

Notes, Assignments and Study Guides

Notes

- Numbers: Rationals, Reals, Complex¹
- Basic proof techniques: Direct²
- Square root of 2 is irrational³
- Quantifiers⁴
- Principle of Mathematical Induction⁵
- Strong induction and Well-Ordering Principle⁶
- Fibonacci Numbers⁷
- Divisibility⁸
- Prime and Composite Numbers⁹
- Patterns in the Primes¹⁰
- Common Divisors¹¹
- The Division Theorem¹²
- A weird number system¹³
- The Division Theorem (cont)¹⁴
- The Euclidean Algorithm¹⁵
- Diophantine Equations¹⁶
- Euclidean Division and Diophantine Equations¹⁷
- Finding all Solutions¹⁸
- Finding all Solutions (cont)¹⁹
- Fundamental Theorem of Arithmetic²⁰
- Consequences of Fundamental Theorem²¹
- Modular Arithmetic and Congruences²²

¹notes/numbers_intro.html

²notes/proofs_basic.html

³notes/irrationality_of_sqrt2.html

⁴notes/proofs_quantifiers.html

⁵notes/proofs_induction.html

⁶notes/proofs_induction_other.html

⁷notes/numbers_fibonacci.html

⁸notes/numbers_divisibility.html

⁹notes/primes_intro.html

¹⁰notes/primes_patterns.html

¹¹notes/numbers_gcd.html

¹²notes/numbers_division_theorem.html

¹³notes/weird_number_system.html

¹⁴notes/numbers_division_theorem.html

¹⁵notes/numbers_euclidean_algorithm.html

¹⁶notes/equations_diophantine_intro.html

¹⁷notes/equations_diophantine_and_euclidean.html

¹⁸notes/equations_diophantine_all_solutions.html

¹⁹notes/equations_diophantine_all_solutions.html

²⁰notes/numbers_fundamental_theorem.html

²¹notes/numbers_fta_consequences.html

²²notes/congruence_intro.html

- Arithmetic with Congruences²³
- Chinese Remainder Theorem²⁴
- Congruence Classes as a Number System²⁵
- Multiplicative Inverses²⁶
- Basics of Encryption²⁷
- Encryption via Multiplication²⁸
- Fermat's Little Theorem²⁹
- Reduced Residues and ϕ ³⁰
- Euler's Theorem³¹
- Encryption via Exponentiation³²
- Public Key Cryptography and RSA³³
- Order of Elements in \mathbb{Z}_n ³⁴
- Polynomials over \mathbb{Z}_n ³⁵
- Primitive Roots³⁶
- Applications of Primitive Roots: Diffie-Hellman protocol³⁷
- Quadratic Residues³⁸
- Law of Quadratic Reciprocity, Gauss's Lemma³⁹
- Proof of Quadratic Reciprocity⁴⁰
- Primality Tests⁴¹

Assignments

- Assignment 1⁴²
- Assignment 2⁴³
- Assignment 3⁴⁴
- Assignment 4⁴⁵

²³[notes/congruence_arithmetic.html](#)

²⁴[notes/congruence_chinese_remainder.html](#)

²⁵[notes/congruence_system.html](#)

²⁶[notes/congruence_multiplicative_inverses.html](#)

²⁷[notes/encryption_basic.html](#)

²⁸[notes/encryption_mult.html](#)

²⁹[notes/congruence_fermats.html](#)

³⁰[notes/residues_basic.html](#)

³¹[notes/residues_eulers_theorem.html](#)

³²[notes/encryption_exponentiation.html](#)

³³[notes/encryption_rsa.html](#)

³⁴[notes/residues_order.html](#)

³⁵[notes/residues_polynomials.html](#)

³⁶[notes/residues_primitive_roots.html](#)

³⁷[notes/encryption_diffie_hellman.html](#)

³⁸[notes/residues_quadratic.html](#)

³⁹[notes/residues_reciprocity.html](#)

⁴⁰[notes/residues_reciprocity_proof.html](#)

⁴¹[notes/primes_testing.html](#)

⁴²[assignments/1.html](#)

⁴³[assignments/2.html](#)

⁴⁴[assignments/3.html](#)

⁴⁵[assignments/4.html](#)

- Assignment 5⁴⁶
- Assignment 6⁴⁷
- Assignment 7⁴⁸
- Assignment 8⁴⁹
- Assignment 9⁵⁰
- Assignment 10⁵¹

Study Guides

- Midterm 1 Study Guide⁵²
- Midterm 2 Study Guide⁵³
- Midterm 3 Study Guide⁵⁴

⁴⁶[assignments/5.html](#)

⁴⁷[assignments/6.html](#)

⁴⁸[assignments/7.html](#)

⁴⁹[assignments/8.html](#)

⁵⁰[assignments/9.html](#)

⁵¹[assignments/10.html](#)

⁵²[notes/studyGuide1.html](#)

⁵³[notes/studyGuide2.html](#)

⁵⁴[notes/studyGuide3.html](#)