1. Exam is 2/22/19 in class. Closed book except for 3" x 5" card. No calculators. Sections in Fraleigh are 4.1-4, 5.6, 8 and The material for HW1-4 except order of permutations.

2. Vocabulary: commutative, associative, integers, divisibility, congruence mod n, primes, prime factorization, definition of group (closed, identity, inverse), subgroup, cyclic group, isomorphism, permutation, subgroup generated by a & g.

3. Notation: \( \mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{A}(n), a \equiv b \mod n, \nu_p(n), \gcd(m, n) \), \( (\mathbb{Z}/n\mathbb{Z}, +) \), \( (\mathbb{Z}/n\mathbb{Z}^*, \times) \), \( \langle a \rangle \equiv a \mod G \) for isomorphism \( \Phi \) for isomorphism \( G = \# \text{elements in } G \) \( x \equiv y \mod n \) \( \phi(n) \) for \( \phi(x) \).

4. Groups to know: \( (\mathbb{Z}/n\mathbb{Z}, +) \) - isomorphic to \( \mathbb{Z}/n\mathbb{Z} \) - cyclic group of order \( n \); \( (\mathbb{Z}/n\mathbb{Z}^*, \times) \) - structure is general but explicit \( V = \text{Klein 4 group} \); \( S_3 = \text{symmetric group on } 1, 2, 3 \).

5. Theorems to know: Euclidean algorithm, determining whether \( H \leq G \) is actually a subgroup, subgroups of cyclic groups and in connection with \( \gcd \). How to multiply permutations.

6. Not on this test: \( \phi(n) \), repeating decimals as such.

La Grange's Theorem, Cayley's Theorem, calculating the order of a general permutation.