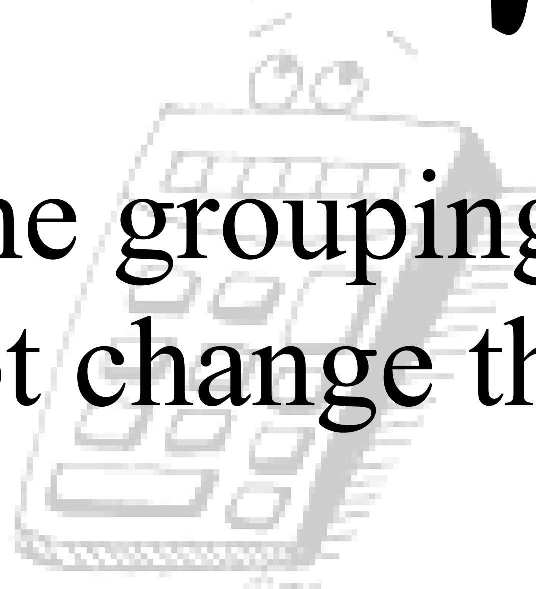
Associative Property of Addition

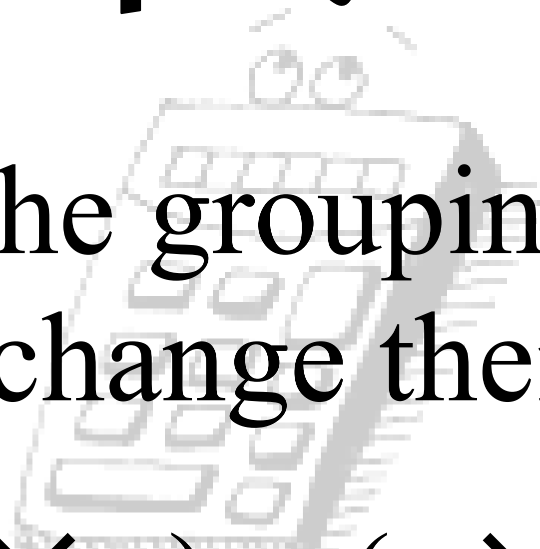


Changing the grouping of addends does not change their sum

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

$$2 + (3 + 5) = (2 + 3) + 5$$

Associative Property of Multiplication

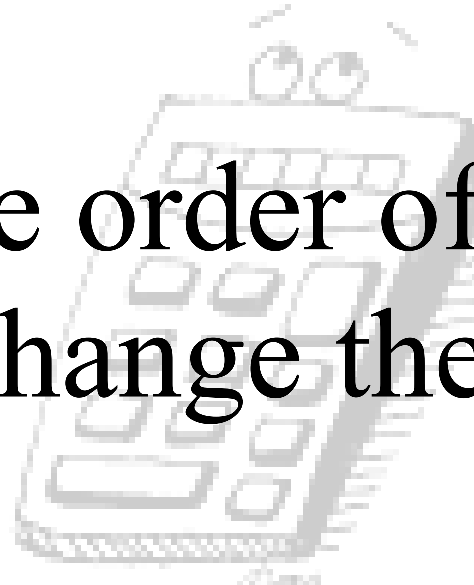


Changing the grouping of factors does not change their product

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

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

Commutative Property of Addition

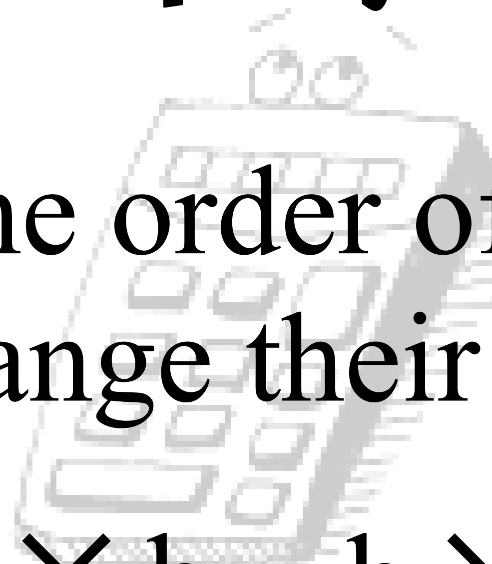


Changing the order of addends does not change their sum

$$a + b = b + c$$

$$1 + 2 = 2 + 1$$

Commutative Property of Multiplication



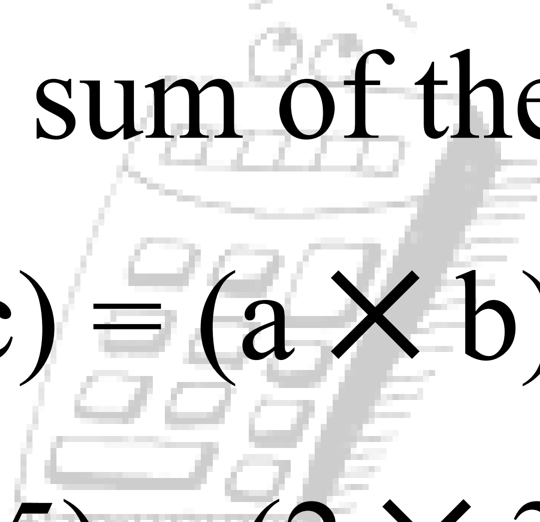
Changing the order of factors does not change their product

$$a \times b = b \times a$$

$$2 \times 3 = 3 \times 2$$

Distributive Property

The product of a factor and a sum equals the sum of the products.



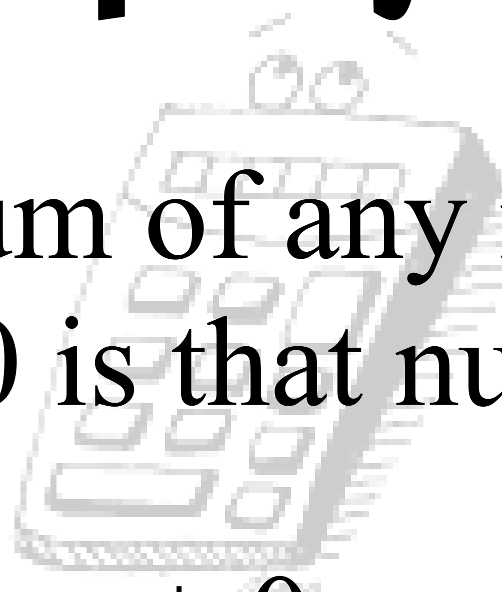
$$a \times (b + c) = (a \times b) + (a \times c)$$

$$2 \times (3 + 5) = (2 \times 3) + (2 \times 5)$$

$$2 \times \quad 8 \quad = \quad 6 \quad + \quad 10$$

$$16 = 16$$

Identity Property of Addition

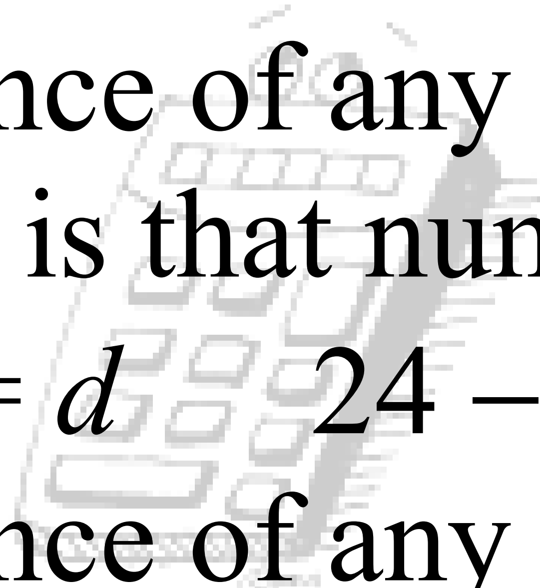


The sum of any number
and 0 is that number.

$a + 0 = a$

$19 + 0 = 19$

Subtraction Rules of Zero



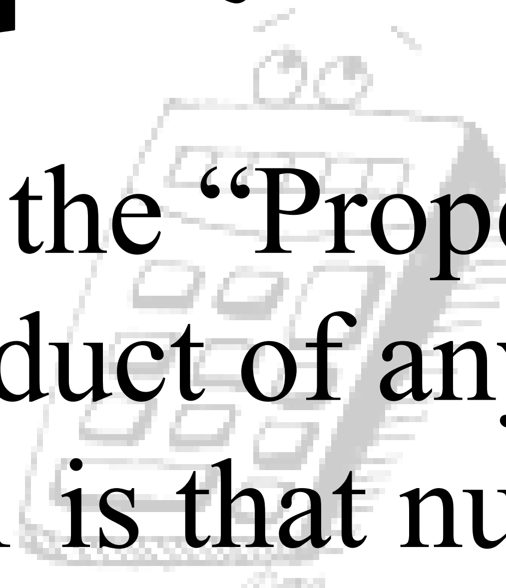
The difference of any number and zero is that number.

$d - 0 = d$ $24 - 0 = 24$

The difference of any number and itself is zero.

$d - d = 0$ $24 - 24 = 0$

Identity Property of Multiplication

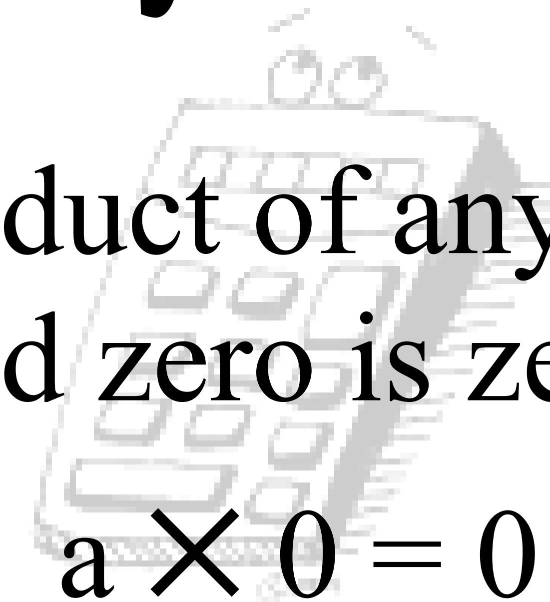


Also called the "Property of One":
The product of any number
and 1 is that number.

$$a \times 1 = a$$

$$9 \times 1 = 9$$

Zero Property of Multiplication

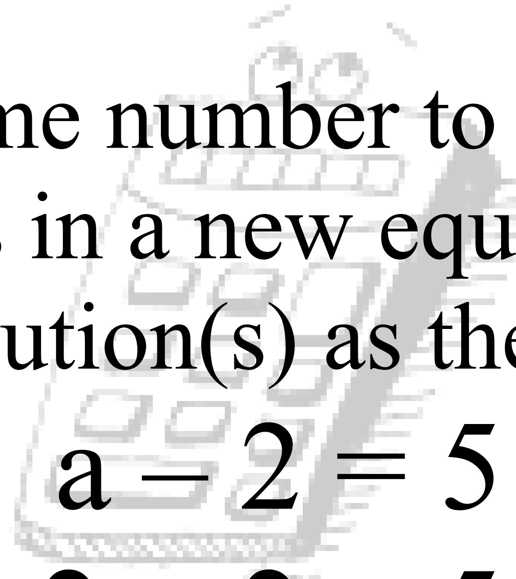


The product of any number and zero is zero.

$$a \times 0 = 0$$

$$10 \times 0 = 0$$

Addition Property of Equality



Adding the same number to both sides of an equation results in a new equation, having the same solution(s) as the original.

$$a - 2 = 5$$

$$a - 2 + 2 = 5 + 2$$

$$a = 7$$

$$\checkmark \quad \boxed{7} - 2 = 5$$

Multiplication Property of Equality

Multiplying both sides of an equation by the same nonzero number results in a new equation, having the same solution(s) as the original.

$$c \div 2 = 5$$

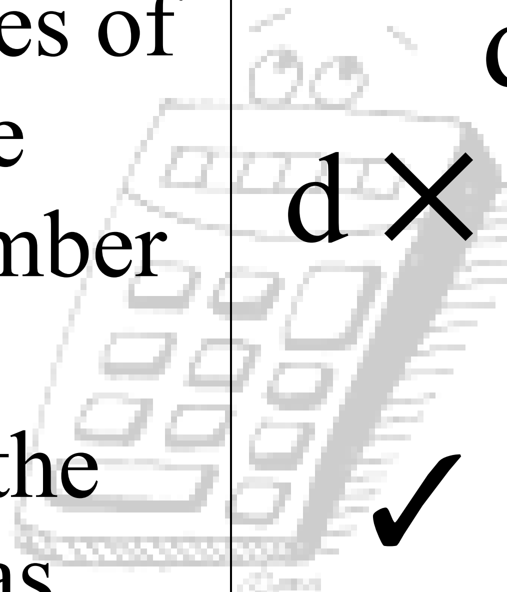
$$c \div 2 \times 2 = 5 \times 2$$

$$c = 10$$

$$\checkmark \quad \boxed{10} \div 2 = 5$$

Division Property of Equality

Dividing both sides of an equation by the same nonzero number results in a new equation, having the same solution(s) as the original.



$$d \times 2 = 18$$

$$d \times 2 \div 2 = 18 \div 2$$

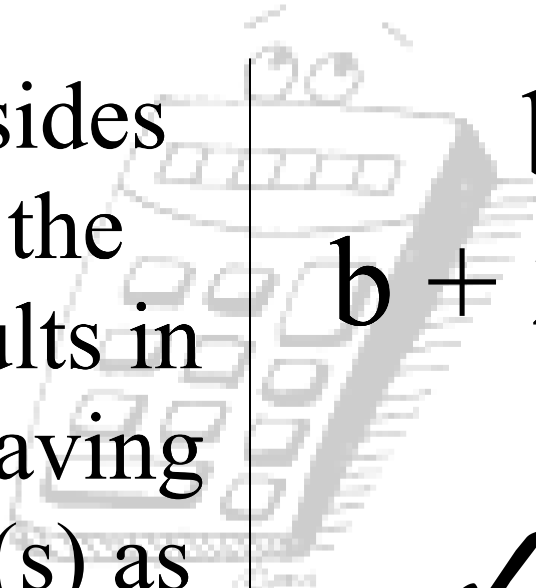
$$d = 9$$

$$\checkmark \quad \boxed{9} \times 2 = 18$$

$$3n = 15 \qquad \frac{3n}{3} = \frac{15}{3} \qquad n = 5 \qquad \checkmark\, 3 \cdot \boxed{5} = 15$$

Subtraction Property of Equality

Subtracting both sides of an equation by the same number results in a new equation, having the same solution(s) as the original.



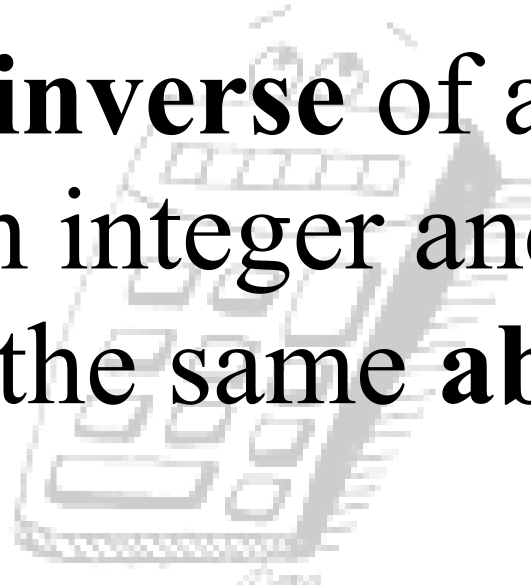
$$b + 2 = 5$$

$$b + 2 - 2 = 5 - 2$$

$$b = 3$$

$$\checkmark\ \boxed{3} + 2 = 5$$

Additive Inverse of Integers



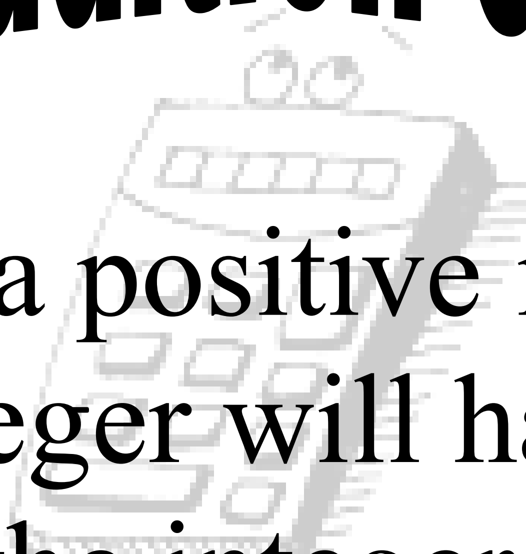
The **additive inverse** of an integer is its opposite. An integer and its additive inverse have the same **absolute value**:

The sum of an integer and its additive inverse is always zero.

$^{-}3$ and $^{+}3$

$$\mathbf{^{-}3 + {}^{+}3 = 0}$$

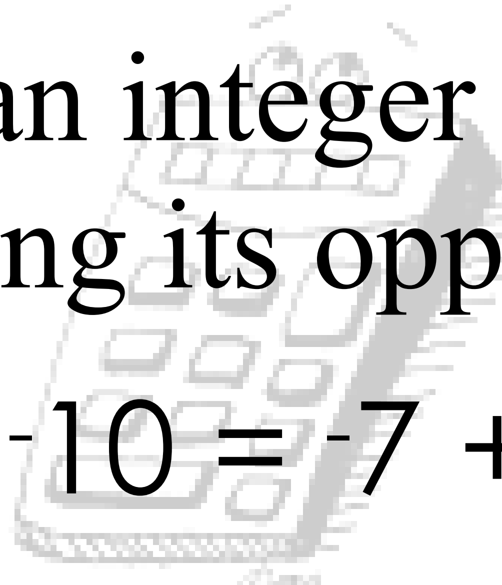
Rule for Addition of Integers



The sum of a positive integer and a negative integer will have the same sign as the integer with the greater absolute value.

$^{+}10 + {}^{-}8 = {}^{+}2$ $\qquad$ $^{+}9 + {}^{-}11 = {}^{-}2$

Rule for Subtraction of Integers



Subtracting an integer is the same as adding its opposite.

$${}^{-}7 - {}^{-}10 = {}^{-}7 + {}^{+}10$$

$${}^{-}8 - {}^{+}3 = {}^{-}8 + {}^{-}3$$

$${}^{+}4 - {}^{-}5 = {}^{+}4 + {}^{+}5$$