
CS1340: DISCRETE STRUCTURES II

PRACTICE QUESTIONS I

- (1) Given any sequence of $mn + 1$ real numbers, some subsequence of $(m + 1)$ numbers is increasing or some subsequence of $(n + 1)$ numbers is decreasing.
- (2) Let $(x_i, y_i), i = 1, 2, 3, 4, 5$ be a set of five distinct points with integer coordinates in the xy -plane. Show that the midpoint of the line joining at least one pair of these points has integer coordinates.
- (3) How many ordered pairs of integers (a, b) are needed to guarantee that there are two ordered pairs (a_1, b_1) and (a_2, b_2) such that $a_1 \bmod 5 = a_2 \bmod 5$ and $b_1 \bmod 5 = b_2 \bmod 5$.
- (4) Show that a non-empty set has an equal number of even subsets (that is, subsets with an even number of elements) and odd subsets.
- (5) Show that in a group of five people (where any two people are either friends or enemies), there are not necessarily three mutual friends or three mutual enemies.

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