Gen Phys

- Get out your notebook, pen/pencil and worksheet.
- Leave EVERYTHING else in your cubbies
- Lab notebooks on the demo table on the way out.
- **Test of Math Methods this Friday!**

Lesson 5

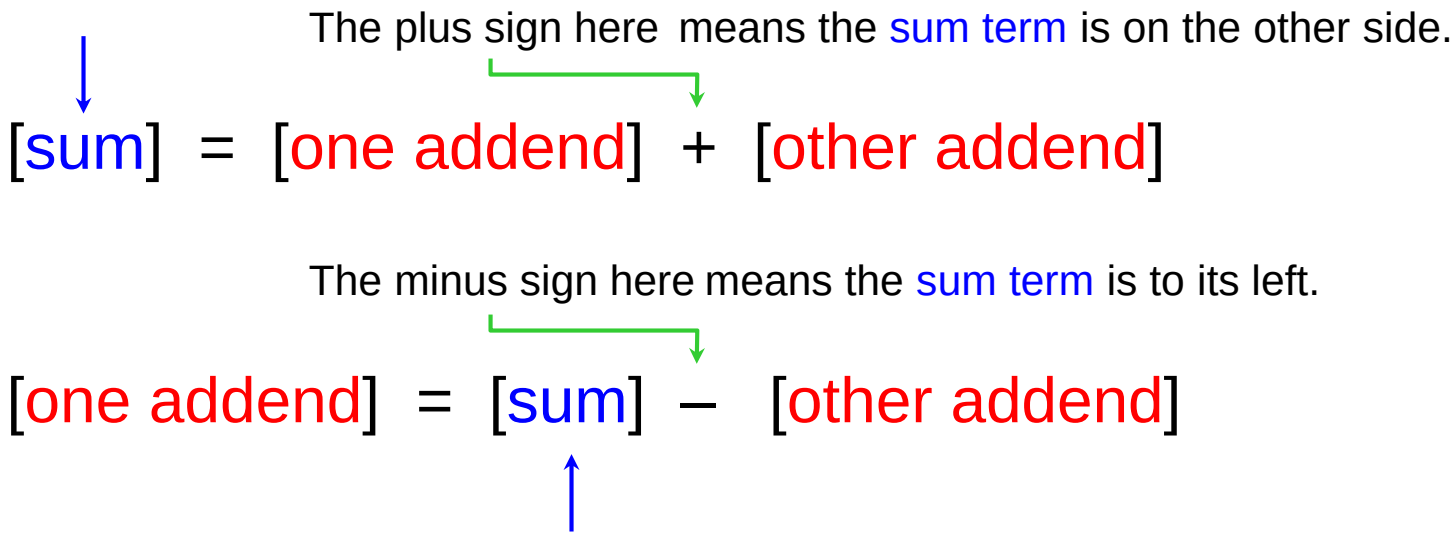
Sums and Differences with Variables

Objective:

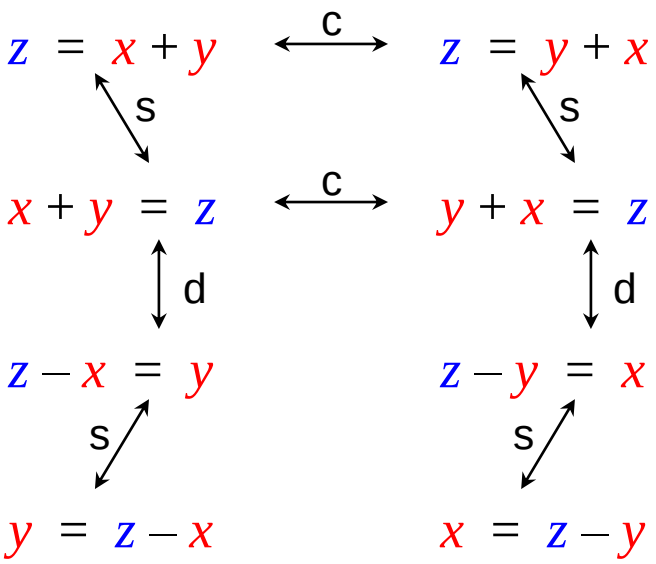
Solve sum and differences equations that contain a variable.

In solving an adding/subtracting equation, first identify the sum term and the two addends.

Recall the two basic patterns:



Recall the 8 equations that relate sums and differences, this time using variables.



s: the symmetric property of equality. If $a = b$, then $b = a$.

c: the commutative property of addition. $a + b = b + a$

d: the definition of subtraction. $a - b = c \leftrightarrow b + c = a$

$z = x + y$ $\quad$ $z = y + x$

$x + y = z$ $\quad$ $y + x = z$

The sum equals one addend plus the other addend.

$z - x = y$ $\quad$ $z - y = x$

$y = z - x$ $\quad$ $x = z - y$

One addend equals the sum minus the other addend.

The top four equations are explicit for the sum z.

The bottom four equations are explicit for one of the addends, x or y.

Identify the sum term and the two addends in the equation.

$$8 + m = t$$

The plus sign on the left side means t on the right side is the sum.

So the 8 and the m are the addends.

Now, solve the equation for m.

What kind of term is m? It is an addend.

Recall, one addend is the sum minus the other addend. So,

$$m = t - 8$$

[one addend] = [sum] – [other addend]

Identify the sum term and the two addends in the equation.

$$s = m - 4$$

The minus sign on the right side means *m* is the sum.

So the *s* and the 4 are the addends.

Now, solve the equation for *m*.

What kind of term is *m*? It is the sum.

Recall, the sum equals one addend plus the other addend. That is,

$$m = s + 4 \quad \text{(or } m = 4 + s \text{)}$$

Either order is OK.

[sum] = [one addend] + [other addend]

Identify the sum term and the two addends in the equation.

$$p - m = 7$$

The minus sign on the left side means *p* is the sum.

So the *m* and the 7 are the addends.

Now, solve the equation for *m*.

What kind of term is *m*? It is an addend.

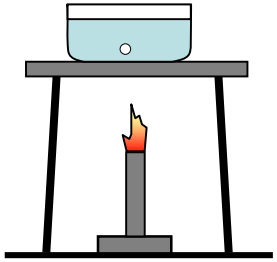
Recall, one addend is the sum minus the other addend. So,

$$m = p - 7$$

[one addend] = [sum] – [other addend]

Application (Thermodynamics): The amount of heat Q transferred to a system is equal to the change in internal energy ΔU of the system minus the work W done on the system: $Q = \Delta U - W$.

Suppose we know Q and ΔU and we want to calculate W.



Let's solve the equation for W.

$$Q = \Delta U - W$$

Which term is the sum? ΔU So Q and W are the two addends.

[one addend] = [sum] – [other addend]

$$W = \Delta U - Q$$

Remember:

[sum] = [one addend] + [other addend]

[one addend] = [sum] – [other addend]

1. $41 = x - 3n$

2. $cy = 3 + x$

3. $\frac{m}{n} - x = 5$

4. $\frac{a}{b} = x - 7$

5. $y + x = 18$

6. $23 - x = a$

1. $41 = x - 3n$

2. $cy = 3 + x$

3. $\frac{m}{n} - x = 5$

4. $\frac{a}{b} = x - 7$

5. $y + x = 18$

6. $23 - x = a$