In addition and multiplication, no matter how the numbers are grouped, the answer will always be the same.

$(a + b) + c = a + (b + c)$

$(4 + 6) + 2$ gives the same total as $4 + (6 + 2)$

$(4 + 6) + 2 = 10 + 2 = 12$

$4 + (6 + 2) = 4 + 8 = 12$

In addition and multiplication, numbers may be added or multiplied together in any order.

$a + b = b + a$

$6 + 2 = 8$ and $2 + 6 = 8$

So why does order matter? Grouping numbers to equal ten makes them easier to add.

$7 + 9 + 6 + 2 + 4 + 3 = ?$

$(7 + 3) + (6 + 4) + 9 + 2 = 31$

Addition and multiplication are both associative, subtraction and division are not.

$(a \times b) \times c = a \times (b \times c)$

$(2 \times 3) \times 4$ gives the same total as $2 \times (3 \times 4)$

$(2 \times 3) \times 4 = 6 \times 4 = 24$

$2 \times (3 \times 4) = 2 \times 12 = 24$

For subtraction and division, the order is important and should not be changed as this results in different answers

$a \times b = b \times a$, or $ab = ba$

$2 \times 3 = 6$ and $3 \times 2 = 6$

So why does order matter? When you have several numbers to multiply, try to find an easier way.

$5 \times 17 \times 2$? or $5 \times 2 \times 17$?

$25 \times 23 \times 4$? or $4 \times 25 \times 23$?

Adding zero to a number won't change the number. In other words, it will not change the number's identity. Subtraction also works.

$a + 0 = a$ $b - 0 = b$

$4 + 0 = 4$ $5 - 0 = 5$

A product can be written as the sum or difference of two or more products.

$15 \times 3 = (10 \times 3) + (5 \times 3)$

$27 \times 8 = (20 \times 8) + (7 \times 8)$

Multiplying a number by one will not change the number. Multiplying by one does not change the number's identity. Division also works.

$a \times 1 = a$ $b \div 1 = b$

$5 \times 1 = 5$ $6 \div 1 = 6$

$3(x + 4) = 3x + 12$

$5(d - 2) = 5d - 10$

$a(a + b - 4) = a^2 + ab - 4a$

Identity Properties of Addition and Multiplication

Distributive Property

Associative Properties of Addition and Multiplication

Commutative Properties of Addition and Multiplication