## **Color-Coding in Problem Solving**

In solving Physics problems, due to the large number of variables in the equations, it is helpful to use a color-coding method to a solve system of equations. The color-coding is necessary throughout every step of the IDEAS process, but is specifically useful in the Algebra/Analysis step of the problem solving method.

I suggest using 3 colors when solving problems. While the colors themselves are up to the physicist, the categories are as follows:

- "Givens": the values that are known in the problem. This includes "hidden" givens.
- **"Finds":** the variables that you need to solve for.
- **Miscellaneous:** parts of the equation(s) that are neither Givens or Finds. This includes non-variable coefficients and "intermediate" finds.

The goal in using this color-coding methodology is to help the physicist decide which equations to use to solve for specific variables. While there may be instances where there is more than one possible way to solve for a specific variable, generally speaking, one will select an equation that contains only one of the Finds to be solved for and the rest of the equation will consist of Givens or non-variable coefficients.

Once an equation has been selected using the color-coding method, the physicist will use algebra to solve for the Find in question. The equation will be fully solved when one side of the equation is made up of only Givens and the other side is only the desired Find.

## **IDEAS**

**I** DENTIFY **DIAGRAM E QUATION** LGEBRA

Identify all information: "givens" and "finds"

Draw a picture or diagram with all info included

Select equations that connect the information

Solve the equation algebraically

Plug in numbers, check units, sig figs



IDENTIFY:

- Underline any key phrases in the problem statement that may help to reveal key information in the problem.
- Identify all the Givens (known quantities) and Finds (desired unknown quantities) in the problem statement.
- Include "Hidden Givens" that may be necessary to solve the problem.
- Pay attention to vector components.

DIAGRAM:

- Draw a picture of the situation.
- Label any and all distances and vector quantities that are visible. Include all units and vector arrows.
- Draw any graphs that are necessary for solving the problem. Be sure to include the axis labels and units. EQUATION:
  - Write out all equations that may be useful to solving this problem.
  - Be sure to write out all component versions of any vector equations. (This will likely double the number of necessary equations).

ALGEBRA:

- Perform any algebra needed to isolate the Find(s) from the Givens.
- The ONLY value that may be plugged into the equations in this step is ZERO. This is to simplify the algebraic process.

SOLUTION:

- Rewrite the equation obtained from the algebra step.
- Plug in all Givens (including units) and compute the value of the Find(s).
- Check units, significant figures, and vector notation.