

C. Equation Manipulation

1) Solve for m : $a_1 = \frac{F_1}{m}$

$$m = \frac{F_1}{a_1}$$

2) Solve for v_f : $v_{ave} = \frac{(v_f - v_i)}{2}$

$$v_f = 2v_{ave} + v_i$$

3) Solve for a : $d = vt + \frac{1}{2}at^2$

$$a = \frac{2(d - vt)}{t^2}$$

4) Solve for r :

$$a = \frac{Gm_2}{r^2}$$

$$r = \sqrt{\frac{Gm_2}{a}}$$

5) Solve for I : $W = I^2Rt$

$$I = \sqrt{\frac{W}{Rt}}$$

6) Solve for m_1 : $F_g = \frac{Gm_1m_2}{r^2}$

$$m_1 = \frac{F_g r^2}{Gm_2}$$

7) Solve for v : $d = vt + \frac{1}{2}at^2$

$$v = \frac{d - \frac{1}{2}at^2}{t}$$

8) Solve for d :

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

$$d = \frac{v_f^2 - v_i^2}{2a}$$

D. Dimensional Analysis

Based on given units for the variables on the right, determine what would be the unit(s) for the variable left of the equal sign. Reduce the units to find the final simplest unit for the variable.

1. $a_c = \frac{v^2}{r}$, if v units are m/s and r units are m

$$\left(\frac{m}{s}\right)^2 \div m \rightarrow \frac{m^2}{s^2} \div \left(\frac{m}{1}\right) \rightarrow \frac{m}{s^2}$$

2. $P = \frac{Fd}{t}$, if F units are $kg \cdot m/s^2$, d units are m, and t units are s

$$(kg \cdot \frac{m}{s^2}) \cdot m \div s \rightarrow (kg \cdot \frac{m}{s^2}) \left(\frac{m}{1}\right) \left(\frac{1}{s}\right) \rightarrow kg \frac{m^2}{s^3}$$

3. $R = \frac{\rho L}{A}$, if ρ units are $\Omega \cdot m$, L units are m, and A units are m^2

$$\left(\frac{\Omega \cdot m}{1}\right) \cdot m \div m^2 \rightarrow \Omega$$