

Multiplicative Rule of Equality

The Multiplicative rule of equality says that if you multiply one side of an equation by a number, that you must multiply the other side of the equation by the same number.

If $a=b$, then $ca=cb$.

Ex.

If $x = 7$, then $5x = 5(7)$
 $5x = 35$

The rule can be used to solve for a variable (symbol). To do this, isolate the symbol on one side, and all other terms on the other side. Then multiply both sides by the reciprocal of the coefficient of the variable.

Ex.

$$5x+17 = 0 \xrightarrow{\text{additive rule of equality}} 5x = -17 \xrightarrow{\text{reciprocal of coefficient (5) = } 1/5} (1/5)5x = (1/5)(-17) \quad \swarrow \quad \underline{x = -17/5}$$

ex.

$$8x - 4 = 0 \longrightarrow 8x = 4 \longrightarrow (1/8)8x = (1/8)4 \longrightarrow \underline{x = 4/8}$$

notice: by multiplying a fraction as above, we could consider it to be dividing by a number instead.

Suppose we had a fractional coefficient.

Ex.

$$4/5x + 9 = 0 \quad 4/5x = -9 \quad (5/4)4/5x = (5/4)(-9) \quad x = -45/4$$

What if there are no other terms besides ones with variables?

Ex.

$$3x^3 + 6x^2 + 9x = 0$$

$$(1/3) 3x^3 + (1/3)6x^2 + (1/3)9x = (1/3)0$$

$$x^3 + 2x^2 + 3x = 0$$

exercises: Solve for the variable.

- 1.) $2x + 4 = 0$
- 2.) $4x + 8 = 0$
- 3.) $5x - 5 = 0$
- 4.) $7x - 14 = 0$
- 5.) $8/9x + 2 = 0$
- 6.) $3/2x + 9 = 0$
- 7.) $15/16x - 12 = 0$
- 8.) $3/4x - 4 = 0$
- 9.) $6x^4 + 5x^3 - 12x^2 + x = 0$
- 10.) $15x^3 + 45x^2 - 60x = 0$