Taking Notes on Math Problems

Unit: Study Skills

NGSS Standards/MA Curriculum Frameworks (2016): SP5

AP® Physics 1 Learning Objectives/Essential Knowledge (2024): SP2.A, SP2.B, SP2.C, SP2.D

Mastery Objective(s): (Students will be able to…)

- Take notes on math problems that both show and explain the steps.

Success Criteria:

- Notes show the order of the steps, from start to finish.
- A reason or explanation is indicated for each step.

Language Objectives:

- Be able to describe and explain the process of taking notes on math problems.

Tier 2 Vocabulary: N/A

Notes:

If you were to copy down a math problem and look at it a few days or weeks later, chances are you'll recognize the problem, but you won't remember how you solved it.

Solving a math problem is a process. For notes to be useful, ***your notes need to capture the process as it happens, not just the final result***.

If you want to take good notes on how to solve a problem, you need your notes to show what you did at each step.

Use this space for summary and/or additional notes:

For example, consider the following physics problem:

> A 25 kg cart is accelerated from rest to a velocity of $3.5\,\frac{m}{s}$ over an interval of 1.5 s. Find the net force applied to the cart.

The solved problem looks like this:

A 25 kg cart is accelerated from rest to a velocity of $3.5\,\frac{m}{s}$ over an interval of 1.5 s. Find the net force applied to the cart.

(m = 25 kg; $v_o = 0$; $v = 3.5\,\frac{m}{s}$; t = 1.5 s; F_{net})

$$F_{net} = ma \qquad v - v_o = at$$
$$F_{net} = 25a \qquad 3.5 - 0 = (a)(1.5)$$
$$F_{net} = (25)(5.5) \qquad 3.5 = 1.5a$$
$$F_{net} = 138.\overline{8}\,\text{N} \qquad a = 5.5\,\frac{m}{s^2}$$

This looks nice, and it's the right answer. But if you look at it now (or look back at it in a month), you won't know what you did.

The quickest and easiest way to fix this is to number the steps and add a couple of words of description for each step:

A 25 kg cart is accelerated from rest to a velocity of $3.5\,\frac{m}{s}$ over an interval of 1.5 s. Find the net force applied to the cart.

① Label quantities (Given & Unknown): m = 25 kg; $v_o = 0$; $v = 3.5\,\frac{m}{s}$; t = 1.5 s; F_{net}

② Find Equation that has desired quantity

$$F_{net} = ma$$
$$F_{net} = 25a$$

③ Need another equation to find a

$$v - v_o = at$$
$$3.5 - 0 = (a)(1.5)$$
$$a = 5.5\,\frac{m}{s^2}$$

④ Solve for a

⑤ Substitute a into 1st equation

$$F_{net} = (25)(5.5)$$
$$F_{net} = 138.\overline{8}\,\text{N}$$

⑥ Remember the unit!

The math is exactly the same as above, but notice that the annotated problem includes two features:

- Steps are numbered, so you can see what order the steps were in.
- Each step has a short description, so you know exactly what was done and why.

Annotating problems this way allows you to ***study the process***, not just the answer!

Use this space for summary and/or additional notes: