commutative ring

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Let $(X, +, \cdot)$ be a ring. Since $(X, +)$ is required to be an abelian group, the operation "+" necessarily is commutative.

This needs not to happen for "$\cdot$". Rings R where "$\cdot$" is commutative, that is, $x \cdot y = y \cdot x$ for all $x, y \in R$, are called commutative rings.

The commutative rings are rings which are more like the fields than other rings are, but there are certain dissimilarities. A field has always a multiplicative inverse for each of its nonzero elements, but the same needs not to be true for a commutative ring. Further, in a commutative ring there may exist zero divisors, i.e. nonzero elements having product zero. Since the ideals of a commutative ring are `http://planetmath.org/Ideal`two-sided, the these rings are more comfortable to handle than other rings.

The study of commutative rings is called *commutative algebra*.