

1.

$$m_1 = 150 \text{ kg} \quad m_2 = ?$$

$$V_1 = -3 \text{ m/s} \quad V_2 = 5 \text{ m/s}$$

$$m_1 V_1 + m_2 V_2 = 0$$

$$m_2 V_2 = -m_1 V_1$$

$$m_2 = \frac{-m_1 V_1}{V_2}$$

$$= \frac{-150 \cdot -3}{5}$$

$$m_2 = 90 \text{ kg}$$

2.

$$m_1 V_1 + m_2 V_2 = 0 \quad V_2 = 6 \text{ m/s}$$

$$m_2 V_{12} + m_2 V_1 + m_1 V_1 \quad V_{12} = V_2 - V_1$$

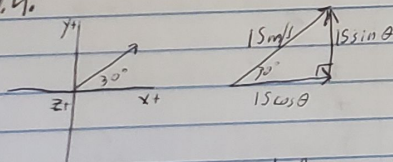
$$m_1 V_1 + m_2 V_1 = -m_2 V_{12}$$

$$V_1 (m_1 + m_2) = -m_2 V_{12}$$

$$V_1 = \frac{-m_2 V_{12}}{m_1 + m_2} \rightarrow -2.25 \text{ m/s} \rightarrow V_1$$

$$6 - 2.25 = 3.75 \text{ m/s} = V_2$$

3.



$$m_b = 1 \text{ kg}$$

$$m_d = 0.5 \text{ kg}$$

$$20 \cos 40^\circ \quad 20 \cos 40^\circ \cos 20^\circ = 14.40$$

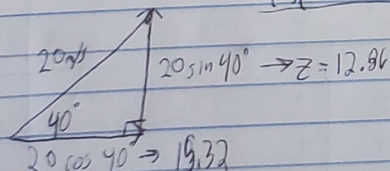
$$20 \cos 40^\circ \sin 20^\circ = 5.24$$

$$10.41 \hat{x} + 0.2 \hat{y} + 4.29 \hat{z} = V$$

$$(1)(13 \hat{x} + 7.5 \hat{y} + 0 \hat{z}) + (0.5)(5.24 \hat{x} + 14.4 \hat{y} + 12.96 \hat{z})$$

$$1 + 0.5$$

$$15.62 \hat{x} + 10.3 \hat{y} + 6.43 \hat{z}$$



5.

$z \rightarrow y$

$$y_i = 5 \text{ m}$$

$$y_f = \frac{1}{2} a t^2 + V_{iy} t + y_i$$

$$0 = -4.9 t^2 + 4.29 t + 5$$

$$t = 1.539 \text{ seconds}$$

$x \rightarrow x$

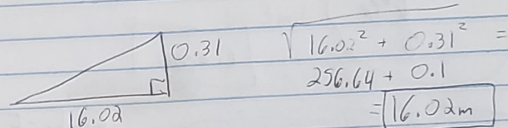
$$x_f = V_{ix} t + x_i$$

$$16.02 \text{ m} = 10.41(1.539)$$

$y \rightarrow z$

$$z_f = V_{iz} t + z_i$$

$$0.31 \text{ m} = 0.2(1.539)$$



6.

$$V_c = 40 \text{ m/s}$$

$$m_c = 100 \text{ kg}$$

$$V_k = 20 \text{ m/s}$$

$$m_k = 70 \text{ kg}$$

$$m_t = 170 \text{ kg}$$

$$m_c V_c - m_k V_k = V_f m_t$$

$$V_f = \frac{m_c V_c - m_k V_k}{m_t}$$

$$\frac{(100)(40) - (70)(20)}{170} = 1.93 \text{ m/s}$$

7.

$$V = \sqrt{2g\Delta h}$$

$$L = x_f$$

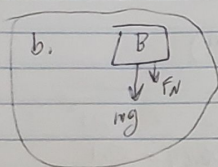
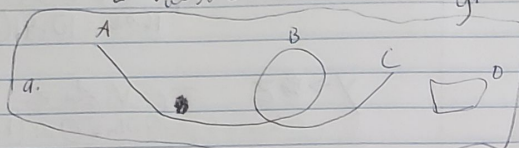
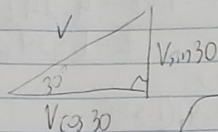
$$t = 1.38 \text{ seconds}$$

$$0 = -4.9t^2 + V_{iy} \sin 30^\circ + 1$$

$$L = 10.5(1.38) = 14.49 \text{ m}$$

$$L = V_{iy} \sin 30^\circ t$$

g.



C. bigger

$$\text{barely} = F_N \rightarrow 0$$

$$d. \sum F_{yB} = mg + F_N = ma$$

$$mg + F_N = m \frac{v^2}{r}$$

$$V = \sqrt{\frac{r(mg + F_N)}{m}} \quad V = \sqrt{rg}$$

$$e. \quad V = 7$$

$$v^2 = 2g\Delta h$$

$$\frac{v^2}{2g} = h_f - h_i \quad h_i = ? \quad h_f = 10 \text{ m}$$

$$10.6 = \frac{49}{19.6} = 10 - h_i \quad 2.5 = 10 - h_i$$

$$h_i + 2.5 = 10 \quad h_i = 7.5$$

$$mgh_A + \frac{1}{2}mv_A^2 = mgh_B + \frac{1}{2}mv_B^2$$

$$mgh_A + \frac{1}{2}v_A^2 - gh_B = \frac{1}{2}v_B^2$$

$$f. \quad V_B = 12.12 \text{ m/s}$$

$$2(gh_A - gh_B + \frac{1}{2}v_A^2) = v_B^2 \quad v_B = \sqrt{2g(h_A - h_B) + v_A^2}$$

8.

$$W_{nc} = -f \Delta x = -\mu mg \Delta x$$

$$W_{nc} + E_i = E_f$$

$$-\mu mg \Delta x + \frac{1}{2}Kx^2 = mgh_f + \frac{1}{2}mv_f^2$$

$$\frac{1}{2}Kx^2 = m(gh_f + \mu m \Delta x + \frac{1}{2}v_f^2)$$

$$x = \sqrt{\frac{2m(gh_f + \mu m \Delta x + \frac{1}{2}v_f^2)}{K}}$$

$$\Delta x = 4 \text{ m} \quad h_f = 1 \text{ m} \quad m = 100 \text{ kg}$$

$$\mu = 0.3$$

$$K = 30,000$$

$$v = 3 \text{ m/s}$$

$$x = 0.42 \text{ m}$$