1.4

Evaluating Algebraic Expressions

ex Evaluate $1.4x - 0.3$ at $x = 10$

$1.4(10) - 0.3$

$14 - 0.3$

13.7

hint: always put ( ) around the #

Terms of an Algebraic Expression

term - a set of numbers & variables, separated from the other terms by addition/subtraction.

separated by +.

ex In $20x + 15$

term1 term2

$3x^2y + 5y^2 - 12x^4 - 127$ has 4 terms

Coefficients of a term

Coefficient - number part of a term.

ex In $20x+15$ the coefficient of term1 is 20. Coefficient of term 2 is 15.

In $3x^2y + 5y^2 - 12x^4 - 127$ the coefficients are $3, 5, -12, -127$

In $-x+4$ the coefficients are $-1, 4$

If there is no coefficient given, then the coefficient is one.

ex In $x+2$ the coefficients are 1,2

Might need to rewrite a little

ex $\frac{3x}{4} = \frac{3}{4} \cdot \frac{x}{1} = \frac{3}{4} \cdot x$ so coefficient is $3/4$.

Terms And Factors

It is important to distinguish between terms and factors, since we treat them differently in simplification.

Remember terms are +/-, factors are multiplied.

ex In $x+5$, x is a term
In $x \cdot 5$, x is a factor

In $5x-10$ x is a factor, $5x$ is a term.

Like Terms

Like terms - terms with exactly the same variables, raised to exactly the same powers.

ex

Like terms	Unlike terms
$2x$ and $5x$	$14x$ and $3y$
$7x^4$ and $15x^4$	$3x^3$ and $3x^2$
$4x^2y^3$ and $-17x^2y^3$	$7x^2y$ and $4x^2y^2$

Ignore Coefficients

Identifying like terms

ex In

$3x+2y-12x$, $3x$ and $-12x$ are like terms.

In

$3p^2q^4+4p^2q^3-5pq^2+p^2q^3+2p^2q^3-q^4$; $4p^2q^3$ & p^2q^3 & $2p^2q^3$ are like terms

Might need to simplify a little bit first

ex $3x^2+4y-x(4x)=3x^2+4y-4x^2$, $3x^2$ & $-4x^2$ are like terms

Combining Like Terms

We can add/sub things with similiar units (ex \$2 + \$3 = \$5, 4 inches + 6 inches = 10 inches) but we cannot add/sub things with different units (ex what is \$2 + 4 inches?)

Same is true with terms, like terms can be combined (add/sub), unlike terms cannot.

To combine like terms: add/sub the coefficients and keep same variables/powers.

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

$$5x^2 - 3x + 2x^2 - 3x^2 + 4x^3 = (5+2-3)x^2 - 3x + 4x^3$$
$$= 4x^2 - 3x + 4x^3$$
$$= 4x^3 + 4x^2 - 3x$$

This DOES NOT simplify any further!

NOTE: Once you have no more like terms, you CANNOT combine anything else!

Commutative Property

it Says: we can switch the order of mult!

ex $5(x)(3)=3(5)(x)=15x$

General approach

put all the numbers (that are multiplied) first.
put all the variables (that are multiplied) last.
then multiply whatever possible.

ex $-10(t)(4)(s)=(-10)(4)(t)(s)$
$=-40st$

$(-5t)(-2t)=(-5)(-2)(t)(t)$
$=10t^2$

$(4)(-5t)(-2t)=(4)(-5)(-2)(t)(t)$
$=40t^2$

Addition is commutative too!

ex $x+5=5+x$
$2+x+4=2+4+x$
$=6+x$

Rewriting expressions like this results in <u>equivalent expressions</u>

ex 3x and x·3 are equivalent equations

Associative Properties of Addition & Multiplication

If you're adding (or multiplying) more than two #s it doesn't matter which two you start with.

ex In $3+4+5$ if we add the 3 and 4 first we get $(3+4)+5 = 7+5 = \boxed{12}$
If we start with the 4 and 5 we get $3+(4+5) = 3+9 = \boxed{12}$
Note: we get 12 either way!

Same for $(3 \cdot 4) \cdot 5 = 12 \cdot 5 = 60$
$3 \cdot (4 \cdot 5) = 3 \cdot 20 = 60$

This can help us simplify!
ex $3+(2+x) = (3+2)+x = 5+x$

Can use with Commutative
ex $5 \cdot (x \cdot 2) = 5(2 \cdot x) = (5 \cdot 2) x = 10x$

The Distributive Property

a, b, c reals

$$a(b+c) = ab + ac \quad \text{and}$$
$$a(b-c) = ab - ac$$

ex $2(3+4) = 2(7) = 14$ $\qquad 2(3+4) = 2\cdot 3 + 2\cdot 4 = 6+8 = 14$

ex $2(x+4) = 2x+8$

ex $3(2x+6) = (3)(2x) + (3)(6)$
$= 6x + 18$

$-5(4x-3) = (-5)(4x) - (-5)(3)$
$= -20x - -15$
$= -20x + 15$

$x(5x-2) = (x)(5x) - (x)(2)$
$= 5x^2 - 2x$

This is a way to remove parenthesis.

Might have more stuff inside ().

ex $2(x+3y-4z) = 2x+6y-8z$

$(2x+5y+\frac{1}{3}z)\frac{1}{2} = \frac{1}{2}\cdot(2x+5y+\frac{1}{3}z)$
$= 1x + \frac{5}{2}y + \frac{1}{6}z$

ex $-(2x+6) = -1(2x+6)$
$= -2x - 6$

Simplifying Algebraic Expressions

Steps:

1. Get rid of parenthesis (using Distributive)
2. Simplify each term (using Assoc. & Comm.)
3. Combine like terms

ex $x(3x+4)+x$

1. $x(3x+4) + 2 \cdot x \cdot 2$

   $x3x + x \cdot 4 \;\; + 2 \cdot x \cdot 2$

2. $3x^2 + 4x + 4x$ (can be done w/ .)
3. $\boxed{3x^2 + 8x}$

ex $3(4x+2) + 2(x-5)$

1. $3(4x+2) + 2(x-5)$

   $12x + 6 + 2x - 10$

   $\boxed{14x - 4}$