METHODOLOGY of ANALAYSIS:

1. Recognise, understand, **define**, document the problem (Specify required outputs) [ART]
2. Accumulate **data** and verify accuracy (problem inputs)[ART]
3. Select an appropriate **theory** or principle recognising necessary assumptions (tools for solution) [ART and SCIENCE]
4. **Estimate** the answer bounds (guide for error checks) [ART]
5. **Solve** the problem [SCIENCE]
6. **Verify** and check results, make conclusions. [ART]

UOWD
University of Wollongong in Dubai

(C) UOW 2016 McCarthy T, Freeth C, Yu T, Hussain S

1. Define
2. Data
3. Theory
4. Estimate
5. Solve
6. Verify

(C) UOW 2016 McCarthy T, Freeth C,

UOWD
University of Wollongong in Dubai

DEFINE

1. Recognise, understand, **DEFINE** and briefly document the problem.
This step requires you to briefly identify the main requirements of the problem. Do not write “refer to question”.

DATA

2. Accumulate **DATA** (problem inputs)

Write down any data given in the question and/or diagrams for easy reference. You may think this is unnecessary BUT it can be very beneficial in identifying the concepts and equations needed for step 3.

THEORY

3. Select any appropriate **THEORY** or principle recognising necessary assumptions (tools for solution)

Identify and write down the principles and equations which will be needed to solve the problem. Do not just write down everything you can think of in the hopes something is correct.

ESTIMATE

4. **ESTIMATE** the answer bounds (guide for error checks)

Think about the problem and the bounds in which the answer would be expected to fall.
A simple example is the requirement to determine the mass of a car based on some pre-defined data and subsequent calculations.

It would be expected that a car should have a mass of somewhere in the range of 1000 to 2500 kg.

Subsequent calculations should prove this and then appropriate discussion can be recorded in step 6.

SOLVE

5. **SOLVE** the problem
Develop the solution in a logical order addressing all relevant parts.

VERIFY

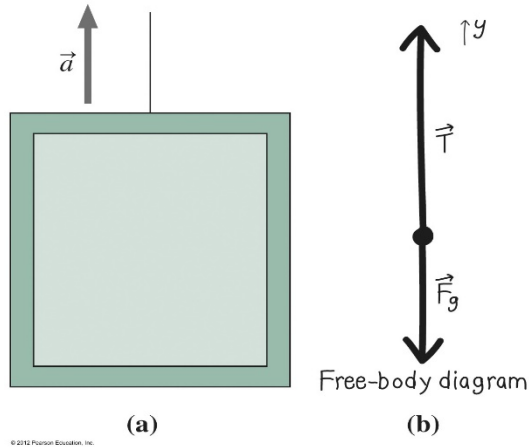
6. **VERIFY** and check results, make conclusions

You should not repeat the answer here.
You should discuss the results with respect to the estimate(s) you made.

Example

- A 740-kg elevator accelerates upward at 1.1 m/s^2, pulled by a cable of negligible mass. Find the tension force in the cable.

- Define: Find the force in cable driving elevator
- Data: mass of elevator m=740 kg and its acceleration a= 1.1 m/s^2
- Theory: Newton's law $\vec{F}_{\text{net}} = \vec{T} + \vec{F}_g = m\vec{a}$



- Estimate: Makes sense; look at some special cases.
  - When a = 0, T = mg=*7.3 kN, so* the cable tension should be greater than mg.
  - When T = 0, a = –g, and the elevator falls freely.
- Solve : In a coordinate system with y-axis upward, Newton's law reads: $T_y + F_{gy} = ma_y$.Solving:$T = m\left(a_y + g\right) = 8.1\ \text{kN}$
- Verify: 8.1kN is greater than 7.3KN as estimated because acceleration adds to gravity.

© 2012 Pearson Education, Inc.