Algebraic structure

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In mathematics an **algebraic structure** is a set with one, two or more binary operations on it.

The basic algebraic structures with **one binary operation** are the following:

- Magma (mathematics)

    A set with a binary operation.

- Semigroup

    A set with an operation which is associative

- Monoid

    A semigroup with an identity element

- Group

    A monoid where each element has a corresponding inverse element

- Commutative group

    A group with a commutative operation

The basic algebraic structures with **two binary operations** are the following:

- Ring

    A set with two operations, often called addition and multiplication. The set with the operation of addition forms a commutative group, and with the operation of multiplication it forms a semigroup (many people define a ring so that the set with multiplication is actually a monoid). Addition and multiplication in a ring satisfy the distributive property

- Commutative ring

    A ring whose multiplication is commutative

- Field

    A commutative ring where the set with multiplication is a group.

Examples are

- The whole numbers (natural numbers together with zero) with addition (or

multiplication) is a monoid, but is not a group

- The integers with addition is a commutative group, but with multiplication is just a monoid

- The integers with addition and multiplication is a commutative ring, but not a field

- The rational numbers, the real numbers and the complex numbers with the ordinary addition and ordinary multiplication are fields.

Category: Algebra