New Mexico Tech Dept of Physics

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"IDEA" Method

Problem solving is a skill that can be learned. People are paid to solve problems. Most people (except accountants) are not paid just to plug #'s into calculators or formulae. The IDEA method is an attempt to teach problem solving in Physics, but it can be applied to almost any situation. IDEA stands for, Interpret, Develop, Execute, Assess. (Young and Freedman called this method "ISEE" – Identify, Setup, Execute, Evaluate)

INTERPRET

Translate English into math and pictures:

1a Sketch – *Indicate forces, distances, velocities, accelerations, dimensions, axes orientation and direction, and origin. Rewrite any initial vectors in* **standard orientation.**

1b Identify key variables – *Find* $m_1, m_2, F_1, F_2, T, \theta, \mu_s, \mu_k, a_1, a_2$ *etc.*

Write them down and assign numerical values. Describe each in a couple words where needed.

1c Identify missing variables. Indicate them explicitly with a question mark, e.g.

$m_2 = ?, \mu_s = ?$

1d Categorize the problem: Imagine how system will behave -- *Is this a statics problem? A ramp problem? Is there friction? Is there a net acceleration? Are certain objects tied together? Flash of insight goes here!! This is the hardest part. Just HOW are you going to solve it.*

1e Write down key eqn's for type of problem identified. e.g.

$$\sum \vec{F} = m\vec{a}, \quad f = \mu N$$

1f Look again at your variable list, are there additional missing variables beyond the ones asked for in the question. Identify with "?".

DEVELOP

2a Draw Free Body diagrams

– Force arrows attached to objects, velocities and accelerations adjacent to objects. NOTE: Your sketch and Free Body Diagram has to be at LEAST 3"x3".

2b Specialize your general equations to the problem at hand.

2c By now you should have figured out how you're going to get to the final solution. Make a note to yourself or me about what your approach will be (e.g. "We know the block will slide if the sum of all externally applied forces + friction is not sufficient to give the required acceleration")

EXECUTE (Evaluate)

3a Newton's Eqn in component form -- *x-component, y-component*

3b Solve algebraically for missing vars

3c Plug numerical values

3d Get Answer

ASSESS

4a Is the sign of the answer correct?

– Based on directions defined in your sketch, are objects moving as they ought?

4b Are the units correct? Does the magnitude make sense?

4c Is there another way to work the problem to check your work? –

Alternate solution methods (energy methods vs. Newton's law methods, component addition vs. vector sketch)? Are there unused equations that can be checked to see if they give same solution?