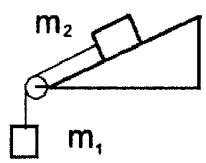
$\Sigma F = ma$	$F_N = mg\cos\theta$
$F_g = mg$	$F_D = mg\sin\theta$

Honors Physics Test -- Ch. 5b - 11-15-02 WARD

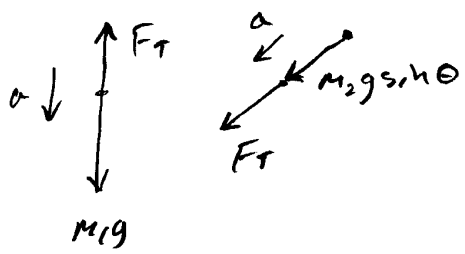
Name Period

Problems - Follow the 13 commandments. Draw and label FBD where indicated.

1.



Mass 1 is 6.25 kg and mass 2 is 4.75 kg. The angle of the hill is 25°. (a) Draw and label FBDs for both objects. (b) Solve for the acceleration of the objects. (c) What is the tension in the rope?



$$\Sigma F = ma$$

$$M_1 g - F_T = M_1 a$$

$$F_T + M_2 g \sin\theta = M_2 a$$

$$(M_1 + M_2 \sin\theta) g = (M_1 + M_2) a$$

$$a = \frac{(M_1 + M_2 \sin\theta) g}{M_1 + M_2}$$

$$= \frac{(6.25\,kg + 4.75\,kg \sin 25°)\, 9.8\,\frac{m}{s^2}}{6.25\,kg + 4.75\,kg}$$

b) $\boxed{a = 7.36\,\frac{m}{s^2}}$

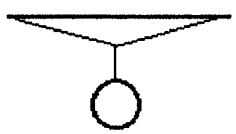
$$F_T = M_1 g - M_1 a$$

$$= M_1 (g - a)$$

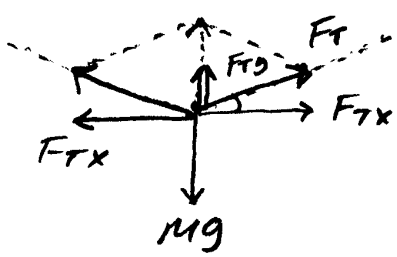
$$= 6.25\,kg\,(9.8\,\tfrac{m}{s^2} - 7.36\,\tfrac{m}{s^2})$$

$$\boxed{F_T = 15.3\,N}$$

2.



A 7.27 kg bowling ball is suspended as shown. The ropes make an angle of 17° with the horizontal. (a) Draw and label FBD. (b) What is the tension in each rope?



$$\Sigma F_x = 0$$

$$F_{Tx} - F_{Tx} = 0$$

$$\Sigma F_y = 0$$

$$F_{Ty} + F_{Ty} - Mg = 0$$

$$2F_{Ty} - Mg = 0$$

$$2F_T \sin\theta = Mg$$

$$F_T = \frac{Mg}{2\sin\theta}$$

$$= \frac{7.27\,kg\,(9.8\,\frac{m}{s^2})}{2\sin 17°}$$

$$\boxed{F_T = 122\,N}$$

both angled ropes

$$F_{Ty} = F_T \sin\theta$$

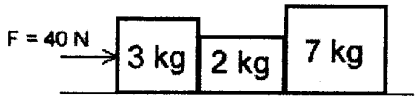
$$F_{Tx} = F_T \cos\theta$$

$$Mg = (7.27\,kg)(9.8\,\tfrac{m}{s^2})$$

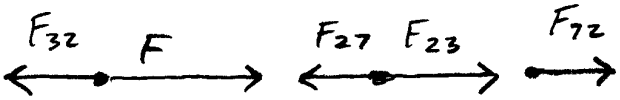
$$\boxed{Mg = 71.2\,N}$$

bottom rope

3.



(a) Draw an FBD for each box. (b) Find the acceleration of the boxes. (c) Find the net force on the 7 kg box (c) Find the force exerted on the 7 kg box by the 2 kg box.



$\vec{a}$

$\Sigma F = ma$

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

$= \frac{40N}{(3+2+7)kg}$

b) $\boxed{a = 3.33 \frac{m}{s^2}}$

$\Sigma F_7 = m_7 a$

$= 7kg(3.33 \frac{m}{s^2})$

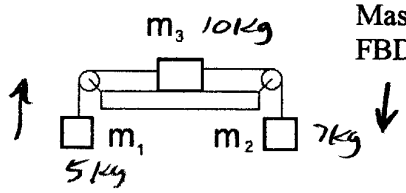
c) $\boxed{\Sigma F_y = 23.3N}$

d) $\Sigma F_7 = m_7 a$

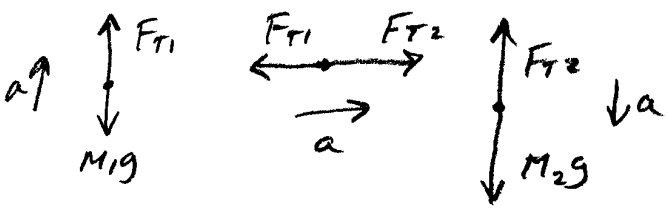
$F_{72} = m_7 a$

$\boxed{F_{72} = 23.3N}$

EC.



Mass 1 is 5 kg, mass 2 is 7 kg, and mass 3 is 10 kg. (a) Draw and label FBD. (b) Find the acceleration.



$F_{T1} - m_1 g = m_1 a$

$-F_{T1} + F_{T2} = m_3 a$

$m_2 g - F_{T2} = m_2 a$

$m_2 g - m_1 g = (m_1 + m_2 + m_3) a$

$a = \frac{(m_2 - m_1) g}{m_1 + m_2 + m_3}$

$= \frac{(7kg - 5kg) 9.8 \frac{m}{s^2}}{5kg + 7kg + 10kg}$

$\boxed{a = 0.891 \frac{m}{s^2}}$