Problem Solving
Problem Solving Procedure

1. Problem definition
2. Analyze information
3. Gather tools
4. Plan solution steps
5. Evaluate solution steps
6. Solve problem
7. Check answer
8. Present the result
Problem Definition

• Read the problem carefully
  – Many mistakes are made by reading too quickly
• Determine what is really being asked
  – Some questions have extraneous information present
  – Some questions ask for more than one thing
Example Problem

A refrigerator’s 750-Watt motor runs for an average of 12 minutes every hour. Assuming no power is consumed when the refrigerator motor is off, and electricity costs $0.10/kWh, what is the typical annual cost of running the refrigerator?
Analyze Information

• Clearly present all information given in the problem
  – This includes:
    • Given quantities
    • Implied quantities
    • Unknown quantities
    • Quantities to be determined
Example Problem

A refrigerator’s 750-Watt motor runs for an average of 12 minutes every hour. Assuming no power is consumed when the refrigerator motor is off, and electricity costs $0.10/kWh, what is the typical annual cost of running the refrigerator?
Information

- **Given quantities**
  - 750-Watt motor
  - 12 minutes/hour
  - $0.10/kWh

- **Implied quantities**
  - Minutes in an hour (60 minutes)
  - Hours in a day (24 hours)
  - Days in a typical year (365 days)

- **Unknown quantities**
  - Total annual power consumed
  - Total annual operating cost

- **Quantity to be determined**
  - Total annual cost
Gather Tools

• Evaluate applicable tools
  – Methods of analysis
  – Equations
  – Principles
  – Physical Laws
  – Computer Software

• Analyze how each of the tools specifically applies to the problem
Plan Solution Steps

• Many problems have intermediate steps
  – For example, a problem may ask for the power absorbed by a resistor
    • Intermediate quantities would be current and potential

• Not all correct paths to a solution are equal
  – Getting a correct answer is not the only goal
    • Usually want the simplest approach
    • Always want an approach that allows for intuitive checking at every step
Evaluate Solution Steps

• Write out the equations to be used and steps to the solution
  – How do the equations and steps specifically apply to this problem?
  – Does the solution path actually solve the problem?
  – Do we need more information for the solution to work?
  – Do we need additional tools to solve the problem?
Solve Problem

• Carefully apply the solution
  – Pay attention to details
    • Algebra
    • Numeric calculations
    • Check the information entered into calculators or computers
    • Keep track of units and dimensions
Check Answer

- Retrace the solution
  - Verify the steps and calculations
- Determine if the result is reasonable
  - Extreme answers look foolish
- Verify that the question is answered
  - Even a technically correct answer is useless if it does not answer the question
    - “Oh, I thought the problem asked for something else.”
Present the Result

• A correct number does not equal a correct answer
  – Illegibly written
  – Not presented as requested (not underlined)
  – No or incorrect dimensions (a potential of 5A)
  – Irrelevant units (281,801.17 Bolivares)
  – Incorrect significant digits ($\underline{131.40}$=$130$)
  – Exact number errors (e.g. there are 2.4 people in the car)
Present the Result cont.

- Even the best solutions/ analyses need to be presented well
  - The most innovative ideas still need to be sold
  - Poor presentation can cause good ideas to be ignored
  - Poor presentation can make it easy to dismiss even an intelligent analysis /idea