

## Teacher Resources

### Recommended Books

1) *Surely you're joking, Mr. Feynman!*, By Richard Feynman – One of the most brilliant physicists of the 20th Century teaches, in a lighthearted manner, how to think about problems in physics.

2) *Physics*, by John Cutnell and Kenneth Johnson

3) *Introductory Physics*, By Jerold Touger

### Recommended Physics Web Sites

1) [www.scientificamerican.com](http://www.scientificamerican.com)

2) [www.splung.com](http://www.splung.com)

3) [www.howstuffworks.com/](http://www.howstuffworks.com/)

4) [www.hyperphysics.phy-astr.gsu.edu/hbase/hph.html](http://www.hyperphysics.phy-astr.gsu.edu/hbase/hph.html)

5) [www.physicscentral.com/](http://www.physicscentral.com/)

6) [www.sciencejoywagon.com/physicszone/](http://www.sciencejoywagon.com/physicszone/)

7) [www.rlgreene.org/illum.html](http://www.rlgreene.org/illum.html)

8) [www.edinformatics.com/il/il\\_physics.htm](http://www.edinformatics.com/il/il_physics.htm)



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# LEARNING by Example

the  
PHYSICS  
tutor



## ACCELERATE YOUR MATH SKILLS

# User Instructions & Teachers Resource Guide

Grade Level: 9 - College

## **Introduction**

Physics is frequently one of the hardest subjects for students to tackle because it is a combination of two of the toughest subjects for most students: Math and Word Problems.

If the student understands the math but doesn't do well with word problems then they will encounter difficulty. Likewise if students understand the word problem at hand but have no idea where to begin with the math, again, they will encounter difficulty.

By taking the lessons one step at a time and focusing on the core concepts in a methodical manner, you can help the student gain confidence in his or her problem solving skills. Once this confidence is gained, mastery of the material follows in short order.

## **How to Use This Lesson**

### **In The Classroom**

Physics intimidates many students. For this reason, when using this lesson in the classroom, the following techniques may be useful.

After a problem is presented but before the solution begins, pause the video and make sure that each and every student completely understands what information is given in the problem and what needs to be solved.

After the problem has been solved in the lesson, pause the video and make sure that every student understands every step in the solution.

In some cases it is helpful after a student watches the solution to a problem to pause the video, present the very same problem on the chalkboard, and ask the class to solve it again. Even though it is the very same problem, this process reinforces the steps needed to reach the solution and, more importantly, gives the student confidence.

### **At Home - Self-Study**

When using this lesson at home for self study, the following tips are useful.

Rewind the video at any time if you do not understand something. It is very important that the student understand every single step in the solution in order to gain confidence and understanding of the solution process.

The problems are specifically chosen so that the earlier problems are less difficult than the later problems. For this reason, if a student doesn't understand the solution to problem 1 of the lesson and goes on to problem 2 or problem 3, it will lead to a lack of understanding. Continue repeating a problem solution until it is fully understood prior to continuing on.

### **Homework Strategy**

The method of teaching employed in this lesson is to introduce the concepts by working example problems. This gives the student confidence and the skills to do well on homework and exams.

The best way to master the material and prepare for exams is to work many, many problems and ensure the correct answers are reached every step of the way. It is very beneficial to work the odd numbered problems in the back of the student's textbook and check answers for each problem. Start with the easier problems and work your way to the harder problems.

After homework has been assigned it is useful to have some of your students work the problems out on the board for the benefit of the other students. This allows the student to explain his or her thought process. Sometimes hearing another student's solution will allow other students to "get it".

### **Test Taking Tips**

The following test taking tips are very useful in physics:

- a) Write down what information is given in the problem.
- b) Write down what is asked to be solved for (the unknown).
- c) Write down any relevant equations to the problem at hand.
- d) Try to devise a strategy in order to solve the problem.
- e) Using the equations and your strategy, begin to solve for the unknowns in a step-by-step fashion.

### **Checking Your Work**

In many cases it is easy to check your solution and not let errors creep into the final solution. The best way to do this is to simply do the calculations a second time and verify the math. Another method is to take the answer and plug it back into the relevant equations to verify that the solution is correct.

### **Final thoughts**

Physics is taught best by working example problems. It will be necessary to give a short lecture at the beginning of the day to explain the concepts, but it is in many cases very helpful to immediately supplement the lecture with worked example problems. When doing this use the methods employed on this lesson. Specifically, state the problem clearly and make sure that every student understands it, form a plan to solve the problem, and work each solution in a step-by-step manner.

When you are done solving a problem do not assume that every student fully understands the solution. Ask the students probing questions to ensure that they have mastered the material. By working many example problems, and by using this lesson as a guide for practice problems, learning physics will be easier for the student.