

# Associative Property Encyclopedia Article

## Associative Property

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# Contents

<a href="#">Associative Property Encyclopedia Article.....</a>	<a href="#">1</a>
<a href="#">Contents.....</a>	<a href="#">2</a>
<a href="#">Associative Property.....</a>	<a href="#">3</a>

# Associative Property

In **algebra**, a binary operation is a rule for combining the elements of a set two at a time. In most important examples that combination is also another member of the same set. **Addition**, **subtraction**, **multiplication**, and **division** are familiar binary operations. A familiar example of a binary operation that is associative (obeys the associative principle) is addition (+) of **real numbers**. For example, the sum of 10, 2, and 35 is determined equally as well as  $(10 + 2) + 35 = 12 + 35 = 47$ , or  $10 + (2 + 35) = 10 + 37 = 47$ . The parentheses on either side of the defining equation indicate which two elements are to be combined first. Thus, the associative property states that combining a with b first, and then combining the result with c, is equivalent to combining b with c first, and then combining a with that result. A binary operation (\*) defined on a set S obeys the associative property if  $(a * b) * c = a * (b * c)$ , for any three elements a, b, and c in S. Multiplication of real numbers is another associative operation, for example,  $(5 \times 2) \times 3 = 10 \times 3 = 30$ , and  $5 \times (2 \times 3) = 5 \times 6 = 30$ . However, not all binary operations are associative. Subtraction of real numbers is not associative since in general  $(a - b) - c$  not equal  $a - (b - c)$ , for example  $(35 - 2) - 6 = 33 - 6 = 27$ , while  $35 - (2 - 6) = 35 - (-4) = 39$ . Division of real numbers is not associative either. When the associative property holds for all the members of a set, every combination of elements must result in another element of the same set.