GOAL Problem Solving Steps

Gather information

The first thing to do when approaching a problem is to understand the situation. Carefully read the problem statement, looking for key phrases like "at rest," or "freely falls." What information is given? Exactly what is the question asking? Don't forget to gather information from your own experiences and common sense. What should a reasonable answer look like? You wouldn't expect to calculate the speed of an automobile to be 5×10^6 m/s. Do you know what units to expect? Are there any limiting cases you can consider? What happens when an angle approaches 0° or 90° or a mass gets huge or goes to zero? Also make sure you carefully study any drawings that accompany the problem.

Organize your approach

Once you have a really good idea of what the problem is about, you need to think about what to do next. Have you seen this type of question before? Being able to classify a problem can make it much easier to lay out a plan to solve it. You should almost always make a quick drawing of the situation. Label important events with circled letters. Indicate any known values, perhaps in a table or directly on your sketch. Some kinds of problems require specific drawings, like a free body diagram when analyzing forces. Once you've done this and have a plan of attack, its time for the next step.

Analyze the problem

Because you have already categorized the problem, it should not be too difficult to select relevant equations that apply to this type of situation. Use algebra (and calculus, if necessary) to solve for the unknown variable in terms of what is given. Substitute in the appropriate numbers, calculate the result, and round it to the proper number of significant figures.

Learn from your efforts

This is actually the most important part. Examine your numerical answer. Does it meet your expectations from the first step? What about the algebraic form of the result before you plugged in numbers? Does it make sense? (Try looking at the variables in it to see if the answer would change in a physically meaningful way if they were drastically increased or decreased or even became zero.) Think about how this problem compares to others you have done. How was it similar? In what critical ways did it differ? Why was this problem even assigned? You should have learned something by doing it. Can you figure out what?

For complex problems, you may need to apply these four steps of the GOAL process recursively to subproblems. For very simple problems, you probably don't need this protocol. But when you are looking at a problem and you don't know what to do next, remember what the letters in GOAL stand for and use that as a guide.

Selected problem solutions in this study guide follow the GOAL problem solving strategy. These problems should serve as examples of how the GOAL strategy can be applied to nearly any physics problem.