Order of Operations & Simplifying Expressions

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Notes

Order of Operations	The order in which we operate and combine numbers P – <u>Parentheses</u> first ()[] tell us to <u>Restart</u> PEMDAS inside E – <u>Exponents</u> second, if no parenthesis then apply exponent MD – Do any Multiplication or Division going <u>Left</u> to <u>Right</u> ✳ AS – Do any Addition or Subtraction <u>last</u>, going <u>Left</u> to <u>Right</u>

PEMDAS Step by Step

Ex. $1 + 12 \div -3(-14 + 4^2) - 2^3 + 15$

$1 + 12 \div -3(-14 + 16) - 2^3 + 15$

$1 + 12 \div -3(2) - 2^3 + 15$

$1 + 12 \div -3(2) - 8 + 15$ $2 \cdot 2 \cdot 2$

$1 + -4(2) - 8 + 15$

$1 + -8 - 8 + 15$

0

PEMDAS Multiple Steps per Line

Ex. $1 + 12 \div -3(-14 + 4^2) - 2^3 + 15$

$1 + -4(-14 + 16) - 8 + 15$

$1 + -4(2) - 8 + 15$

$1 + -8 - 8 + 15$

$\boxed{0}$

Term	A group of <u>numbers</u> and <u>variables</u> that are multiplied together. Terms are separated by a <u>plus</u> or <u>minus</u> sign in an expression *The sign goes with the term that follows it.* Ex. $\underline{3x} + \underline{4} = \underline{2xy}$ 3 Terms: $3x, 4, -2xy$
Coefficient	The <u>number</u> part of a term that contains a variable <u>part</u> Ex. $\underline{3}x + 4 \underline{-2}xy$ The coefficients are: $\underline{3}$ and $\underline{-2}$
Constant	A term without a <u>variable</u> (<u>only</u> a <u>number</u>) the constant is: $\underline{4}$
Like Terms	Terms with the <u>same</u> variable raised to the same <u>power</u> part

<u>Like Terms</u>

$3x$ and x

-5 and 8

$7x^2 - x^2$

$3xy + 21xy$

<u>Unlike Terms</u>

$3x$ and yx

8 and $5x$ ← one has a variable one doesn't

$7x^2$ and $2x^3$ ← not the same power

$2xy$ and $21x^2y$

Combining Like Terms	You can only add or subtract things with the same <u>name</u> 4 cats + 3 cats = 7 cats $20 ☺ - 7 ☺ = 13 ☺$ 7 fourths + 9 fourths = 16 fourths $4x + 8x = 12x$ $\dfrac{7}{4} + \dfrac{9}{4} = \dfrac{16}{4}$ $11a^2 - 1a^2 = 10a^2$ $-13xy + 2xy = -11xy$

Order of Operations & Simplifying Expressions

Distributing

What it looks like: there are terms _inside_ the parentheses that are added or subtracted, with a term _multiplied_ to the _outside_ of the parentheses

Ex. $2(5x - 4)$ yes   Ex. $2(5x)$ no addition Ex. $2+(5x-4)$ not multiplied outside

What it means: there are _multiples_ of everything inside the parentheses

Ex. $2(5x - 4)$ two groups of $5x-4$ Ex. $-3(7x + 6)$ subtracting $7x+6$ three times

$5x-4 + 5x-4$ $-(7x+6) - (7x+6) - (7x+6)$

★ How to simplify it: the term outside is multiplied to _EACH_ term inside

Ex. $4(10 + 3)$
$4 \cdot 10 + 4 \cdot 3$
$40 + 12$
$\boxed{52}$

Ex. $7(20 - 4)$
$7 \cdot 20 + 7 \cdot -4$
$140 + -28$
$\boxed{112}$

Ex. $-5(11 - 8)$
$-5 \cdot 11 + -5 \cdot -8$
$-55 + 40$
$\boxed{-15}$

Ex. $4(10x + 3)$
$4 \cdot 10x + 4 \cdot 3$
$\boxed{40x + 12}$

Ex. $7(20x - 4)$
$7 \cdot 20x + 7 \cdot -4$
(ok) $140x + -28$
best $\boxed{140x - 28}$

Ex. $-5(11 - 8x)$
$-5 \cdot 11 + -5 \cdot -8x$
$-55 + 40x$ (ok)
$\boxed{40x - 55}$ best

Simplifying Expressions

To put an expression (no equal sign) into simplest form, perform _all_ possible _operations_, including _Distributing_ and _Combining_ like terms.

Ex. $2(8x + 4) - 7x$
distribute
$2 \cdot 8x + 2 \cdot 4 - 7x$
$16x + 8 - 7x$
$\boxed{9x + 8}$

Ex. $10x - 3(15 - 4x) + 40$
$10x + -3 \cdot 15 + -3 \cdot -4x + 40$
$10x - 45 + 12x + 40$
$\boxed{22x - 5}$

Ex. $7x - 5(11 - 8x) - 1$
$7x + -55 + 40x - 1$
$\boxed{47x - 56}$

Ex. $2a + 5m - (3 + 2m) - 9a$
$2a + 5m - 3 - 2m - 9a$
$\boxed{-7a + 3m - 3}$

Ex. $2(3x - 3) - (8x - 2)$
$6x + -6 - 8x + 2$
$\boxed{-2x - 4}$