

MULTIPLICATION

Edward Cannon 2008

Multiplication is essentially repeated addition, extended in its definition to all real numbers. Almost all methods of multiplying, except by repeated addition, require the memorization of the basic multiplication table, or frequent reference to it. The basic multiplication table is the two facts: any number multiplied by 1 is itself, and number multiplied by 0 is 0, and the following table:

	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3		9	12	15	18	21	24	27
4			16	20	24	28	32	36
5				25	30	35	40	45
6					36	42	48	54
7						49	56	63
8							64	72
9								81

multiplication is commutative, $a \cdot b = b \cdot a$ so the portion of the table below the diagonal is superfluous. Multiplication can be done in several ways, the most common is the standard method.

Repeated addition

Multiplication of whole numbers can be done by repeated addition. In this method one number is added repeatedly to itself to generate the product. This method is computationally simple and easy for many students to grasp, but can be tedious if it involves larger numbers.

Example: 3 times 15

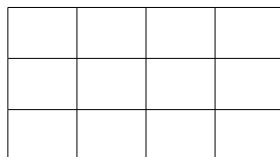
15 is first added to itself to get 30. This is two repetitions of 15, but we need three, so 15 is added to the sum to generate 45, which is three 15s or 3 times 15.

Geometric construction

Whole numbers can be multiplied by geometric construction, by drawing a rectangle with the width and length representing the two numbers in the product.

Example: 4 times 3

A line is drawn with 4 segments, representing the number 4, as so. |—|—|—|—| Then a similar line is drawn perpendicular with 3 segments, and a grid is constructed, as so



The squares are then counted and the total count is the answer, 12.

Box method

A unique and unusual method of multiplication is the box method.

Standard method

The method most commonly taught in schools is the standard method.