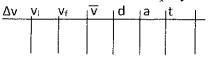
# Skill 13 - Quantitative Problem Solving

This chart summarizes two different strategies for quantitative problem solving.

# **HEAD PROBLEM METHOD**

Series of simple steps involving basic equations used to link variables. Use this grid to keep track of variables and solve step by step.



Make a list of known variables and the unknown "goal". Find the equation which includes the "goal" and the other givens. Solve with attention to units and mathematical reasoning.

KINEMATICS EQUATIONS

$$\bar{v} = \frac{d}{t}$$

$$\bar{v} = \frac{d}{t} \qquad \qquad \bar{v} = \frac{v_i + v_f}{2}$$

$$\Delta v = at$$
  $a = \frac{\Delta v}{t}$   $t = \frac{\Delta v}{a}$ 

$$\Delta v = v_f - v_i$$
  $a = \frac{v_f - v_i}{t}$ 

$$d = v_i t + \frac{1}{2} a t^2$$

$$v_f^2 = v_i^2 + 2ad$$

$$v_f = v_i + at$$

Example: An otter starting from rest and accelerates uniformly for 4s down a frictionless ramp with a length of 32m. What is the acceleration of the otter?

## "Head Problem" Method

Step One List the givens and unknown in the grid of possible variables.

Δν	V <sub>i</sub>	V <sub>f</sub>	V	<u>l</u> d	<sub>l</sub> a	t	L
	0			32m	?	4s	

Determine which other variable you can calculate from this starting point:

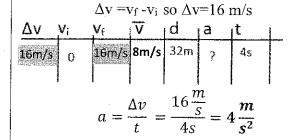
$$\bar{v} = \frac{d}{t} = \frac{32m}{4s} = 8m/s$$

$$\Delta v \quad V_i \quad V_f \quad \overline{V} \quad d \quad a \quad t$$

$$0 \quad 8m/s \quad 32m \quad ? \quad 4s$$

Keep working with simple equation until goal is reached:

$$\bar{v} = \frac{v_i + v_f}{2}$$
  $8\frac{m}{s} = \frac{0 + v_f}{2}$   $v_f = 16m/s$ 



# **Kinematics Equation Method:**

### Givens:

 $v_i=0$ t=6sd=20m

### Unknown a=?

# **Equation and Substitution:**

$$d=v_it+1/2at^2$$

$$32m=0t+1/2a(4s)^2$$

$$32m = 1/2a(16s^2)$$

$$a = \frac{32m}{8s^2} = 4\frac{m}{s^2}$$