

Thoughts on Physics Problem Solving

Physics and Math of Sustainable Energy

College of the Atlantic

I strongly recommend following the suggestions and guidelines below. These are practiced by almost all experienced physics problem solvers.

1. Start by paraphrasing or re-writing the problem. There are at least two benefits to this. Writing helps to focus your mind and make sure you have read the problem correctly. And if you re-state the problem, your solutions now stand on their own. They are readable to someone (perhaps you at a future date) who has not seen the problem statement from the textbook.
2. Make a list of the bits of information given in the problem. If variables are unknown, you can denote them with a '?'. State what it is that you need to solve for.
3. Often it is helpful to draw a sketch or a diagram of the situation. Like writing, this can help get you focus on the problem.
4. If you have to do some re-arranging of an equation (e.g., $P = E/t$ and you need to figure out t), it is almost always better to do the re-arranging *before* you plug in numbers.
5. If you are doing some algebra, it can be helpful to write a little note to yourself about what you're doing. (E.g., "I need to solve for t .")
6. Most of the time you should do conversions by hand, and write out the units.
7. Speaking of units, any physical quantity should always be written with units.
8. Never write down a bonkers number of significant digits. Really. Past a certain point, the digits cease to have meaning.
9. For your final answer, check that the units are right and that the answer makes sense. This last step isn't always done in writing.
10. If you see that you're going to have a multi-step process ahead, or if you've got some complicated steps ahead, write a sentence describing your strategy. (E.g., "I've gotta end up in seconds in order to be in Watts, so I'll convert years to seconds.")
11. Use a lot of space. You might want to try unlined paper; there's an almost unlimited supply of this in the recycling bins, and not having lines encourages you to write large and give yourself space. If you are unable to liberate yourself from lined paper, try skipping some lines.

Additional Thoughts

1. Problem write-ups are your permanent record of your understanding of the material covered. Write them so that if you look at them a few months or years from now, they will be understandable to you.
2. The reason I emphasize writing up your problem solutions clearly and thoroughly is not because I am a neat freak or because I want to impose a style on you. Rather, I am convinced (and there is evidence in support of this proposition), that the act of writing helps to focus one's thoughts and engages your mind, leading to more enduring learning.
3. You should aim to develop some sort of semi-structured style for solving problems. Different people have different styles. But good, experienced problem-solvers all have some sort of system that they use.
4. I will not give numerical grades on HW assignments. Instead, I will give a letter grade and try to include as many comments as I can. I'm mainly interested in seeing that you thoughtfully attacked the problem and wrote it up in a clear and coherent way. It is better to be clear and wrong than unclear and right. If you only want comments and don't want a letter grade on your HW, please write a note to this effect on the top of your assignment.