

1. Division Algorithm (DA)
 - (a) Find q and r given a and b .
 - (b) Use DA in algorithms that require repeated division.
2. Arithmetic in other bases
 - (a) Decimals and representations of integers and fractions.
 - (b) Conversion of repeating decimals to quotients.
 - (c) Construction of base b addition and multiplication tables for the digits $0, 1, 2, \dots, b - 1$.
3. The Fundamental Theorem of Arithmetic (existence and uniqueness of prime factorization), and its consequences.
 - (a) Counting the number of divisors of a number.
 - (b) Finding GCDs and LCMs
 - (c) Divisibility Rules
 - (d) Using FTA to prove irrationality.
4. Counter games including Bouton's Nim
5. The Euclidean Algorithm
 - (a) The decanting problem
 - (b) Solving other diophantine equations. (See the coin problems, examples 1 and 2 in lecture 2, for example.)
6. Mathematical Induction
7. Modular arithmetic. Finding remainders when large numbers, given in decimal or exponential form, are divided by single digit numbers and 11.