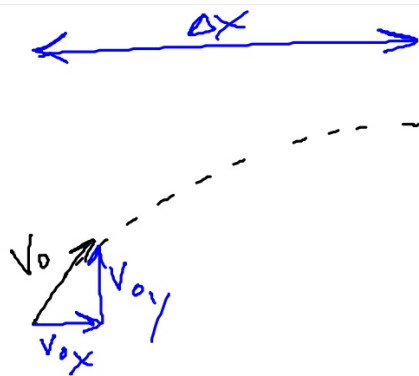


13.



BANG -
 $v_{com} = \text{constant } (\sum F_{ext} = 0)$
 so if $\frac{1}{2}m$ stops, then
 the other half $\frac{1}{2}m$
 doubles its velocity

X

$$v_0 = 10 \text{ m/s}$$

$$a = 0$$

$$\Delta x = ?$$

y

$$v_0 = 17.3 \text{ m/s}$$

$$a = -9.8 \text{ m/s}^2$$

$$v_{top} = 0$$

$$t_{up} = ?$$

$$\therefore \Delta x_{total} = 3 \times (\Delta x_{(up)})$$

at
zenith

$$\Sigma F_{\text{ext}} = 0 \text{ so } \vec{p}_0 = \vec{p}_f$$

$$mV_0 = \left(\frac{m}{2}\right)(0) + \left(\frac{m}{2}\right)V_f$$

$$m(10) = 0 + \frac{m}{2}V_f$$

$$\underline{V_f = 20 \text{ m/s}}$$

rise

$$\Delta x = ? \quad t = ?$$

$$V_x = 10 \text{ m/s}$$

$$V_{0y} = 17.3$$

$$a_x = 0$$

$$V_{fy} = 0$$

$$a = -9.8 \text{ m/s}^2$$

$$V_f = V_0 + at$$

$$0 = 17.3 + -9.8t$$

$$t = 1.765 \text{ s}$$

$$\Delta x = V_x t + \dots$$

$$\Delta x = 10(1.765)$$

$$= 17.65 \text{ m}$$

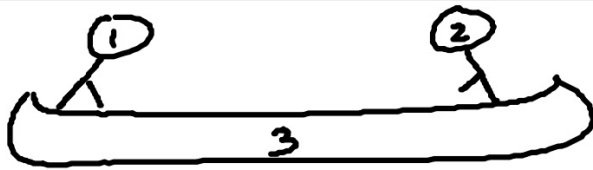
fall

$$\Delta x = ? \quad t = 1.765 \text{ s} \quad a_x = 0 \quad v_x = 20 \text{ m/s}$$

$$\begin{aligned} \Delta x &= 20(1.765) \\ &= 35.3 \text{ m} \end{aligned}$$

$$\Delta x_{\text{total}} = 17.65 + 35.3 = 53 \text{ m}$$

16.



$$m_1 = 80 \text{ kg} \quad m_3 = 30 \text{ kg} \quad m_2 = ?$$

$$X_{1_0} = 0 \quad X_{3_0} = 1.5 \text{ m} \quad X_{2_0} = 3 \text{ m}$$

$$X_{1_f} = 2.6 \text{ m} \quad X_{3_f} = 1.1 \text{ m} \quad X_{2_f} = -0.4 \text{ m}$$

$$\Sigma F_{\text{ext}} = 0 \text{ so } V_{\text{com}} = \text{const. since } V_{\text{com}_0} = 0$$

$$X_{\text{com}} = \text{constant}$$

$$X_{com} = X_{com}$$

$$\frac{m_1 X_{1_o} + m_2 X_{2_o} + m_3 X_{3_o}}{M} = \frac{m_1 X_{1_f} + m_2 X_{2_f} + m_3 X_{3_f}}{M}$$

$$(80)(0) + m_2(3) + (30)(1.5) = (80)(2.6) + m_2(-0.4) + (30)(1.1)$$

$$m_2 = 57.6 \text{ kg}$$