

Elementary algebra
Class notes
Simplifying Algebraic Expressions (section 3.1)

We will use these basic concepts in almost every problem. We must understand them.

Review of Exponents and Order of Operations:

expl 1: For the expression 5^3 , label the parts 5 and 3. What are these numbers called?

expl 2: Write 5^3 as **repeated multiplication** to make sense of it. What is the value of 5^3 ?

expl 3: Calculate 1^7 and 7^1 . How do they differ? Use repeated multiplication to show the difference.

expl 4: Use repeated multiplication to calculate $\left(\frac{2}{5}\right)^3$.

To multiply fractions, multiply the tops and bottoms separately, then simplify if needed.

expl 5: Use order of operations to simplify the following.

a.) $(3+5) \cdot 2$

b.) $3+5 \cdot 2$

c.) $3+(5 \cdot 2)$

How do the parentheses affect your answers?

expl 6: Use order of operations to simplify the following.

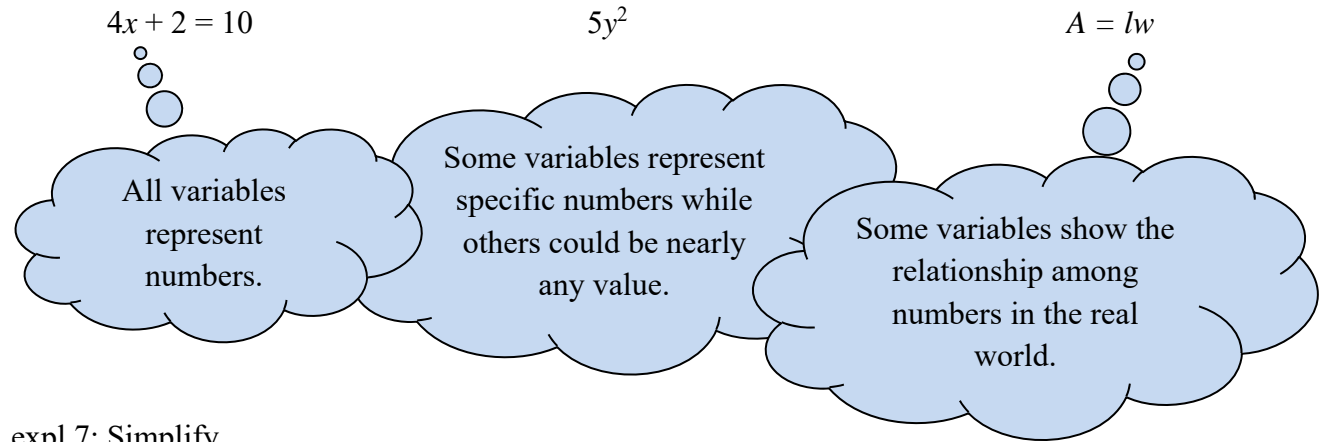
a.) $3 \cdot 4^2$

b.) $3[5-3(6+1)]$

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Variables:

Variables play many different roles in algebra. Below are three examples. Deciphering a variable's role helps us know what we are expected to do.



expl 7: Simplify.

$$3x + 5x$$

expl 8: Evaluate the following when $x = 2$, $y = 5$, and $z = 7$.

$$3x^2 - 4z + y$$

Equations versus Expressions:

How do equations and expressions differ? Write an example of each and point out the main difference.

Their purposes are quite different. Knowing which you are dealing with helps you know what to do.

We will not solve equations yet but do want to know the difference between an equation we solve and an expression we manipulate (i.e. simplify, multiply, add, etc.).

Review Properties of Real Numbers: From memory, fill in an example, using numbers, for each property below.

Commutative property of addition:

Commutative property of multiplication:

Associative property of addition:

Associative property of multiplication:

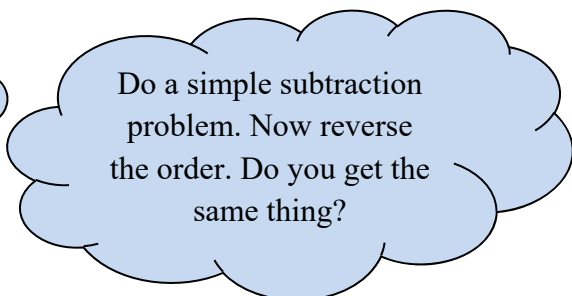
Distributive property:

expl 9: Use the commutative or associative properties to simplify the following. Then tell which rule(s) you used.

a.) $-3(5y)$

b.) $8 + (x + 5)$

expl 10: Show that subtraction is not commutative.



Do a simple subtraction problem. Now reverse the order. Do you get the same thing?

expl 11: Use the distributive property to rewrite the expression below without parentheses. Then simplify.

$$-3(5x + 4) - 7$$

expl 12: Use the distributive property to rewrite the sum as a product.

$$7x + 7y$$

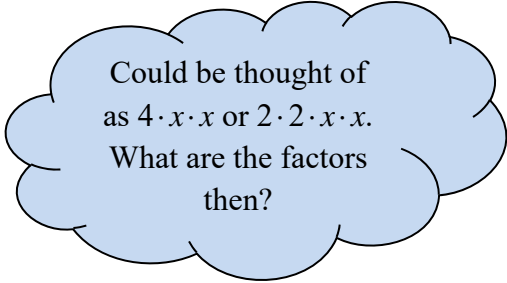
Factors versus terms:

terms: things we are adding (or subtracting)

expls: $\underline{x} + \underline{4}$ or $\underline{2x} + \underline{3}$ or $\underline{4x^2} + \underline{3x} - \underline{6}$

factors: things we are multiplying (or dividing)

expls: $\underline{5} \cdot \underline{x}$ or $\underline{3}(\underline{x+2})$ or $\underline{4} \cdot \underline{x^2}$



Could be thought of as $4 \cdot x \cdot x$ or $2 \cdot 2 \cdot x \cdot x$.
What are the factors then?

Write your own examples now.

Combining like terms:

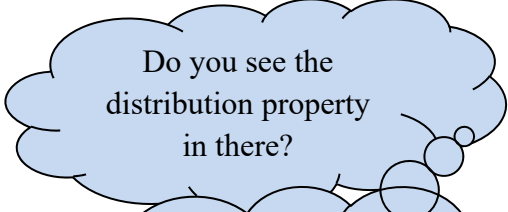
Like terms are terms that have the same variable(s) raised to the same exponents. We will combine them to simplify expressions.

expl 13: Simplify by combining like terms.

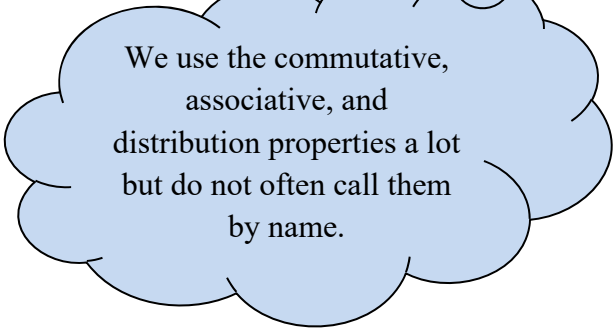
a.) $4x + 7x$

b.) $a + 6a - 5 - 9a$

c.) $4y^2 + 6 - 3y - 2y^2$



Do you see the distribution property in there?



We use the commutative, associative, and distribution properties a lot but do not often call them by name.

Definition: Coefficient: the plain number (or non-variable) part of a term, usually written first. Sometimes it is described as the numerical factor of the term.

expl 14: Identify the coefficients of the terms below.

a.) $4x$

d.) $7t^2$

b.) $-y$

e.) $y \cdot 5$

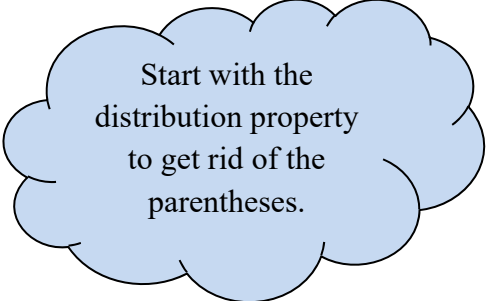
c.) a

f.) 5

expl 15: Simplify.

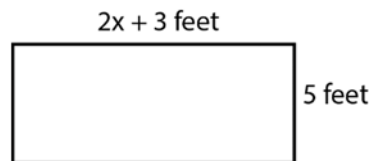
a.) $8(r - 5)$

b.) $5(2x - 3) + 4(x + 2) - 6(x - 2)$



Start with the distribution property to get rid of the parentheses.

expl 16: The perimeter P of a rectangle is given by the expression $2l + 2w$ where l is the length and w is the width of the rectangle. Find the perimeter of the rectangle to the right.



expl 17: Do you remember the formula for the area of a rectangle? Can you find the area of the rectangle above?

Worksheet: Things to know about your calculator (Texas Instruments – 82, 83, 85, 86):

A laundry list of things I have found useful over the years. Read it over and try out the stuff it talks about. If you have a TI84, use the instructions for the TI83. If you have a different brand calculator, try to figure out if your calculator has the same functionality.