

## Problem Solving Framework

Read the problem carefully.

Draw a useful picture (sketch) that shows how the objects are related spatially and identify the time sequence of events. Label given quantities on the picture.

Restate the question in your own words (if necessary).

Describe the physics concepts that might be useful to reach a solution [e.g., kinematics, Newton's 2<sup>nd</sup> Law, conservation of energy].

Describe any *approximations* (e.g., ignore air friction) or *constraints* (e.g., the blocks move together so they have the same acceleration) that are reasonable to apply.

Draw physics diagram(s) with convenient coordinate systems

Define variables *symbolically*.

- Identify the known and (unwanted) unknown quantities.
- Identify the target quantity -- the unknown quantity that will provide the answer to the question.

Write the equations of the physics concepts [e.g.,  $v_{ave} = \frac{\Delta v}{\Delta t}$ ,

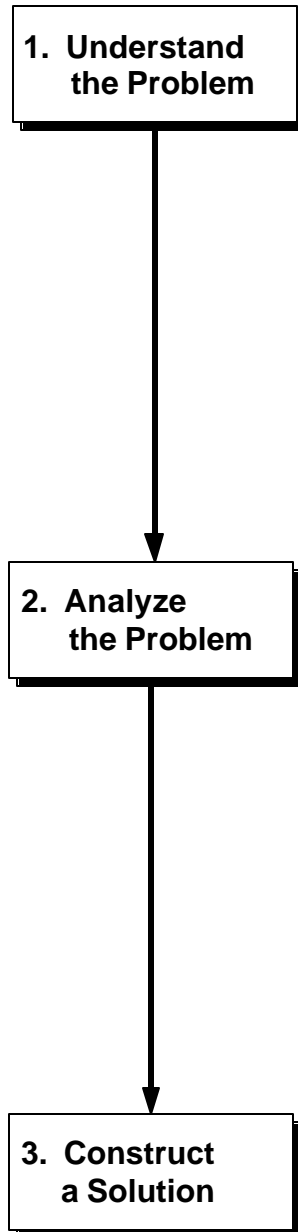
$x_f = x_o + v_o \Delta t + \frac{1}{2} a (\Delta t)^2$ ] and constraints [e.g.,  $a_1 = a_2 = a$ ] you identified in Step 1.

Apply equations to all the relevant objects at the relevant times. Do you have enough equations (including constraint equations) to eliminate the unwanted unknowns?

Use math (algebra/calculus) to solve for target variable(s).

Check the units of your equation to see if you made any mathematical errors.

Substitute numerical values of known quantities into your equation(s) and calculate the value of the target variable. Answer the question.



# Answer Sheet

Course: \_\_\_\_\_ Section: \_\_\_\_\_

Date: \_\_\_\_\_

**Manager:** \_\_\_\_\_

**Recorder:** \_\_\_\_\_

**Skeptic:** \_\_\_\_\_

**Skeptic:** \_\_\_\_\_

## UNDERSTAND THE PROBLEM

Picture and Given Information

Question:

Physics Concepts:

Approximations and Constraints:

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## ANALYZE THE PROBLEM

Diagram and Define Quantities

Target Quantity

Useful Equations:

**CONSTRUCT A SOLUTION**

Construct specific equations, eliminate unwanted unknowns, and solve for target quantity.

Check Units

Calculate Numerical Answer