

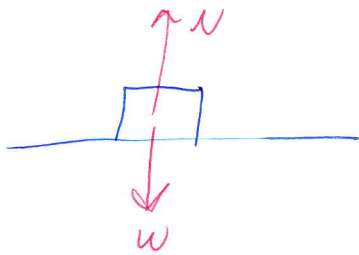
Answer Key Pd 1

Dynamics

AT Dynamics (18)

Directions: Solve the following problem. Show all work. Be neat. Your solution should mathematically read like an essay. Each is worth 5 points. Please circle your final answer.

- 1) A 12 kg box is at rest on a table. Determine the normal force acting on the box



$$\Sigma F_y = N - W = ma$$

$$N - W = 0$$

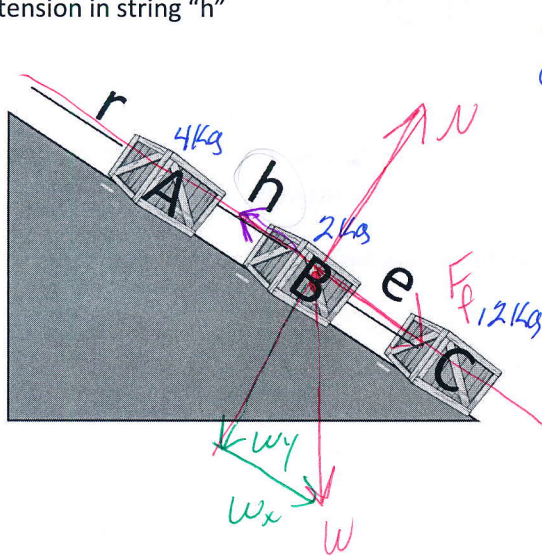
$$N = W$$

$$N = mg$$

$$N = (12 \text{ kg})(9.8 \text{ m/s}^2)$$

$$N = 117.6 \text{ N}$$

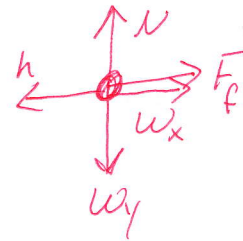
- 2) The 3 boxes shown are being pulled up the incline at 3 m/s. The coefficient of friction between all of the boxes and the incline is 0.4. The incline makes an angle of 21 degrees above the horizontal. The masses of the boxes are as follows: "A"=4kg, "B"=2kg, "C"=12kg. Determine the tension in string "h"



$$\mu = 0.4$$

$$\theta = 21^\circ$$

the System Is Boxes B+C



$$\Sigma F_x = h - W_x - F_f = ma$$

$$h - W \sin \theta - \mu N = 0$$

$$h = mg \sin \theta + \mu mg \cos \theta$$

$$h = mg (\sin \theta + \mu \cos \theta)$$

$$h = (14 \text{ kg}) (9.8 \text{ m/s}^2) (\sin 21^\circ + (0.4) \cos 21^\circ)$$

$$h = 100.4 \text{ N}$$

$$\Sigma F_y = N - W_y = ma$$

$$N - W_y = 0$$

$$N = W \cos \theta$$

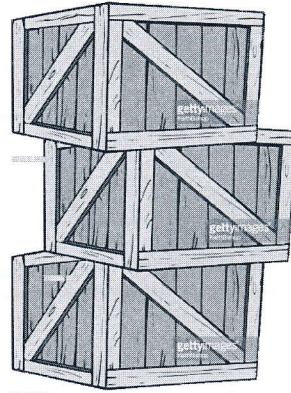
$$N = mg \cos \theta$$

- 3) 3 boxes are in an elevator. The elevator is accelerating upward at 2.3 m/s^2 . Determine the net force acting on the center box. Each box has a mass of 12 kg .

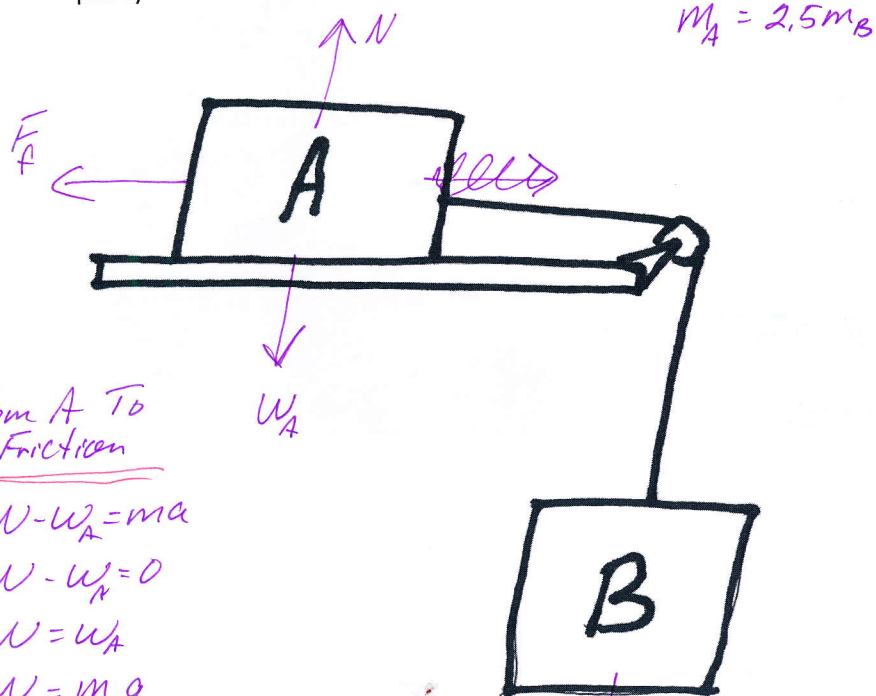
$$\Sigma F_y = F_{\text{net}} = ma$$

$$F_{\text{net}} = (12 \text{ kg})(2.3 \text{ m/s}^2)$$

$$F_{\text{net}} = 27.6 \text{ N}$$



- 4) Box "A" has 2.5 times the mass of box "B." Box "B" pulls box "A" at a constant speed. Determine the coefficient of friction between box "A" and the table. Assume the string and pulley are massless and frictionless.



System Is A+B

System A To Find Friction

$$\begin{aligned} \Sigma F_y &= N - W_A = ma \\ N - W_A &= 0 \\ N &= W_A \\ N &= m_A g \end{aligned}$$

x-Direction: System Is A+B



$$\Sigma F_x = W_B - F_f = ma$$

$$m_B g - \mu N = (m_A + m_B) a \quad a = \text{zero}$$

$$m_B g - \mu N = 0$$

$$m_B g = \mu N$$

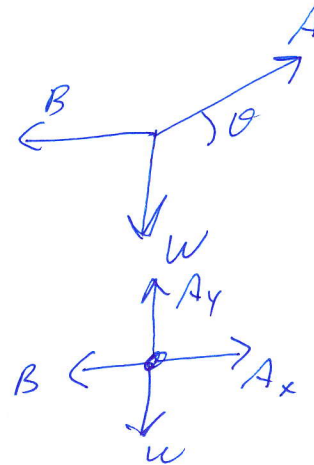
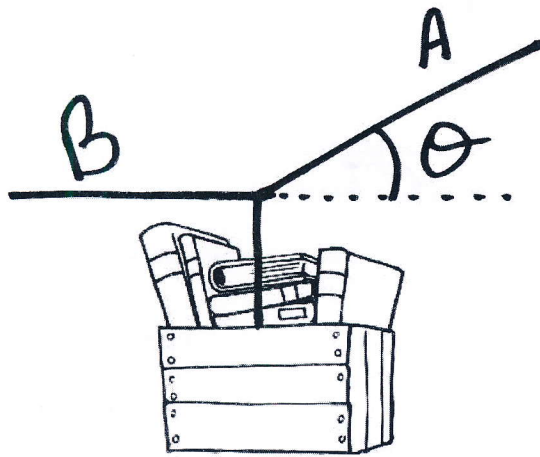
$$m_B g = \mu m_A g$$

$$m_B = \mu (2.5 m_B)$$

$$\frac{1}{2.5} = \mu = 0.4$$

Answer Key

- 5) Determine the tension in string "B" if the angle indicated is 42 degrees and the weight of the box is 120N.



$$\Sigma F_x = A_x - B = ma$$

$$A_x - B = 0$$

$$A \cos \theta = B$$

$$\Sigma F_y = A_y - W = ma$$

$$A_y - W = 0$$

$$A \sin \theta = W$$

$$A = \frac{W}{\sin \theta}$$

$$\frac{W \cos \theta}{\sin \theta} = B = \frac{W}{\tan \theta} = B = \frac{120 \text{ N}}{\tan 42} = \underline{133 \text{ N}}$$

(Guss I
Can't Read Even
with Glasses)

6) Determine the mass of a 12 kg object

12kg