PROBLEM SOLVING PROCEDURES

The ability to solve problems directly and quickly is a hallmark of an efficient and knowledgeable physics student. It is also the sign of someone who has become a formal reasoner - one who can deal with the abstract in a constructive way. Through practice in the solution of problems a physics student attains an ability and confidence in independent thinking.

In problem solving, a systematic approach is highly recommended. An orderly procedure aids clear thinking, helps avoid errors, and usually saves time. Most important, it helps a student to analyze and eventually solve the more complex problems whose solution is not immediately or intuitively apparent.

Problem-Solving "Flow Chart":

1. Read the statement of the problem carefully, and decide exactly what information is required.

2. Draw a suitable diagram and/or list the data given.

3. Identify the type of problem, and write physical principles which seem relevant to its solution. These principles may be expressed concisely as algebraic equations.

4. Determine if the data given are adequate to solve the problem. If not, decide what is missing and how to get it. This may involve consulting a table, making a reasonable assumption, or drawing upon general knowledge for such information as the value of "g", the acceleration due to gravity.

5. Decide whether in the particular problem it is easier to substitute numerical values immediately or first carry out an algebraic solution. Some quantities may cancel.

6. Substitute numerical data in the equations obtained from physical principles. Include the units for each quantity, making sure that they are all in the same system in any one problem.

7. Compute the numerical value of the unknown, preferably with the aid of a calculator. Determine the units in which the answer is expressed. Examine the reasonableness of the answer. Is the result the correct order of magnitude? If the required answer is a velocity, are its units expressed, say, in meters per second rather than, say, Newton-seconds per kilogram?

8. If there is uncertainty in the result, can the answer be obtained by an alternative method to serve as a check?

It should be pointed out here that the best way to both understand physics processes and prepare for tests is by doing problems. If you can't do physics problems, you don't know physics. Learning physics is much like learning how to ride a bicycle. You can read all about the process, but unless you actually get on the bike and give it a try, you'll never learn how to ride.