty A offers the modules $\{A_1, A_2, \ldots, A_{10}\}$. A curriculum requires 4 modules from S and 3 modules from A. How many different curricula are there? If $\{A_1, A_2, \ldots, A_5\}$ have S_1 as a prerequisite and $\{A_6, A_7, \ldots, A_{10}\}$ have S_2 and S_3 as prerequisites, then how many different curricula are there?