

Taking Notes on Math Problems

Unit: Introduction

NGSS Standards/MA Curriculum Frameworks (2016): SP5

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 a math problem.

Summary of Concepts:

- Label the steps that lead to the solution, in order.

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, they need to describe 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.

For example, consider the following problem:

How much heat is needed to increase the temperature of a 25 g sample of a metal with a specific heat capacity of $0.375 \frac{\text{J}}{\text{g}\cdot^{\circ}\text{C}}$ by 40°C ?

The process of solving this problem involves applying the equation $Q = mC\Delta T$, where Q is the amount of heat, m is the mass of the metal, C is the specific heat capacity of the metal, and ΔT is the temperature change. (Note that ΔT is only one quantity, even though it uses two symbols.)

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A good way to document the process is to use a T-chart, in which you show the steps of the solution on the left side, and you write an explanation of what you did and why for each step on the right side.

For this problem, your T-chart might look like the following:

Step	Description/Explanation
$m = 25 \text{ g}$ $C = 0.375 \frac{\text{J}}{\text{g} \cdot ^\circ\text{C}}$ $\Delta T = 40 \text{ }^\circ\text{C}$ Q = quantity desired	Declare variables.
$\underline{Q = m C \Delta T}$	Choose a formula that gives the desired quantity. Make sure we have values for the other variables.
$Q = m C \Delta T$ $Q = (25) (0.375) (40)$ $Q = 375$	Look up the values of any constants needed to solve the problem. Substitute for the variables and solve. (Show as much of the algebra as you think you'll need later.)
$Q = \boxed{380 \text{ J}}$	Round to the appropriate number of significant figures, include the units, and box the final answer.

You will notice that the answers are provided for many of the homework problems in these notes. This is because students are often unsure of whether they are doing a problem correctly until they see whether or not they got the correct answer. This means that if your teacher assigns these problems for homework, it is not sufficient to just write down the answer.

When a teacher says "show work," this does not necessarily mean you should show what you did to obtain the answer. Rather, it means:

1. Declare variables and assign them to values (with units).
2. Write down the relevant equation.
3. Substitute numbers for variables in the equation.
4. Solve for the missing variable.
5. Round to the appropriate number of significant figures and tack on the correct units.

This process would correspond to the left column of the above T-chart.

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