**Definitions:**

Group, Subgroup, Cyclic group, Abelian group, Homomorphism, Monomorphsim, Isomorphism, Epimorphism, Automorphism, Kernel, Index, Permutation group (Sn), Left coset and right coset of H in G, Index of H in G,

**Theorems:**

1. Prove that (Zn, +n ) is a cyclic group.
2. Let G be a group and a∈ G. Then O(a) is the order of the cyclic group generated by a.
3. Let (G, \*) be a group and S⊆ G. Then (S, \*) is a subgroup of (G,\*) if and only if a\*b-1 ∈ S for all a,b in S.
4. Let f: G ⟶ G’ be a group homomorphism from ( G,\*) to ( G’, o). Let e and e’ be the identity elements of G and G’ then (i) f(a) = e’ (ii) f(a-1) = (f(a))-1 for all a in G. (iii) f(a\*b-1) = f(a) o ( f(b))-1 for all a, b in G . (iv) f(H) is a subgroup of G whenever H is a subgroup of G.
5. A group homomorphism f is a monomorphism if and only if kerf = {e}.
6. (i) Any infinite cyclic group is isomorphic to (Z , +). (ii) Any cyclic group of order n is isomorphic to (Zn ,+n ).
7. **Cayley’s Theorem**:- A finite group (G,\* ) of order n is isomorphic to a group of permutations of G.
8. Let H be a subgroup of G. Then (i) a ∈ H if and only if aH = H. (ii) aH = bH iff a-1 \*b ∈ H (iii) a ∈ bH iff aH = bH.
9. **Lagrange’s Theorem of finite groups:**-

Statement:- Let G be a finite group and H be any subgroup of G. Then the order of H divides the order of G.

1. Every group of prime order is cyclic.
2. Let H be a subgroup of G. Then the following statements are equivalent.

(i)aH = Ha ∀ a∈G; (ii) a-1Ha = H ∀ a ∈ G; (iii) a-1Ha ⊆ H ∀ a∈ G.