Math 2001. Lecture 38.

04. 27. 2022.

Last time: functions

Today: Review.

1. Key notions and notations

— sets, set builder notation $\{\ ^{objects}_{\ \ldots}\ :\ ^{properties}_{\ \ldots}\ \}$

Constructions about sets: Cartesian product products, power set,
$\cup$, $\cap$, $\setminus$ (difference), $^-$ (complement).

Venn diagrams

- statements, truth tables, logical equivalence.

  conditional statement, negations, contrapositives

  quantifiers

- permutations, combinations, multisets.

  factorials, binomial coefficients, Pascal's triangle, binomial thms.

  inclusion - exclusion principle

- Pigeonhole principle, division principle

- congruence of integers (mod a positive int.), Fibonacci numbers

— relations. (possible) properties of relations (reflexive, symmetric, transitive)

equivalence rels. partitions, equivalence classes

— functions: domain, codomain, range/image,

injectivity, surjectivity -bijectivity.

2. Key Techniques

Counting: — addition, subtraction, multiplication principle

dynamic counting / algorithmic thinking

— inclusion -exclusion

— bars-and-stars technique

Proofs :   know how to

- prove conditional $(P \Rightarrow Q)$ / biconditional statement $(P \Leftrightarrow Q)$

- prove set containment $(\subseteq)$ and set equality

- prove by cases / contradiction / contrapositive

- prove by mathematical induction / strong inductions
  (take advantage of recursions)

Thank you!