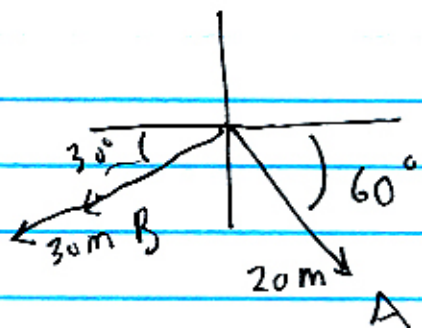


(1)



$$A_x = 20 \cos 60 = 10 \text{ m}$$

$$A_y = -20 \sin 60 = -17.3 \text{ m}$$

$$B_x = -30 \cos 30 = -26.0 \text{ m}$$

$$B_y = -30 \sin 30 = -15 \text{ m}$$

$$|\vec{A} - \vec{B}| = \left\{ (A_x - B_x)^2 + (A_y - B_y)^2 \right\}^{1/2}$$

$$= \left\{ (36)^2 + (2.3)^2 \right\}^{1/2} \text{ m} = \left\{ 1296 + 5.29 \right\}^{1/2}$$

$$= \boxed{36.1 \text{ m}}$$

(2)

2nd phase $v_f - v_i = at$

$$0 - v_i = -7 \times 5 \text{ m/s} = -35 \text{ m/s}$$

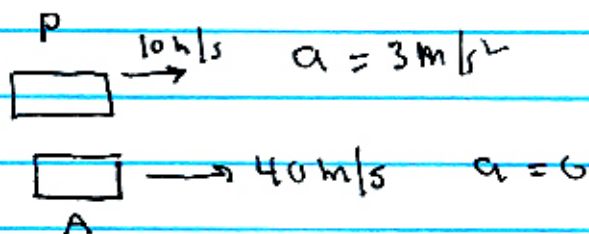
$$v_i = 35 \text{ m/s}$$

1st phase $v_f - v_i = at$

$$35 \text{ m/s} - 0 = a \times 10$$

$$\boxed{a = +3.5 \text{ m/s}^2}$$

(3)



$$(x_{PA} = x_{PI} = 0)$$

$$x_{PA} = v_{AI} t$$

$$x_{PP} = v_{PI} t + \frac{1}{2} a_p t^2$$

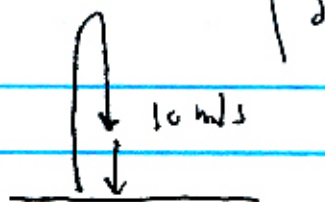
$$x_{PA} = x_{PP}$$

$$v_{AI} t = v_{PI} t + \frac{1}{2} a_p t^2$$

$$(v_{AI} - v_{PI}) t = \frac{1}{2} a_p t^2$$

$$t = \frac{2(v_{AI} - v_{PI})}{a_p} = \frac{2(40 - 10)}{3} \text{ s} = \frac{60}{3} \text{ s} = \boxed{20 \text{ s}}$$

④



Final velocity of Rock = ~~-10 m/s~~ velocity
 when thrown up $\Rightarrow V_F = -30 \text{ m/s}$

$$V_I = -10 \text{ m/s}$$

$$V_F = V_I - g t$$

$$t = \frac{V_F - V_I}{-g} = \frac{-30 - (-10)}{-9.8} \text{ s} = \boxed{2.04 \text{ s}}$$

1. 2 s

2. 1 s

3. 3 s

4. 0.65 s

5. NOT ENOUGH INFORMATION

⑤



$$x_F - x_I = V_{Ix} t \quad (1)$$

$$V_{Fy} = V_{Iy} - g t \quad (2)$$

$$y_F - y_I = V_{Iy} t - \frac{1}{2} g t^2 \quad (3)$$

$$(3) \Rightarrow 10 - 30 = 0 - \frac{1}{2} g t^2$$

$$t = \sqrt{\frac{2 \times 20}{g}} \text{ s} = 2.02 \text{ s}$$

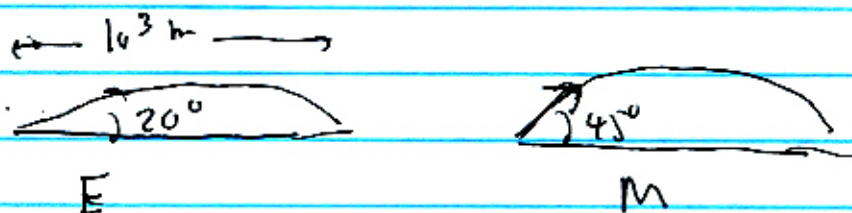
$$(2) \Rightarrow V_{Fy} = 0 - g t = 0 - 9.8 \times (2.02) \text{ m/s} = -19.8 \text{ m/s}$$

$$V_{Fx} = V_{Ix} = 20 \text{ m/s}$$

$$V_F = \sqrt{V_{Fx}^2 + V_{Fy}^2} = \sqrt{400 + 392} \text{ m/s}$$

$$= 28.1 \text{ m/s}$$

6



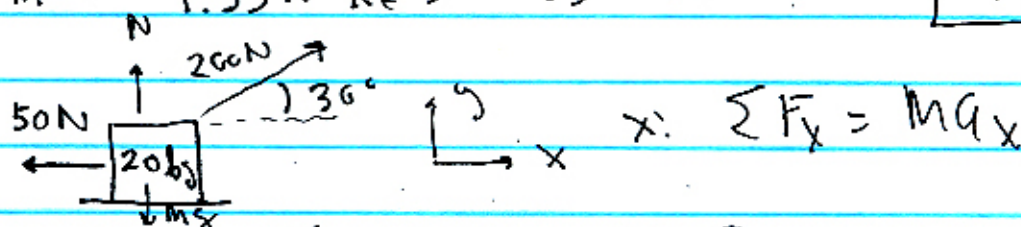
$$\frac{X_M}{X_E} = \left(\frac{v_M}{v_E} \right)^2 \times \left(\frac{5 \sin 2\theta_M}{5 \sin 2\theta_E} \right) \times \left(\frac{g_E}{g_M} \right)$$

$$= 1 \times \frac{5 \sin 90^\circ}{5 \sin 40^\circ} \times 6$$

$$\therefore 1 \times \frac{1}{0.643} \times 6 = 9.33$$

$$X_M = 9.33 \times X_E = 9.33 \times 10^3 \text{ m} = \boxed{0.933 \times 10^4 \text{ m}}$$

7



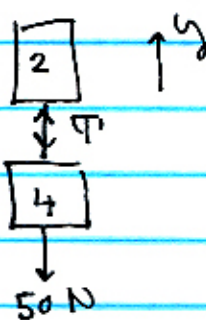
$$x: 200 \cos 30^\circ - 50 = 20 a_x$$

$$a_x = \frac{173.2 - 50}{20} \text{ m/s}^2 = 6.16 \text{ m/s}^2$$

$$5 \text{ m} = X_E - X_I = v_{ix} t + \frac{1}{2} a_x t^2 = 0 + \frac{1}{2} \times 6.16 t^2$$

$$t = \sqrt{\frac{10}{6.16}} \text{ s} = \boxed{1.27 \text{ s}}$$

8



$$\sum F_{\text{EXT},y} = (\sum m) a_y$$

$$-6 \times 9.8 - 50 = 6 a_y \Rightarrow a_y = -18.1 \text{ m/s}^2$$

$$-M_2 g - P = M_2 a_y \Rightarrow P = -M_2 g - M_2 a_y$$

$$P = -M_2 (g + a_y) = -2(9.8 - 18.1) \text{ N} = \boxed{16.6 \text{ N}} \text{ in magnitude}$$

