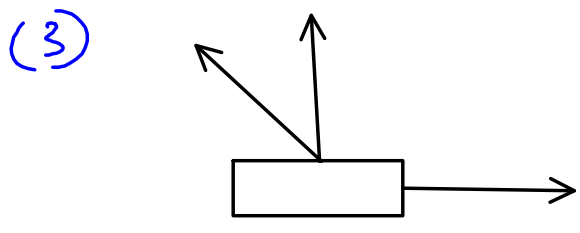
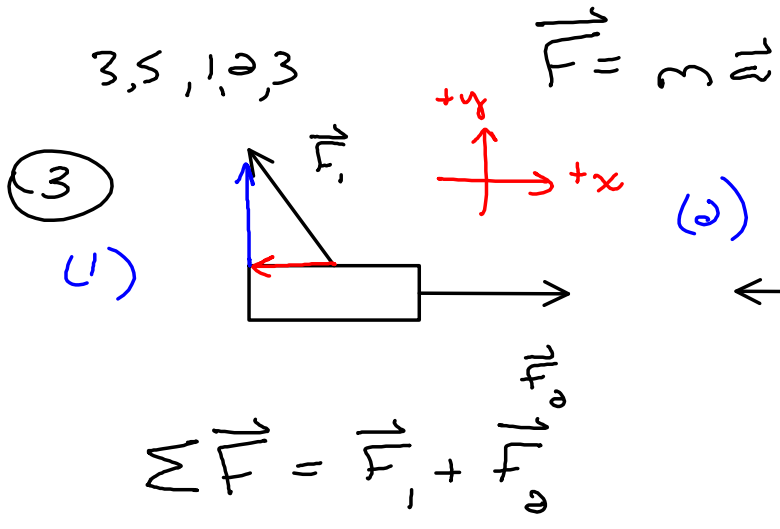
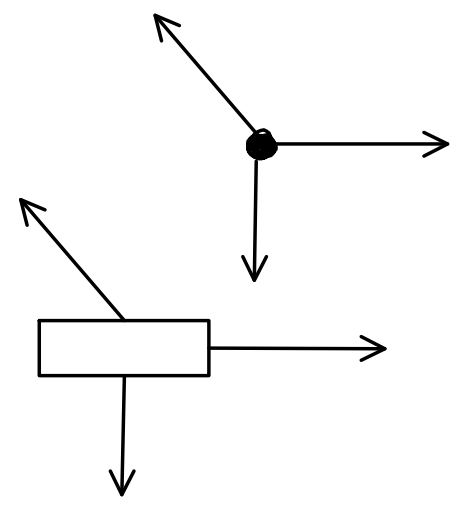


28 JAN 10

- Homework Q & A
- DEMO: acceleration with cart & hanging mass

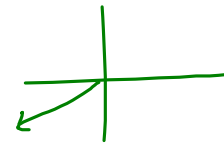
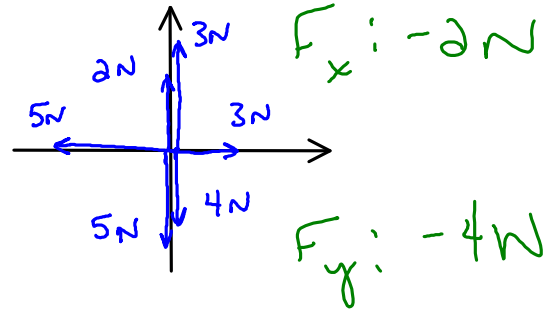
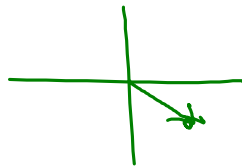
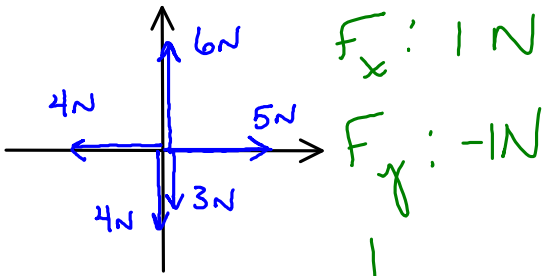
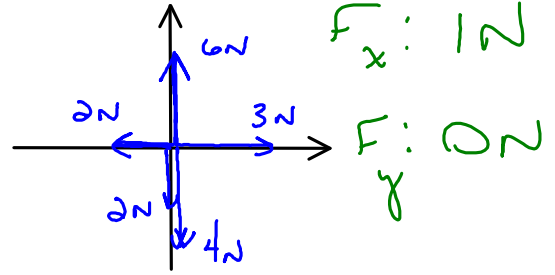
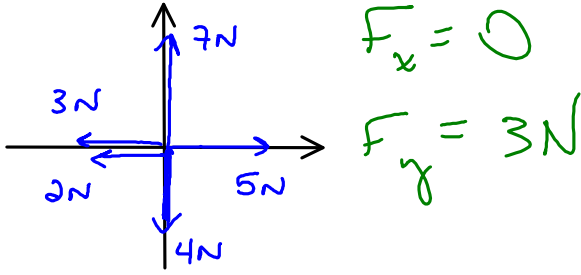


(4)



$\vec{F}_1 = 3 \hat{i}$

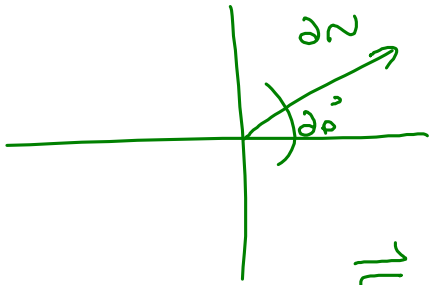
5



$$\textcircled{1} \quad m = 1 \text{ kg}$$

$$a = 2 \text{ m/s}^2 \quad @ \quad 20^\circ \quad \text{above } +\hat{x}$$

$$\begin{aligned} F = ma &= (1 \text{ kg})(2 \text{ m/s}^2) \\ &= 2 \text{ kg} \cdot \text{m/s}^2 = 2 \text{ N} \end{aligned}$$



$$F_x = F \cos 20^\circ = 1.879 \text{ N}$$

$$F_y = F \sin 20^\circ = 0.684 \text{ N}$$

$$\vec{F} = 1.879 \text{ N } \hat{i} + 0.684 \text{ N } \hat{j}$$

$$\textcircled{a} \quad m = 2 \text{ kg}$$

$$\vec{F}_1 = 3\text{N} \hat{i} + 4\text{N} \hat{j}$$

$$(a) \quad \vec{F}_2 = -3\text{N} \hat{i} - 4\text{N} \hat{j}$$

$$\vec{F}_{\text{net}} = 0$$

$$\vec{a} = 0$$

$$(b) \quad \vec{F}_2 = -3\text{N} \hat{i} + 4\text{N} \hat{j}$$

$$\vec{F}_{\text{net}} = 8\text{N} \hat{j}$$

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

$$\vec{a} = 4 \text{ m/s}^2 \hat{j}$$

$$(c) \quad \vec{F}_2 = 3\text{N} \hat{i} - 4\text{N} \hat{j}$$

$$\vec{F}_{\text{net}} = 6\text{N} \hat{i}$$

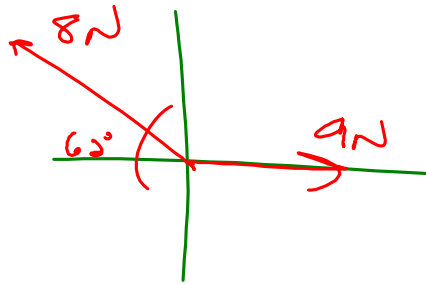
$$\vec{a} = 3 \text{ m/s}^2 \hat{i}$$

③

$$m = 3 \text{ kg}$$

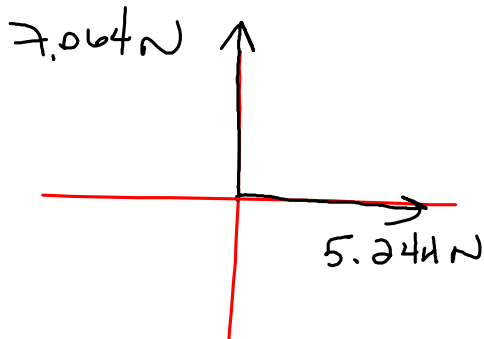
$$F_1 = 9 \text{ N east}$$

$$F_2 = 8 \text{ N @ } 62^\circ \text{ north of west}$$



$$\begin{aligned}\Sigma F_x &= 9 \text{ N} - 8 \cos 62^\circ \text{ N} \\ &= 5.244 \text{ N}\end{aligned}$$

$$\begin{aligned}\Sigma F_y &= 0 + 8 \sin 62^\circ \text{ N} \\ &= 7.064 \text{ N}\end{aligned}$$



$$F_{\text{net}} = \left[(5.244)^2 + (7.064)^2 \right]^{1/2}$$

$$= 8.798 \text{ N}$$

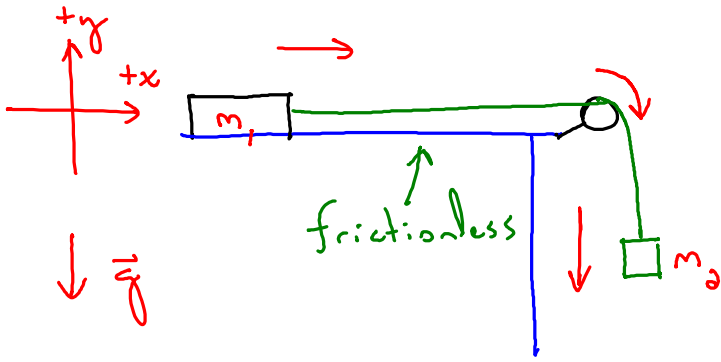
$$a = \frac{F}{m} = \frac{8.798}{3} = 2.933 \text{ m/s}^2$$

Σ \equiv Sigma (uppercase)
"sum"

Π \equiv pi (uppercase)
"multiply"

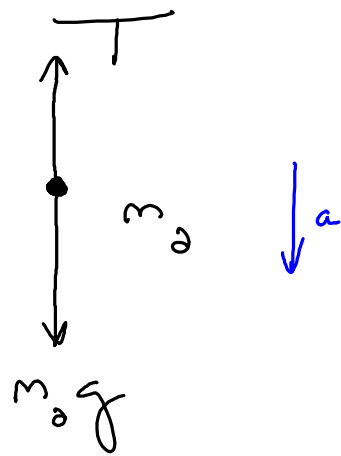
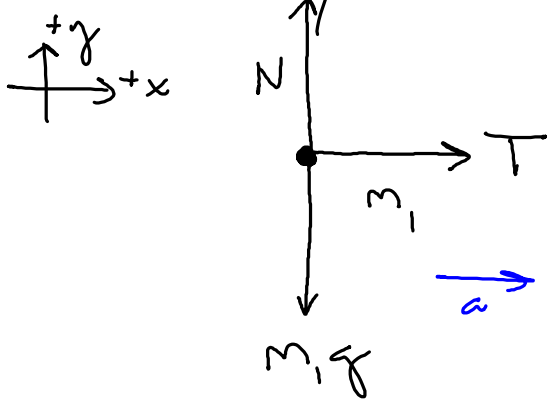


CRASH TEST SMARTY part 1



massless string
no friction
pulley is massless

FREE BODY DIAGRAMS



<u>TRIAL</u>	<u>Hanging Mass</u>	<u>Acceleration</u>
1	50g = 0.05kg	0.1312 m/s ²
2	250g = 0.25 kg	0.8213 m/s ²
3	550g = 0.55 kg	1.789 m/s ²

WEIGHT

$$1 \quad (0.05 \text{ kg})(9.8 \text{ m/s}^2) = 0.49 \text{ N}$$

$$2 \quad (0.25 \text{ kg})(9.8 \text{ m/s}^2) = 2.45 \text{ N}$$

$$3 \quad (0.55 \text{ kg})(9.8 \text{ m/s}^2) = 5.39 \text{ N}$$

CART MASS: $0.525 \text{ kg} + 1 \text{ kg} + 1 \text{ kg} = 2.525 \text{ kg}$

for mass 1

$$\sum F_x = T$$

⏟

$$m_1 a = T$$

for mass 2

$$\sum F_y = T - m_2 g$$

⏟

$$-m_2 a = T - m_2 g$$

⏟

$$T = m_2 g - m_2 a$$

$$m_1 a = m_2 g - m_2 a$$

Solve for a:

$$m_1 a + m_2 a = m_2 g$$

$$a(m_1 + m_2) = m_2 g$$

$$a = \frac{m_2 g}{m_1 + m_2}$$

TRIAL 1

$$a = \frac{(0.05 \text{ kg})(9.8 \text{ m/s}^2)}{(2.525 \text{ kg} + 0.05 \text{ kg})}$$

$$= 0.1903 \text{ m/s}^2$$

TRIAL 2

$$a = \frac{(0.25 \text{ kg})(9.8 \text{ m/s}^2)}{(2.525 \text{ kg} + 0.25 \text{ kg})}$$
$$= 0.8829 \text{ m/s}^2$$

TRIAL 3

$$a = 1.7528 \text{ m/s}^2$$

<u>TRIAL</u>	<u>Hanging Mass</u>	<u>Acceleration of Cart</u>
1	$50\text{g} = 0.05\text{kg}$	0.1310 m/s^2
2	$250\text{g} = 0.25\text{kg}$	0.8074 m/s^2
3	$550\text{g} = 0.55\text{kg}$	1.631 m/s^2

<u>TRIAL</u>	<u>Weight of Hanging mass</u>
1	$(0.05\text{kg})(9.8\text{ m/s}^2) = 0.49\text{ N}$
2	$(0.25\text{kg})(9.8\text{ m/s}^2) = 2.45\text{ N}$
3	$(0.55\text{kg})(9.8\text{ m/s}^2) = 5.39\text{ N}$

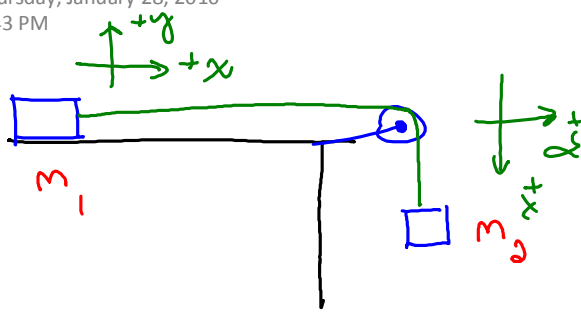
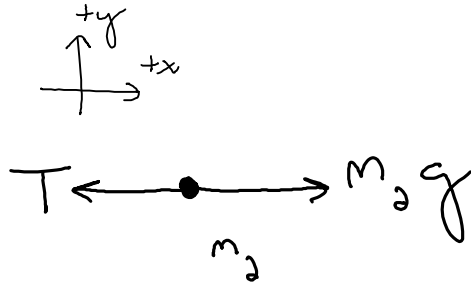
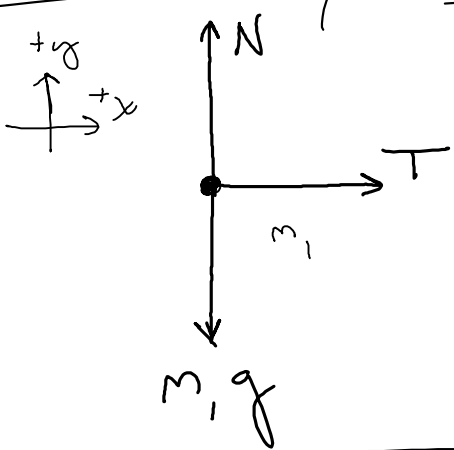


table is frictionless
pulley is massless
string is massless
string is not elastic
no curvature of string

FREE BODY DIAGRAM



mass 1

$$\sum F_x = T$$

$$m_1 a = T$$

mass 2

$$\sum F_x = m_2 g - T$$

$$m_2 a = m_2 g - T$$

$$T = m_2 g - m_2 a$$

$$m_1 a = m_2 g - m_2 a$$

$$m_1 = 2.525 \text{ kg}$$

$$m_1 a + m_2 a = m_2 g$$

$$a(m_1 + m_2) = m_2 g$$

$$a = \frac{m_2 g}{m_1 + m_2}$$

$$a = \frac{(0.05 \text{ kg})(9.8 \text{ m/s}^2)}{2.525 \text{ kg} + 0.05 \text{ kg}} = 0.1903 \text{ m/s}^2$$

Thursday, January 28, 2010
1:39 PM

HRW CHAPTER 5

problems 7, 13, 78

(4) (9), (70)