

Mathematical Foundations of Computer Science

CS 499, Shanghai Jiaotong University, Dominik Scheder

Group Name: **NOIDEA**

1 Broken Chessboard and Jumping With Coins

1.1 Tiling a Damaged Checkerboard

Exercise 1.1. *Re-write the proof in your own way, using simple English sentences.*

Proof. Your proof ... □

Exercise 1.2. *Another exercise ...*

Proof. Your proof ... □

2 Exclusion-Inclusion

2.1 Sets

Exercise 2.1.

1. *Proof.* As is shown in the Venn diagram below, $|A| + |B|$ add the common part $|A \cap B|$ twice. So it should be subtracted once if we want to count $|A \cup B|$. □

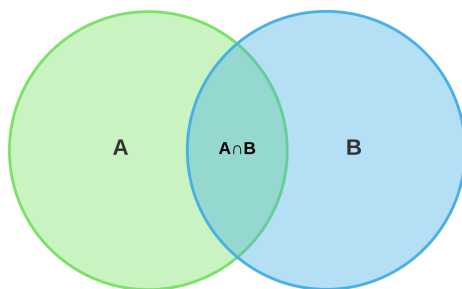


Figure 1: Venn Diagram

2. *Solution.* $|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$ ■

3. *Solution.* $|A \cup B \cup C \cup D| = |A| + |B| + |C| + |D| - |A \cap B| - |A \cap C| - |A \cap D| - |B \cap C| - |B \cap D| - |C \cap D| + |A \cap B \cap C| + |A \cap B \cap D| + |A \cap C \cap D| + |B \cap C \cap D| - |A \cap B \cap C \cap D|$ ■

Exercise 2.2.

Solution. $|A_1 \cup \dots \cup A_n| = \sum_{i=1}^n |A_i| - \sum_{i,j:1 \leq i < j \leq n} |A_i \cap A_j| + \sum_{i,j,k:1 \leq i < j < k \leq n} |A_i \cap A_j \cap A_k| - \dots + (-1)^{n-1} |A_1 \cap \dots \cap A_n|$ ■

Exercise 2.3.

Proof. □

1. testddd

2. testddd