

DISCRETE MATHEMATICS

Math 245

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Suggestions for preparing for the Second Exam

I. Things you should know about the integers and rational numbers:

- Be able to use (and recognize that you are using) commutativity, associativity, the additive and multiplicative identity, the additive inverse (and, for the rationals, the multiplicative inverse), distributivity.
- Properties of $<$. For example $a < b$ implies $a + c < b + c$.
- Be able to define prime, composite, divides, floor, ceiling.

II. Know the statements of the following theorems and know how to apply them (as in webworks problems):

- Quotient-remainder theorem.
- The unique factorization theorem.

III. Be able to do these computations.

- Use the Euclidean algorithm to find the greatest common divisor of two numbers.
- Convert an integer (given in base 10) into another base, and convert from any base into base 10.
- Add in any given base. Construct a multiplication table in a given base. Use a multiplication table to find a product of two numbers in any given base.
- Use unique factorization to solve equations involving integers.

IV. Know these standard proofs and proof methods.

- Transitivity of divides.
- If a divides b and a divides c then a divides $b + c$.
- There exist an infinite number of primes (by contradiction).
- \sqrt{p} is irrational for p a prime (by contradiction).
- The sum of a rational number and an irrational number is irrational (by contradiction).
- Floor and ceiling proofs using the definitions (as in Epp, §3.5).
- Know how to use of a counterexample to disprove a universal statement.