

Things to know for Exam 2

1. GENERAL KNOWLEDGE

- (1) All material from the first test
- (2) Know how to prove Theorem 18.13, Theorem 19.14, Theorem 22.1, Theorem 23.2.

2. INDUCTION

- (1) Know the principle of mathematical induction, and how to use it. This includes understanding how to properly state the base case and inductive step.
- (2) Identify where the inductive hypothesis is used.
- (3) Decide correctly to use (or not to use) multiple base cases.
- (4) Be able to use (or not to use) strong induction.
- (5) Know the relation between binomial coefficients stated in Theorem 16.4.
- (6) State the binomial theorem.
- (7) Use the binomial theorem to calculate coefficients in expansions.
- (8) Use binomial coefficients to count numbers of subsets.

3. THEORY OF INTEGERS

- (1) Know and use the division algorithm.
- (2) Compute GCD's in multiple ways, and find common divisors.
- (3) Use the extended Euclidean algorithm to find a GCD as a linear combination.
- (4) Know how to use Theorems 18.13 and 18.15.
- (5) Know how to use Theorem 19.5.
- (6) Know the Fundamental Theorem of Arithmetic.
- (7) Be able to write prime factorizations

4. RELATIONS

- (1) Identify (equivalence) relations, and prove basic properties.
- (2) Given equivalence relations, find equivalence classes and partitions (and vice versa).
- (3) Know the meanings of Theorems 22.1, 22.6 (see page 161), 22.9, and 23.2.
- (4) Find and recognize transversals.
- (5) Algebra on $\mathbb{Z}_n$.

5. DEFINITIONS AND NAMED THEOREMS

- (1) Mathematical Induction
- (2) (Strong) Inductive Step
- (3) Pigeonhole Principle
- (4) Factorial
- (5) Binomial Coefficient
- (6) Pascal's Triangle
- (7) The Binomial Theorem
- (8) The Division Algorithm
- (9) Common Divisor
- (10) Greatest Common Divisor
- (11) Linear Combination
- (12) Relatively Prime
- (13) Euclid's Lemma
- (14) Prime
- (15) Composite
- (16) Fundamental Theorem of Arithmetic
- (17) Relation
- (18) Reflexive
- (19) Symmetric
- (20) Transitive
- (21) Antisymmetric
- (22) Equivalence Relation
- (23) Equivalence Class
- (24) Transversal
- (25) Partition
- (26) Integers mod n