

Successful Problem Solving Methodology Summary

1. First Things First

- Don't start solving a problem that you don't understand, hoping you will "be inspired" from your efforts. Usually you will just further confuse yourself.
- State a BASIS where appropriate
- Use more than one BASIS if appropriate
- Clearly state ASSUMPTIONS
- If possible, use final answer to check ASSUMPTIONS.
- Interpret results in light of ASSUMPTIONS

2. Make Effective Sketches

- Learn to sketch (and doodle) whenever you can't picture or clearly see the relationships which involve the problem statement.
- Make sketches of appropriate size (at least twice as large as you are used to).
- Use drawing aids (straight edge, ruler, curves, templates)
- Work ONLY in pencil !!
- [Are sketches providing help in visualizing the problem?](#)
 - ✓ Resketch until you can visualize the issue
 - ✓ Is a "before" and "after" appropriate?
 - ✓ What happens "during the process"
 - ✓ Can I simplify the "physics" of the situation?
 - ✓ Eliminate unnecessary "clutter"
 - ✓ Do you need more sketches? Resist urge to solve a problem you don't fully understand.

3. Use Effective (Consistent) Nomenclature and Abbreviations

- Start with nomenclature which describes the answers required. Develop a defining relationship (equation) which expresses this variable.
- Does the nomenclature appear (when appropriate) on problem sketches?
- Use standard symbols when possible
- Use standard abbreviations for units: psig NOT psi(g), kg/s NOT KG/sec
- Always cover "naked decimal points" 0.00317 NOT .00317

4. Employ Consistent Standard Units (CSU).

- To minimize conversion errors, convert given problem data and physical property values to one unit system. For example: ENG: (ft) (s) (lb) (lbf) or SI: (m) (s) (kg) (N)
- Do not needlessly convert problem data and answers into other major unit systems (ENG -> SI -> ENG)
- Data values which needed have been converted may appear on problem sketches but should be presented in parentheses. For example, $d = (36") = 3 \text{ ft}$.
- Make sure final answers are expressed in the units specified in the problem statement.

5. Identify Final Answers

- Double underline AND appropriately identify (circle) all final answers.

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- [Make double underlining a reminder to double check THE PROBLEM STATEMENT ...](#)
 - ✓ Did I answer the right question?
 - ✓ Did I employ the required units?
 - ✓ Are there other parts of the problem to work?

6. Strategic Time Management (Exams)

- Allocate a specific amount of time to work each problem
- Come prepared to "divide" the available time appropriately
- Recognize "test anxiety". Have a plan to deal with it
- Work to maximize your grade by maximizing partial credit
- Little credit will be awarded for simply listing equations since exams stress showing you know how to apply the equations
- Don't depend on the book for "help". The book should provide DATA or SPECIFIC EQUATIONS, not "insight"

7. The Paper Chase

- Start each problem on a new page
- Leave an area for "massaging" problem data
- Keep track of time to complete problem. Note the time you will FINISH the problem in the left margin.
- "Bubble" independent thoughts/developments
- Leave generous WHITE SPACE
- Learn to organize your thinking. Homework is an engineering COMMUNICATION and needs to be logical, clear, and concise.

8. Think Think Think

- First CITE the BASIC PRINCIPLES rather than specific equations. Learn the names of important concepts (continuity equation, second law of motion, first law of thermodynamics, etc.). After you understand the principles involved in a problem you can cite the appropriate equation.
- Don't write equations you aren't certain apply.
- On exams, much credit is lost by using an equation when it doesn't apply. You reveal your lack of understanding.
- Get "into" the process. "Feel" the subject matter.
- Put major (applicable) equations down first and then auxillary equations
- Ask, "Do my intermediate results and FINAL results MAKE PHYSICAL SENSE"?

9. Bring Your Skills and Knowledge With You

- To be an effective problem solver you need to have at your fingertips considerable "general information".
- Appreciate that the human mind is fairly "puny" and can only hold and manipulate 4 or 5 pieces of information at one time.
- Review math concepts (algebra, trig, geometry, calc), chemistry concepts (chemical names, formulas, equation balancing), physics concepts (force, vectors, electrical concepts)
- Be prepared to recognize and employ trial and error techniques
- Learn critical thinking skills.
- Learn creative problem solving techniques