Getting Unstuck

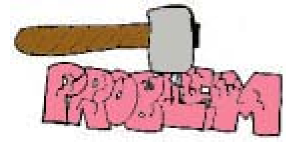
1. Persevere! Keep trying different strategies and stay open to creative ideas.
   Try not to get frustrated.

2. Be more active in the solution!!
   A. Ask yourself questions about the problem. Is this problem a routine one? What data are missing? What equations can I use? Explore the problem.
   B. Draw sketches of what you think that the solution should look like. (e.g. temperature-time curve).
   C. Write equations.
   D. Keep track of your progress.

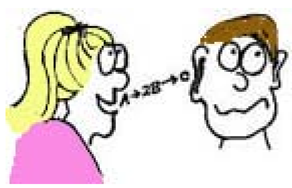
3. Re-focus on the fundamentals. Review the textbook and lecture material. Look for similar examples. Study the examples given. Change what is given in the example and what is asked, then try to see how it might relate to the problem you are addressing.

4. Break the problem into parts. Analyze the parts of the problem. Concentrate on the parts of the

problem you understand and that can be solved.



5. Verbalize the problem to yourself and others.

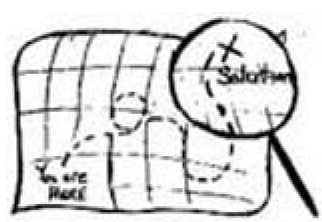


Describe...

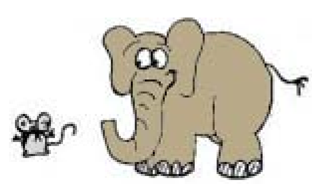
   A. what the problem is
   B. what you have done, and
   C. where you are stuck

6. Paraphrase. Re-describe the problem. Think of simpler ways to describe the problem. Ask other classmates to describe the problem to you in their own words.

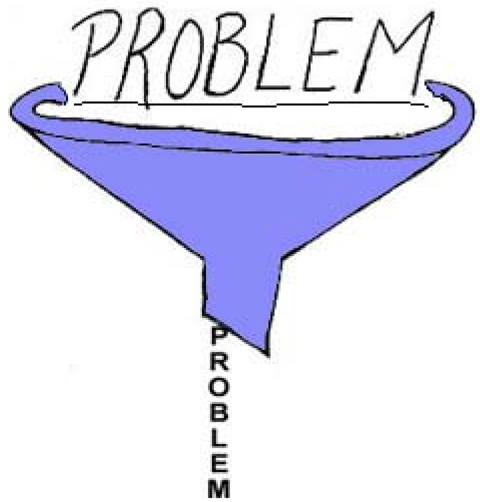
7. Use a heuristic or algorithm. The [algorithm for closed-ended problems] on this site is a good start, and others may be available to you.



8. Look at extreme cases that could give insight and understanding. For instance: What happens if x = 0? x = infinity?



9. Simplify the problem and solve a limiting case. Break up the problem into simpler pieces and solve each piece by itself. Find a related but simpler example and work from there.



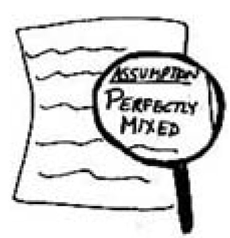
10. Try substituting numbers to see if a term can be neglected.

What if k=1 and m=0?

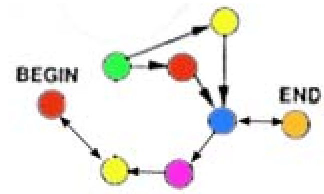
11. Try solving for ratios to drop out parameters that are not given. You may find that you don't need to find some parameters because they cancel out!

$$\frac{V_1}{V_2} = \frac{L_1 * W_1 * \overset{1}{\cancel{H}}}{L_2 * W_2 * \cancel{H}}$$

12. Look for hidden assumptions or for what information you have forgotten to use. After reading each phrase or sentence of the problem statement,
ask yourself if any assumptions can be inferred from that phrase.



13. Alternate working forward towards a solution and backwards from a solution you assumed. Working backwards may at least give you clues as to how you should approach the problem while working forward.



14. Take a break. Incubate. Let your subconscious
work on the problem while you do something else,
like exercising, talking to friends, or just relaxing! Sometimes all you need is a break
to achieve that final breakthrough!

15. Brainstorm. Think of different approaches to the problem, no matter how strange. Guess the solution to the problem and then check the answer.

16. Check again to make sure you are solving the right problem. Double-check all of your values, assumptions, and approaches. Make
sure you haven't missed anything
and that you are looking for the correct solution.

17. Try using a different strategy. There is usually more than one way to solve a problem, and you may find a method that you haven't
considered is much easier than the
one you're working on currently.

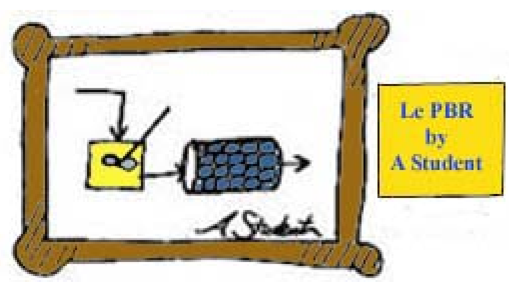
18. Ask for help! There are many resources you may go to for additional instruction or ideas. Instructors can usually steer you in the right direction and clarify your understanding of the problem. If allowed, your classmates
may be the biggest source of help,
since they usually utilize many different approaches and can relate
to your approach.

Algorithm

1. Write out the problem statement. Include information on what you are to solve, and consider why you need to solve the problem.

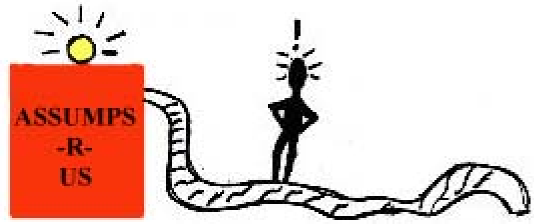
2. Make sure you are solving the **real** problem as opposed to the **perceived** problem. Use techniques such as "Finding out Where the Problem Came From," "The Duncker Diagram," "The Explore Phase," etc. to check to see that you define and solve the **real problem**. Recast the problem statement if necessary.

3. Draw and label a sketch. Define and name all variables and/or symbols. Show numerical values of variables if known.

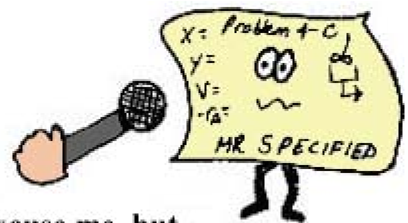


4. Identify and name
   A. Relevent principles, theories and equations
   B. Systems and subsytems
   C. Dependent and independent variables
   D. Knowns and unknowns
   E. Inputs and outputs
   F. Necessary (missing) information

5. List assumptions and approximations involved in solving the problem. Question the assumptions and then state which ones are the most reasonable for your purposes.

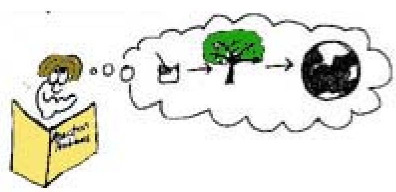


6. Check to see if the problem is either under-specified or over-specified. If it is under-specified, figure out how to find the missing information. If over-specified, identify the extra information that isn't needed.



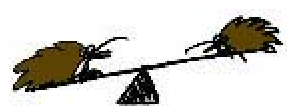
Excuse me, but are you OVER or UNDER Specified?

7. Relate problem to a similar problem or experience (compare to an example problem in lecture or in the book).



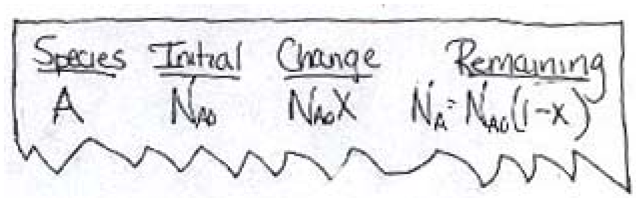
8. Use an algorithm (e.g. reaction engineering)

   A. Mole Balance



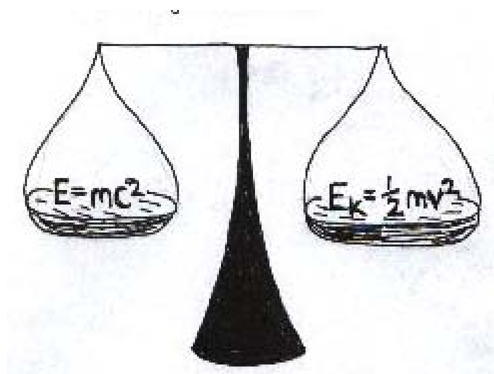
   B. Rate Laws
      i. Kinetic
      ii. Transport

C. Stoichiometry
   i. Gas or liquid
   ii. Pressure drop



D. Combine

E. Energy Balance



F. Evaluate

9. Develop/derive/integrate and/or manipulate an equation or equations from which the desired variable can be determined.

A = problem
B = solved
C = A + B = ?

10. Substitute numerical values and calculate the desired variable.
    Check your units at each step in

the solution to find possible errors.

$$\text{velocity (m/s)} = \frac{\Delta x}{\Delta t}$$

$$= \frac{10 \text{ km}}{5 \text{ min}} * \frac{1 \text{ min}}{60 \text{ sec}} * \frac{1000 \text{ m}}{1 \text{ km}}$$

$$= 33\ \tfrac{1}{3} \text{ m/s}$$

11. Examine and evaluate the answer to see it makes sense.
    Is it reasonable, considering the problem statement? Does it
    consider safety and ethical issues?