

# PHYS 408

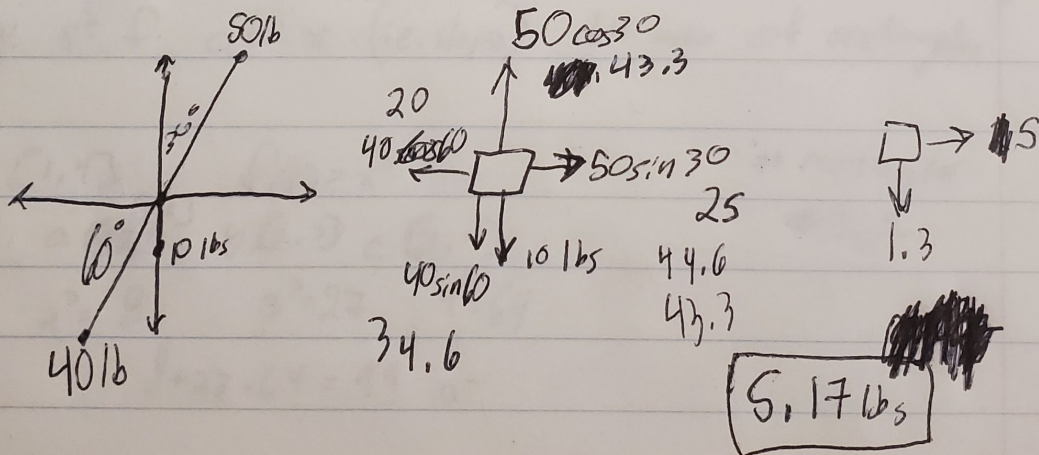
31 August 2

1a. Ricky Gervais watches David Blaine stick a needle through his arm and then pull it out.

1b. Sticking a needle through an arm is much more plausible than a car with 400 mpg

1c. I've seen Joe Rogan stick a needle through David Blaine's arm before. On the other hand, I wouldn't trust some random blogpost on a poorly designed website no matter the content.

2.



5.17 lbs

4. b

5. b

6.2

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 4 | 5 | 6 | 1 | 3 | 2 |
| 2 | 6 | 1 | 5 | 4 | 3 |
| 5 | 4 | 2 | 3 | 1 | 6 |
| 3 | 2 | 4 | 6 | 5 | 1 |
| 1 | 3 | 5 | 2 | 6 | 4 |
| 6 | 1 | 3 | 4 | 2 | 5 |



$$0.31 = Cd$$

$$8.5 \text{ ft}^2 \rightarrow 0.79 \text{ m}^2 = A$$

$$55 \text{ mph} \rightarrow 24.59 \text{ m/s} = v$$

$$\rho = 1.2 \text{ kg/m}^3$$

$$\frac{1}{2} C_d \rho A v^2$$

$$0.5(0.31)(1.2)(0.79)(24.59^2) = 88.85 \text{ N}$$

$$\frac{\text{kg}}{\text{m}^3} \cdot \text{m}^2 \cdot \frac{\text{m}^2}{\text{s}^2} = \text{kg m/s}^2$$

$$1203 \text{ MJ}$$

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

$$\frac{120,300,000}{88.85}$$

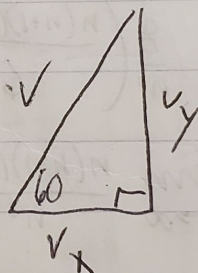
$$= 1,354 \text{ km}$$

1d.

3.

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

$$a = -9.8$$



$$PE_i = KE_T + KE_R$$

$$I = \frac{2}{3} m r^2 \quad \omega = v/r$$

$$mgh = \frac{1}{2} m v^2 + \frac{1}{2} I \omega^2$$

$$mgh = \frac{1}{2} m v^2 + \frac{1}{2} \left[ \frac{2}{3} m r^2 \right] \frac{v^2}{r^2}$$

$$9.7 \text{ m/s} = v_b = \sqrt{\frac{6}{5} (9.8) (8)}$$

$$gh = \frac{1}{2} v^2 + \frac{1}{2} \left( \frac{2}{3} \right) v^2$$

$$\frac{3}{6} v^2 + \frac{2}{6} v^2$$

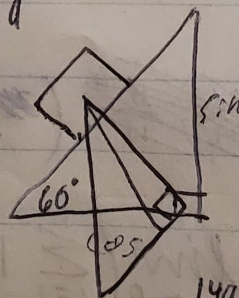
$$m_b v_b + m_d v_d = m_b v_b' + m_d v_d'$$

$$(8)(9.7) + (15)(0) = (8)(5) + (15)v_d'$$

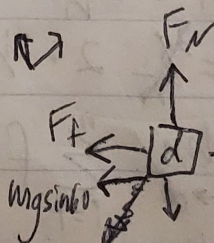
$$v_d' = 2.5 \text{ m/s}$$

$$a = \frac{F}{m}$$

$$\frac{149.35}{15}$$



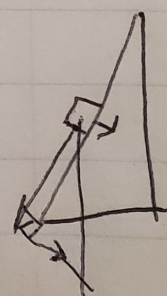
$$149.35$$



$$27.3 \text{ N}$$

$$mg \cos 60$$

$$73.5 \text{ N}$$



$$F_T = F_f = 22.05 \text{ N}$$