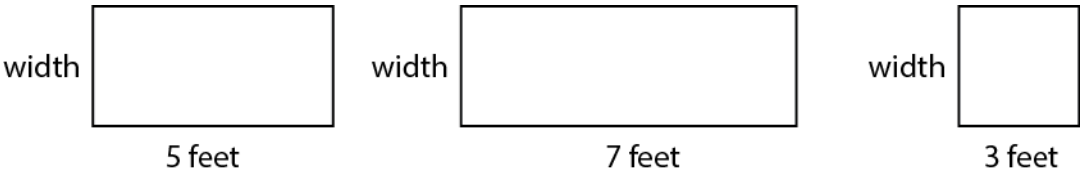
My favorite property of the real numbers is the distribution property.

Technology Integrated Mathematics
Class Notes
Algebra: Adding and Subtracting Algebraic Expressions (Section 7.2)

We need to be able to rewrite expressions like $5x + 7x + 3x$ as simply as we can. This saves work later on if we need to use the expression.

For instance, let's say we are working with three boards. They will have lengths of 5 feet, 7 feet, and 3 feet. Their widths will all be the same but determined by the specific project. If we let x represent the (varying) width of these boards, then $5x$, $7x$, and $3x$ are the areas of the boards. I have drawn them below. (Area equals width times length.)



The total area of these boards is $5x + 7x + 3x$. Imagine scooting these boards together, end to end to end, and you may be able to see why the total area could be thought of as $15x$. All I did there was add $5 + 7 + 3$ to get the total length, didn't I?

Combining Like Terms:
Like terms are terms that contain the *exact* same variable part. We say $5x$ and $7x$ are like terms. However, $5x$ and $7x^2$ are *not* like terms. We cannot add those now that the second term contains "x-squared" and *not* just x.

Definition: Coefficient: The constant factor of a term, usually written in front.

We say 5 is a constant (does *not* change) and x is a variable (it varies).

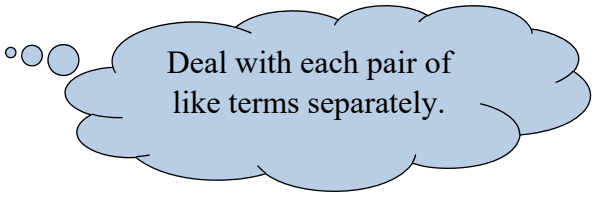
We can always add and subtract like terms.
Be careful! You *cannot* add or subtract *unlike* terms. We must leave those as is.

expl 1: Add.
a.) $6y + 5y + y$

We say simply y to mean $1y$.

b.) $5ab^2 + 6ab^2$

expl 2: Add or subtract.
$13w - 5w + 9w^2 - 2w^2$



Expressions with Parentheses:
We will see expressions like $2(3x + 4)$. What does that mean? How do we simplify that?

Well, what does it mean to multiply anything by 2? (Repeated addition!) Let's write it as $(3x + 4) + (3x + 4)$. When we bring like terms together, we see it as $3x + 3x + 4 + 4$ or $6x + 8$. But, that's the long way!

We will use the **Distribution Property**. In general, we know $a(b + c) = a \cdot b + a \cdot c$. Let's work this problem below.

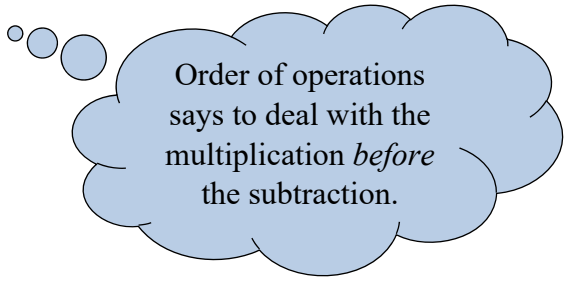
expl 3: Use the distribution property to simplify $2(3x + 4)$.

expl 4: Simplify.

$-8(5m + 2)$

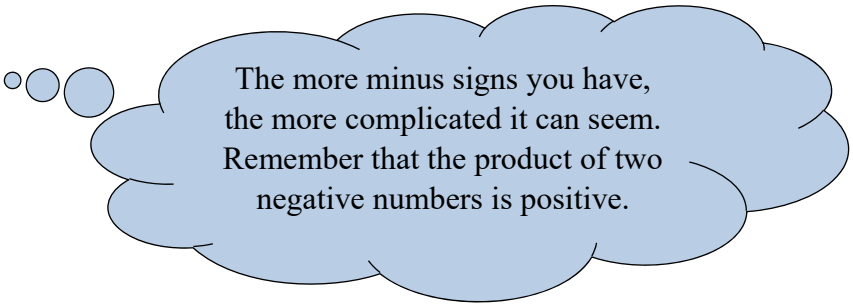
expl 5: Here, there is a *minus* sign in front of the parentheses. We need to "distribute the negative" too.

$3 - 4(2t + 3)$



expl 6: Simplify.

$7(3x + 5) - 3(2x - 2)$



expl 7: Simplify.

$4(x^2 + 2x - 1) - 6(x^2 - 3x + 7)$