Gen Phys

- Pen/pencil, Notebook and worksheet
- Everything else in the cubbies
- Tomorrow: Practice test and math review
- **Friday: Math for Physics TEST!!!!**

**please let me know if you need alternate testing arrangements*

Lesson 7

Mixed Equations

Objective:

Solve equations involving various operations.

We can use the 3-number method to solve combinations of sums, differences, products, and quotients.

Recall:

$$[\text{sum}] = [\text{one addend}] + [\text{other addend}]$$

$$[\text{one addend}] = [\text{sum}] - [\text{other addend}]$$

$$[\text{product}] = [\text{one factor}] \times [\text{other factor}]$$

$$[\text{one factor}] = \frac{[\text{product}]}{[\text{other factor}]}$$

Example:

Solve explicitly for each number in $\frac{28}{4} = 13 - 6$. Do not compute.

There are two ways to view this equation.

As a sum and two addends:

$$\left(\frac{28}{4}\right) = 13 - 6$$

As a product and two factors:

$$\frac{28}{4} = \left(13 - 6\right)$$

The first way is easy to solve for 13 and 6:

$$13 = \frac{28}{4} + 6 \qquad 6 = 13 - \frac{28}{4}$$

The second way is easy to solve for 28 and 4:

$$28 = (4)(13 - 6) \qquad 4 = \frac{28}{13 - 6}$$

Solve for x in $18 = 2x + y$.

There is only one way to view this equation:

18 is the sum of the addends 2x and y.

Since we cannot make x a term by itself, we first solve for the term containing x.

$$(2x) = (18) - (y)$$

Now view the equation as a product and two factors:

This is the key step.

$$(2)(x) = (18 - y)$$

Solve for the factor x.

$$x = \frac{18 - y}{2}$$

Solving Equations with Signed Numbers

Solve for x. $-4 - 6x = 11$

Group the terms so that -4 is the sum term.

[sum] [addend] [addend]

$$(-4) - (6x) = (11)$$

Solve for the addend $6x$.

$$6x = (-4) - (11)$$

Compute.

$$6x = -15$$

Solve for the factor 6 and simplify.

$$x = \frac{-15}{6} = -\frac{15}{6} = -\frac{5}{2}$$

Suppose we rewrite the original equation as $-6x - 4 = 11.$

Group the terms so that $-6x$ is the sum term.

[sum] [addend] [addend]

$$(-6x) - (4) = (11)$$

Solve for the sum $-6x$.

$$-6x = (4) + (11)$$

Compute.

$$-6x = 15$$

Now see x as a factor.

$$(-6)(x) = 15$$

Solve for the factor and simplify.

$$x = \frac{15}{-6} = -\frac{15}{6} = -\frac{5}{2}$$

One more view of the same equation:

Solve for x. $-4 - 6x = 11$

Rewrite the original equation as $-4 + (-6x) = 11$.

Now view 11 as the sum of the two addends -4 and $-6x$.

[addend] [addend] [sum]

$$(-4) + (-6x) = (11)$$

Solve for the addend $-6x$.

$$-6x = (11) - (-4)$$

Compute.

$$-6x = 15$$

Now see x as a factor.

$$(-6)(x) = 15$$

Solve for the factor and simplify.

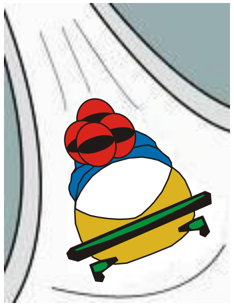
$$x = \frac{15}{-6} = -\frac{15}{6} = -\frac{5}{2}$$

So no matter how you group the terms, the 3-number method still works.

What if x appears in more than one place?

We'll answer at that in the next lesson.

Application (Mechanics): The final velocity v of an object may be found from the equation $v = v_0 + at$, where v_0 is the initial velocity, a is the acceleration, and t is the time.



Calculate the time it takes a bobsled to accelerate from 4 ft/sec to 69 ft/sec if the acceleration is 13 ft/sec[2].

Solve the velocity equation for t.

View the equation as a sum [S] and two addends [A].

$$\underset{[S]}{v} = \underset{[A]}{v_0} + \underset{[A]}{at}$$

Solve for the addend at.

$$at = v - v_0 \qquad [A] = [S] - [A]$$

Now view the equation as a product [P] and two factors [F].

$$\underset{[F]}{(a)}\underset{[F]}{(t)} = \underset{[P]}{v - v_0}$$

Solve for the factor t.

$$t = \frac{v - v_0}{a} \qquad [F] = \frac{[P]}{[F]}$$

Substitute $v = 69$, $v_0 = 4$, and $a = 13$.

$$t = \frac{69 - 4}{13} = \frac{65}{13} = 5 \text{ sec}$$