Distinguishing Between Solution and Answer When Solving Physics Problems

"Sloppy work tends to be habit-forming."
–Silk, The Belgariad, Book 4

Issue: Students often confuse "solution" with "answer" to a problem. The former refers to the set of steps that describe the process or strategy used; while the latter generally represents the last step or final value in the solution.

For a final answer to make physical sense, it must be preceded by a logically presented solution. For that reason, it is the **solution** what is graded. This is not negotiable.

Some characteristics to have in mind:

The Solution:

- describes the steps, procedure, methodology or technique utilized;
- includes the fundamental principle or relationship;
- displays correct physical and mathematical grammar;
- works for variations of the problems with different values for the variables;
- includes the final answer.

The Answer:

- final value or expression in the solution.

Because a correct answer may be obtained by chance (or looking at someone else's work…) or with flawed physics/mathematics, emphasis is given to the **solution**.

Simply stated:

- an unsupported answer, even if correct, receives little to no credit; while
- an incorrect answer which follows clear and proper procedure earns most credit.

Checklist, Non-Negotiable:

- Include the fundamental principle or equation in its general form.
- Include the fundamental principle or equation, specified to the given problem.
- Have a clear distinction between the types of quantities involved (e.g. vectors and scalars).

For a more general checklist, see the next page.

General Solution Checklist

____ **Is a diagram or sketch required?**
e.g. free-body diagram, motion diagram, setup sketch.

____ **Does the solution identify the type of problem?**
e.g. is it clear whether the problem involves dynamics, kinematics, equilibrium, conservation laws, etc?

____ **Is the fundamental principle or equation included?**
note: proper presentation of the fundamental principle or equation identifies the type of problem, so this item may also cover the one above.

____ **Are the variables or quantities specific to your problem identified?**
e.g. say an equation includes a force F. After presenting the equation, are you using the specific force in your problem? Is it "F" or is it F_G, n, T, F_s, etc)?
also check: are you being consistent in your notation?

____ **Is direction important in the problem?**
e.g. are you dealing with vectors or scalars? are you working a specific orientation in space?

____ **If other equations are necessary, did you include them before substituting any values?**
note: always include the most general form of the equation first, before substituting any values.

____ **Are all algebraic and/or trigonometric steps clearly presented?**
note: watch out for proper math grammar.

____ **Is the answer clearly identified or identifiable?**
e.g. did you put a box around it or presented it at the end, or is the work all scattered?

____ **Did you assess the accuracy of your answer?**
e.g. are units and/or dimensions consistent? does the magnitude make sense?