

- Cartesian product
- direct product and direct power
- relation
- function
- operation and finitary operation
- universe or domain
- arity of relation, function, or operation (e.g., nullary, unary, binary, ternary, n -ary)
- n -ary relation on a set X (notation: $\rho \subseteq X^n$)
- n -ary function from set X to set Y (notation: $f : X^n \rightarrow Y$)
- n -ary operation on a set X (notation: $f : X^n \rightarrow X$)
- properties binary relations might satisfy: reflexive, (anti)symmetric, transitive
- properties of functions (e.g., onto, one-to-one, bijective)
- properties of binary operations (e.g., commutative, associative, idempotent)
- equivalence relation, equivalence class
- partition
- congruence modulo n
- partial order, total order, well-order
- greatest common divisor, least common multiple
- relatively prime,
- prime number,
- prime factorization
- power set
- algebraic structure, $\langle A, \mathcal{F} \rangle$, with universe A and operations \mathcal{F}
- algebraic structure types and examples:
 - magma,
 - semigroup,
 - monoid,
 - group

- [relational structure](#), $\langle A, \mathcal{R} \rangle$, with universe A and relations \mathcal{R}
- relational structure examples:
 - [partially ordered set](#) (poset),
 - [graph](#)
- (*Many* more examples at www.math.chapman.edu/~jipsen/structures/doku.php/index.html)
- subuniverse generated by a set S , denoted by $\langle S \rangle$.
- [subalgebra](#)
- [identity element](#)
- [inverse element](#) and inverse operation
- [abelian group](#)
- [Cayley table](#)
- [finite group](#)
- [subgroup](#), proper subgroup, trivial subgroup
- [order](#) (of a group or subgroup)
- order (of a group element)
- g^n and g^{-n} (for g an element of a multiplicative group)
- ng and $-ng$ (for g an element of an additive group)
- [cyclic group](#)
- [generators](#) (of a group), generator (of a cyclic group)
- [symmetry](#), rigid motion
- [permutation](#) (and two ways to write them)
- [cycle](#), length of a cycle
- [transposition](#)
- [parity of a permutation](#) (even/odd)
- [examples of groups](#): \mathbb{Z}_n , $U(n)$, S_n , A_n , D_4
- [distinguished elements of partial orders](#):
 - upper bound (of a subset of a poset, lattice, or join semilattice)

- least upper bound or supremum or join
 - lower bound
 - greatest lower bound or infimum or meet
- [lattice](#), $\langle L, \wedge, \vee \rangle$
- [semilattice](#), $\langle S, \cdot \rangle$
- [joins and meets](#):
 - join (of elements), $a \vee b$
 - meet (of elements), $a \wedge b$
 - join (of a subset), $\bigvee T$
 - meet (of a subset), $\bigwedge T$
 - largest element (of a poset; need not exist)
 - smallest element (of a poset; need not exist)
- [order-preserving function](#)
- [lattice homomorphism](#)
- [coset](#), coset representative
- [index of a subgroup](#)
- [conjugate](#) elements of a group
- [Hasse diagram](#)
- [types of homomorphisms](#):
 - [homomorphism](#)
 - [monomorphism](#)
 - [epimorphism](#)
 - [isomorphism](#)
 - [endomorphism](#)
 - [automorphism](#)
- [kernel of a function](#) (an equivalence relation)
- [kernel of a group homomorphism](#) (a normal subgroup)
- [kernel of a homomorphism](#) (a [congruence relation](#))
- [quotient group](#)

- quotient algebra
- First Isomorphism theorem for groups
- First Isomorphism theorem (general)