Identity Element Encyclopedia Article

Identity Element

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Identity Element

Any mathematical object that, when applied by an operation, such as **addition** or **multiplication**, to another mathematical object, such as a number, leaves the other object unchanged is called an identity element. The two most familiar examples are 0, which when added to a number gives the number, and 1, which is an identity element for multiplication.

More formally, an identity element is defined with respect to a given operation and a given set of elements. For example, 0 is the identity element for addition of **integers**; 1 is the identity element for multiplication of **real numbers**. From these examples, it is clear that the operation must involve two elements, as addition does, not a single element, as such operations as taking a power.

Sometimes a set does not have an identity element for some operation. For example, the set of even numbers has no identity element for multiplication, although there is an identity element for addition. Most mathematical systems require an identity element. For example, a group of transformations could not exist without an identity element that is the **transformation** that leaves an element of the group unchanged.