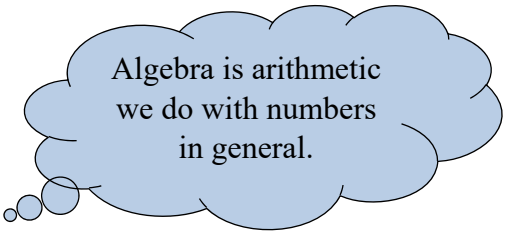


Technology Integrated Mathematics
Class Notes
Algebra: Algebraic Language and Formulas (Section 7.1)

We see patterns in arithmetic. Algebra lets us play around with those patterns in general. Consider this pattern.

$2^3, 3^3, 4^3, 5^3, 6^3, 7^3, 8^3, 9^3, \ldots$

It could be useful to talk about raising *any* number to the power of 3. We would use x to represent the number and write x^3. We call this a **variable** because its value *varies*.

So, just as $4^3 = 4 \times 4 \times 4$, our new $x^3 = x \times x \times x$. But, *eek*, those multiplication signs are confusing now that we are using x to stand in for a number. We will use different notation.

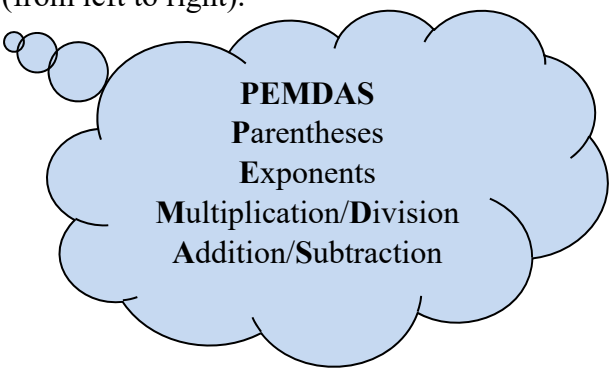
To imply multiplication, we might write $x \cdot x \cdot x$ or $(x)(x)(x)$ or even just xxx.

To imply division, we will usually write it as a fraction, such as $\frac{4x}{3}$ instead of $4x \div 3$.

We will follow the same rules for order of operations as before. So, …

(Spoken in an authoritative old man, old-timey voice):
Let it be known henceforth that whensoever he encountereth numerical expressions such as 2×3^3 and $5 \times 6^2 - 3^4$, a plebeian shall forever after apply these rules!

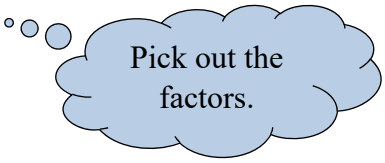
First, simplify all within thine parentheses.
Second, apply any exponents thou encountereth.
Third, performeth any multiplications or divisions (from left to right).
Fourth, performeth subtractions or additions (from left to right).



Definition: Expression: An **algebraic expression** is a general name for any collection of numbers and variables connected by arithmetic signs and does *not* have an equal sign (that would make it an **equation**).

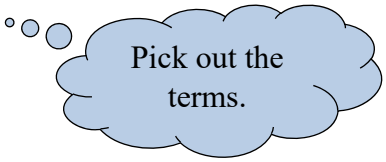
Definition: Factor: things we are multiplying

Examples: $4 \cdot x$ $2(x + 3)$ $(x + 2)(x - 1)$



Definition: Terms: things we are adding or subtracting

Examples: $4 + x$ $2x + 3$ $40 - 3x$

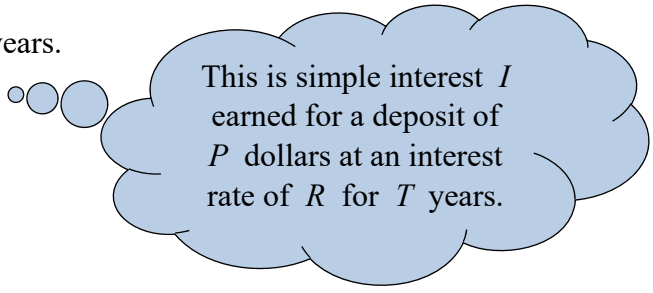


Formulas:
We will see many formulas that tell us how variables are related.

We might say that the area of a rectangle is found by multiplying its width by its length. In formula form, we write $A = l \cdot w$ where A stands in for the area, l is the length, and w is the width.

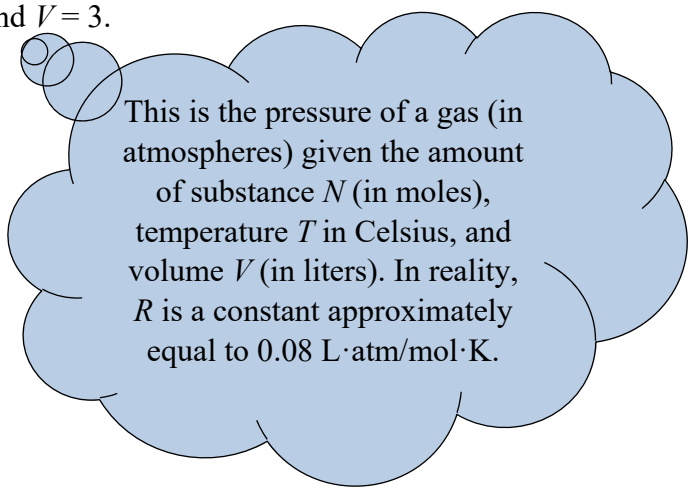
expl 1: Evaluate the following formula. Round to the nearest whole number.

$I = PRT$ for $P = \$200$, $R = 0.03$, and $T = 5$ years.

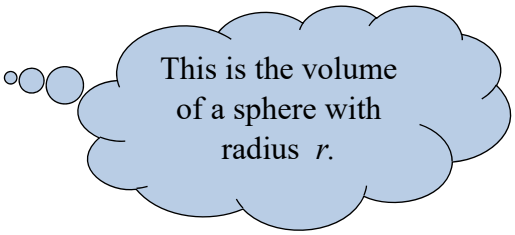


expl 2: Evaluate the following formulas. Round to the nearest whole number.

a.) $P = \dfrac{NR(T+273)}{V}$ for $N = 5$, $R = 0.08$, $T = 27$, and $V = 3$.

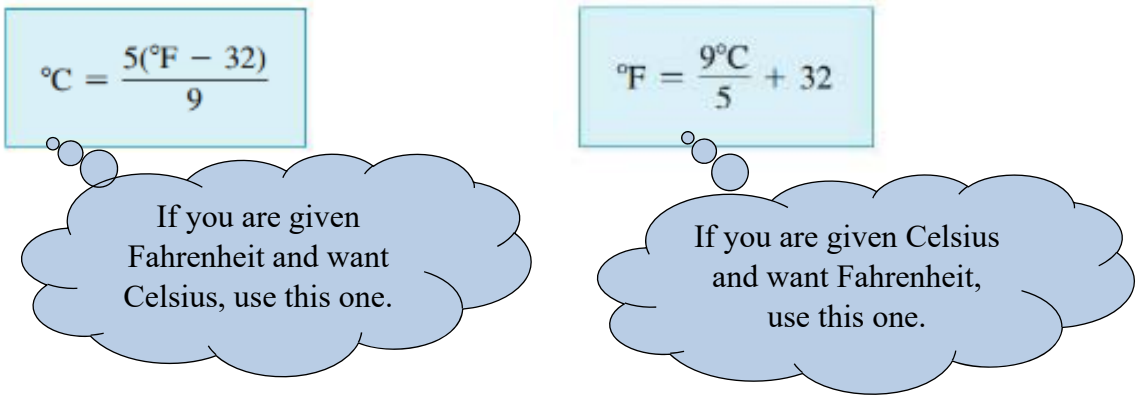


b.) $V = \dfrac{4\pi r^3}{3}$ for $r = 15$. Use 3.14 for π.



Worksheet: Beginning Algebra:
This worksheet will reinforce the definitions of factors versus terms. We will also practice using formulas.

Fahrenheit-Celsius Conversion:
When we did these conversions before, we used a thermometer to equate Celsius readings to Fahrenheit and vice versa. Here, we are given two formulas.



expl 3: Convert 100 °C to Fahrenheit.

expl 4: One way that welded parts shrink in groove joints is called **transverse shrinkage**. The amount of this kind of shrinkage S_T in millimeters is given by $S_T = \frac{A}{5T} + 0.05d$. Here, A is the cross-sectional area of the weld in square millimeters, T is the thickness of the plates in millimeters, and d is the root opening in millimeters. Suppose a plate is 16 mm thick, the cross-sectional area of the weld is 102 sq mm, and the root opening is 3.0 mm. Calculate the amount of transverse shrinkage. Round to the nearest tenth.