

CSCE 411-501 ✖ Fall 2026

Proofs Practice

1. Simplify $7^{\log_9 n^2}$ (i.e. express it in the form n^c , where c does not depend on n).
2. Prove that the algorithm below correctly sorts the input array A :

<u>SELECTIONSORT($A[1, \dots, n]$)</u> For i from 1 to n: $k \leftarrow i$ For j from $i + 1$ to n: If $A[j] < A[k]$: $k \leftarrow j$ Swap $A[i]$ with $A[k]$

3. We define a set of strings S recursively as follows:

- $\varepsilon \in S$
- $1 \in S$
- $\forall x \in S, 0x \in S$
- $\forall x \in S, 10x \in S$

Prove that S is the set of binary strings which do not contain two consecutive ones (Hint: How do we prove set equality?).

4. An L-triomino is a shape consisting of 3 squares in the arrangement shown below. Prove that for every positive integer n , it is possible to place L-triominoes onto a 2^n by 2^n checkerboard such that each triomino covers three distinct squares of the board (no triomino hangs off the edge and no two overlap) and all but one square of the board is covered.

