PHYSICS MATH SKILLS II - SOLUTIONS

1. a) $\frac{V}{R} = \frac{IR}{R}$

$I = \frac{V}{R}$

b) $\frac{V}{I} = \frac{IR}{I}$

$R = \frac{V}{I}$

2. a) $\frac{W}{d} = \frac{Fd}{d}$

$F = \frac{W}{d}$

b) $\frac{W}{F} = \frac{Fd}{F}$

$d = \frac{W}{F}$

3. a) $P = \frac{W}{t} \quad \times t \quad \times t$

$W = Pt$

b) $P = \frac{W}{t} \quad \times t \quad \times t$

$\frac{Pt}{P} = \frac{W}{P}$

$t = \frac{W}{P}$

4. a) $v_f = v_i + at \quad -at \quad -at$

$v_i = v_f - at$

b) $v_f = v_i + at \quad -v_i \quad -v_i$

$\frac{v_f - v_i}{t} = \frac{at}{t}$

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

5. a) $E_k = \frac{1}{2}mv^2$ (×2, ×2)

$\frac{2E_k}{v^2} = \frac{mv^2}{v^2}$

$m = \frac{2E_k}{v^2}$

b) $E_k = \frac{1}{2}mv^2$ (×2, ×2)

$\frac{2E_k}{m} = \frac{mv^2}{m}$

$\sqrt{\frac{2E_k}{m}} = \sqrt{v^2}$

$v = \sqrt{\frac{2E_k}{m}}$

6. a) $\frac{m_1v_1 + m_2v_2}{M} = \frac{Mv_f}{M}$

$v_f = \frac{m_1v_1 + m_2v_2}{M}$

b) $m_1v_1 + m_2v_2 = Mv_f$ ($-m_2v_2$, $-m_2v_2$)

$\frac{m_1v_1}{m_1} = \frac{Mv_f - m_2v_2}{m_1}$

$v_1 = \frac{Mv_f - m_2v_2}{m_1}$

c) $m_1v_1 + m_2v_2 = Mv_f$ ($-m_1v_1$, $-m_1v_1$)

$\frac{m_2v}{m_2} = \frac{Mv_f - m_1v}{m}$

$v_2 = \frac{Mv_f - m_1v}{m_2}$

7. a) $F_A - \mu mg = ma$

$\frac{F_A - \mu mg}{m} = \frac{ma}{m}$

$a = \frac{F_A - \mu mg}{m}$

b) $F_A - \mu mg = ma$ (+μmg, +μmg)

$F_A = ma + \mu mg$

$= m(a + \mu g)$

c) $F_A - \mu mg = ma$ (+μmg, +μmg)

$F_A = ma + \mu mg$

$\frac{F_A}{a+\mu g} = \frac{m(a+\mu g)}{a+\mu g}$

$m = \frac{F_A}{a + \mu g}$

8. a) $\frac{h_i}{h_o} = -\frac{d_i}{d_o}$ (×h_o, ×h_o)

$h_i = -\frac{d_i}{d_o} h_o$ (×$-d_o$, ×$-d_o$)

$-h_i d_o = d_i h_o$

$\frac{-h_i d_o}{d_i} = \frac{d_i h_o}{d_i}$

$h_o = -\frac{h_i d_o}{d_i}$

b) $\frac{h_i}{h_o} = -\frac{d_i}{d_o}$ (×d_o, ×$-d_o$)

$d_i = -\frac{h_i}{h_o} d_o$

9. a) $\left(\frac{1}{2}mv_i^2 + mgh\right) = \frac{1}{2}mv_f^2$ $\times 2$ $\times 2$

$$\frac{mv_i^2 + 2mgh}{m} = \frac{mv_f^2}{m}$$

$$\sqrt{v_i^2 + 2gh} = \sqrt{v_f^2}$$

$$v_f = \sqrt{v_i^2 + 2gh}$$

b) $\frac{1}{2}mv_i^2 + mgh = \frac{1}{2}mv_f^2$ $-\frac{1}{2}mv_i^2$ $-\frac{1}{2}mv_i^2$

$$\frac{mgh}{mg} = \frac{\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2}{mg}$$

$$h = \frac{\frac{1}{2}v_f^2 - \frac{1}{2}v_i^2}{g}$$

$$h = \frac{v_f^2 - v_i^2}{2g}$$

10. a) $\ell = \ell_0 \sqrt{1 - \frac{v^2}{c^2}}$

$\frac{\ell}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{\ell_0 \sqrt{1 - \frac{v^2}{c^2}}}{\sqrt{1 - \frac{v^2}{c^2}}}$

$$\ell_0 = \frac{\ell}{\sqrt{1 - \frac{v^2}{c^2}}}$$

b) $\frac{\ell}{\ell_0} = \frac{\ell_0 \sqrt{1 - \frac{v^2}{c^2}}}{\ell_0}$

$\left(\frac{\ell}{\ell_0}\right)^2 = \left[\sqrt{1 - \frac{v^2}{c^2}}\right]^2$

$\frac{\ell^2}{\ell_0^2} - 1 = 1 - \frac{v^2}{c^2} - 1$

$\left(\frac{\ell^2}{\ell_0^2} - 1\right)^{x-1} = -\frac{v^2}{c^2}^{x-1}$

$\left(1 - \frac{\ell^2}{\ell_0^2}\right)^{xc^2} = \frac{v^2}{c^2}^{xc^2}$

$\sqrt{\left(1 - \frac{\ell^2}{\ell_0^2}\right)c^2} = \sqrt{v^2}$

$$v = \sqrt{1 - \frac{\ell^2}{\ell_0^2}}\, c$$