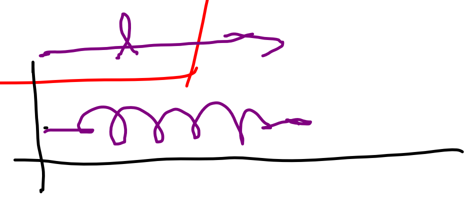
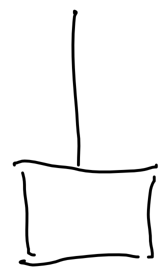
Phys 2110-4 9/26/11

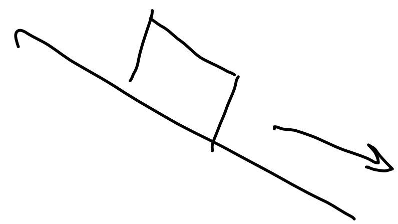
Note Title 9/26/2011

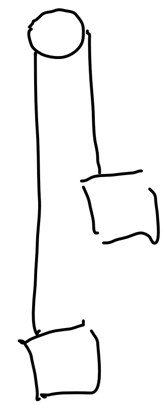
Chap. 4 Forces & Dynamics

$$\boxed{F_{net} = m\vec{a}}$$



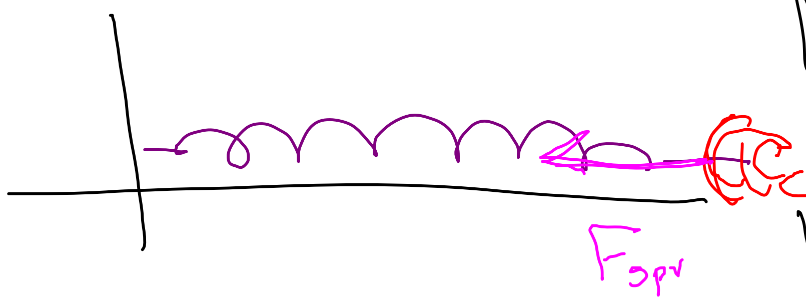






Springs

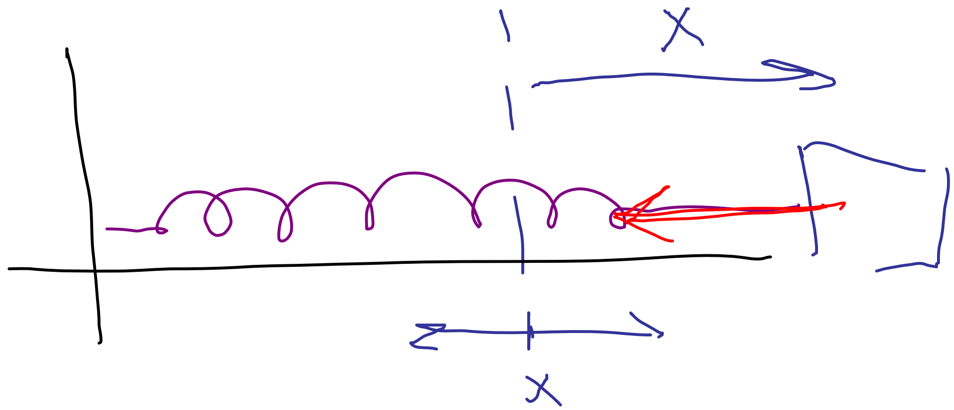
$|F_{spr}| = |kx|$



x = extension

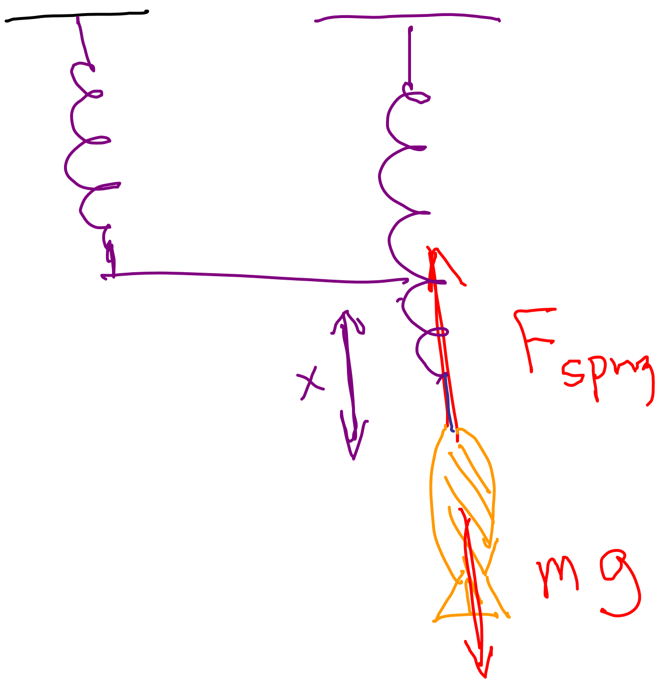
k = spring constant

N/m



$$F_{spr}(x) = -kx$$

Force opp in dir to the extens

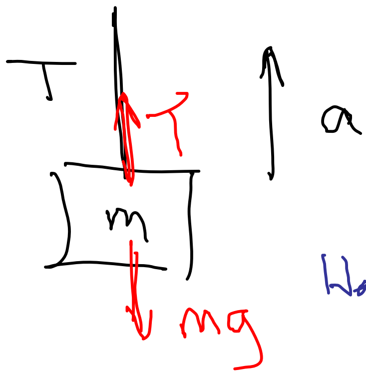


$$F_{sprg} = |kx|$$

$$mg = kx$$

$$\vec{F}_{net} = m\vec{a}$$

Lotsa force problems



$$T - mg = ma$$

a positive

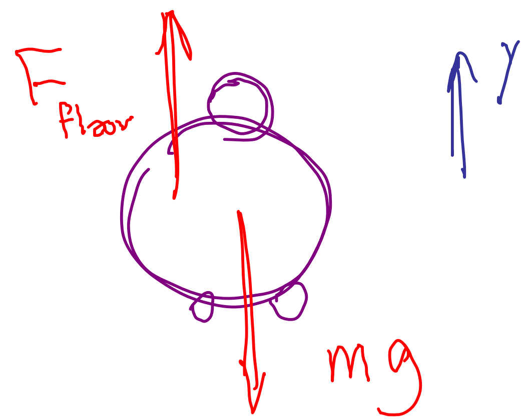
Here, $T = m(g+a)$

T is <u>greater</u> than weight

4:29 An elevator accelerates downward at $2.4\ \frac{m}{s^2}$. What force does elevator's floor exert on a 52-kg passenger?

a_y is negative

DDP!



$$F_{net} = m a_y$$

$$F_{floor} - mg = m a_y = (52\ kg)\left(-2.4\ \frac{m}{s^2}\right)$$

$$F_{floor} = mg + m a_y = m(g + a_y)$$
$$= (52\ kg)\left(9.8\ \frac{m}{s^2} - 2.4\ \frac{m}{s^2}\right)$$

$F_{floor} = 384\,N = m(g - 2.1\,\frac{m}{s^2})$

Here force floor < weight (mg)

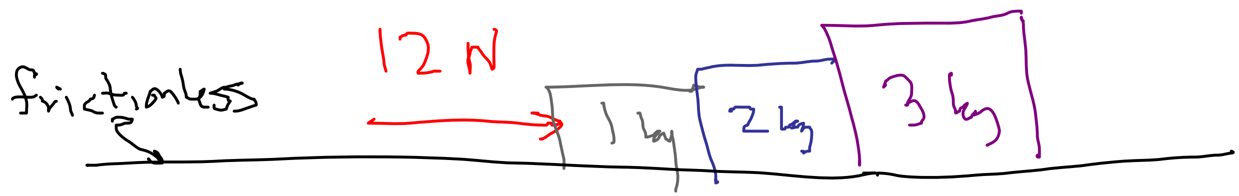
If he was standing on a (MKS) scale, what would it read.

Scale actually divides by g & gives result

Here scale reads $\frac{384\,N}{9.8\,\frac{m}{s^2}} = 39.3\,kg$

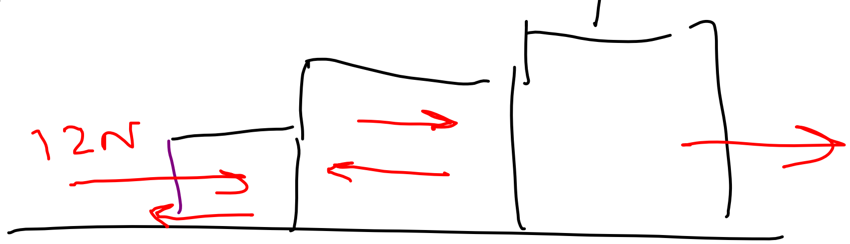
"Apparent weight"

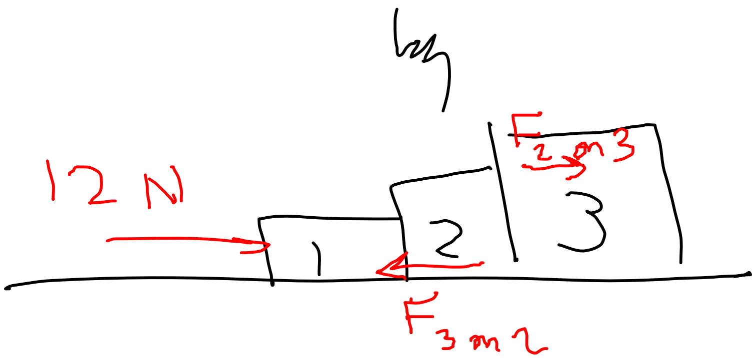
4.45



Blocks of 1.0, 2.0, 3.0 kg are lined up on fric'less table w/ a 12-N force applied to leftmost block.

What force does the middle block exert on the rightmost one?



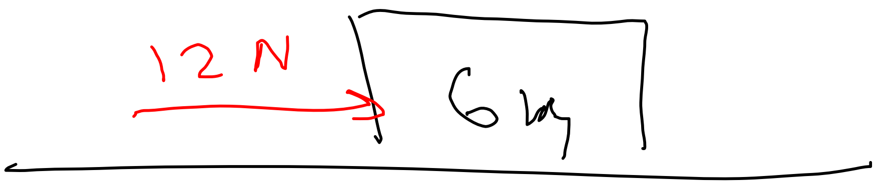


All blocks move together

Same acceleration

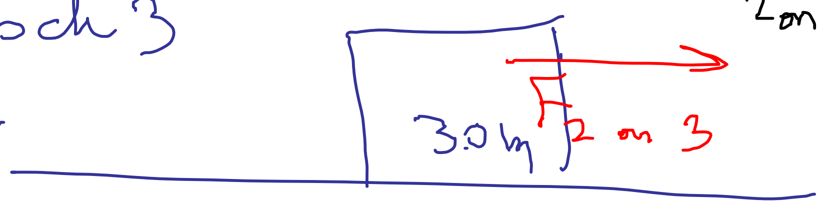
→ Legal to treat them all as 6.0 kg mass for <u>external</u> forces

$$a = F/m = 2.0 \frac{m}{s^2}$$

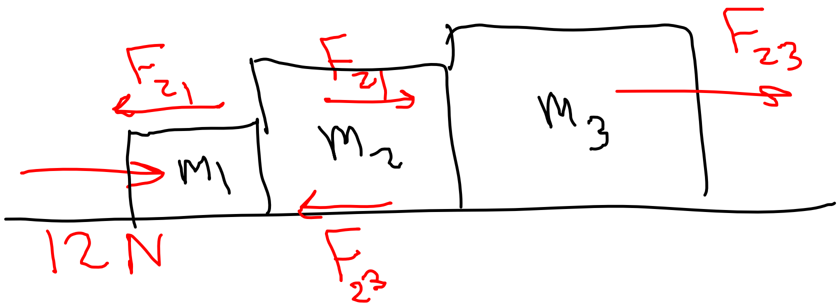


Focus on block 3

$$a = 2.0 \frac{m}{s^2}$$



$$F_{2 \text{ on } 3} = (m_3)(a)$$
$$= (3 \text{ kg})(2.0 \tfrac{m}{s^2})$$
$$= 6 \text{ N}$$



i) $12\,N - F_{21} = m_1 a$

$F_{21} - F_{23} = m_2 a$

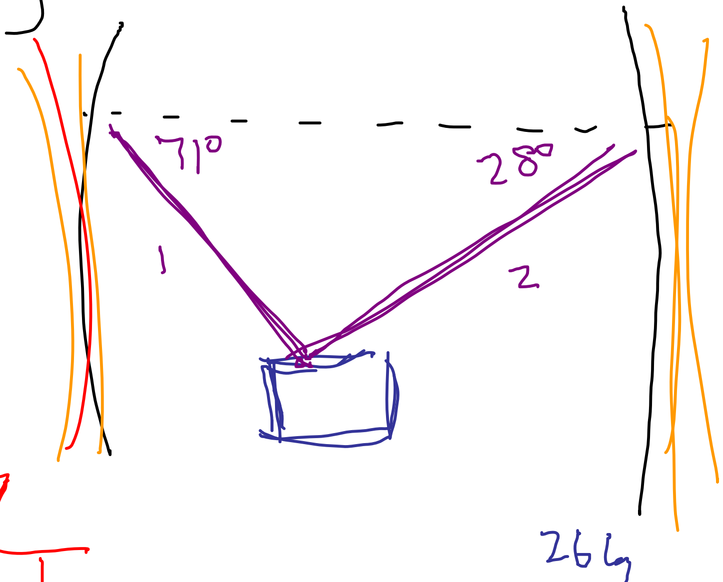
$F_{23} = m_3 a$

3 eqns, 3 unknowns

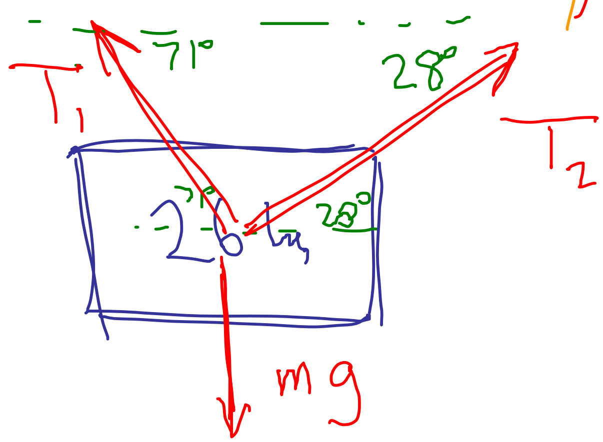
Chapter 5 problem

5.36 Camper hangs 26-kg pack with two ropes

Find the tension in each rope.



Here $\vec{a} = 0$



F_x's add to zero

F_y's add to zero.

These vectors add up to zero.

x force: $-T_1 \cos 71^\circ + T_2 \cos 28^\circ = 0$

$+T_1 \sin 71^\circ + T_2 \sin 28^\circ - mg = 0$

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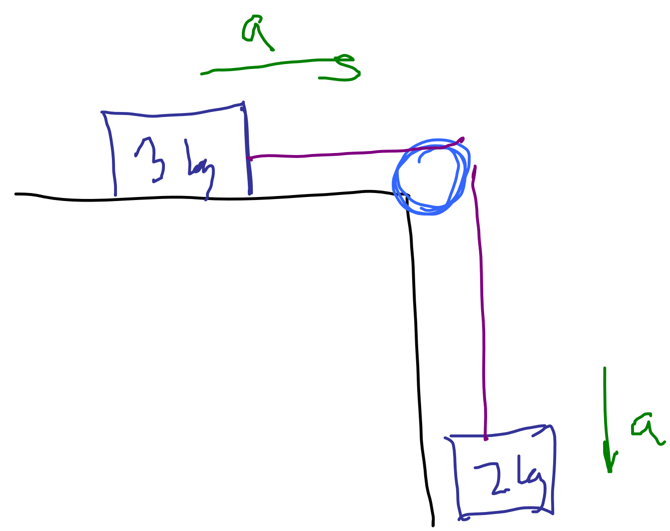
2 eqn's, 2 unknowns

can find T_1 T_2

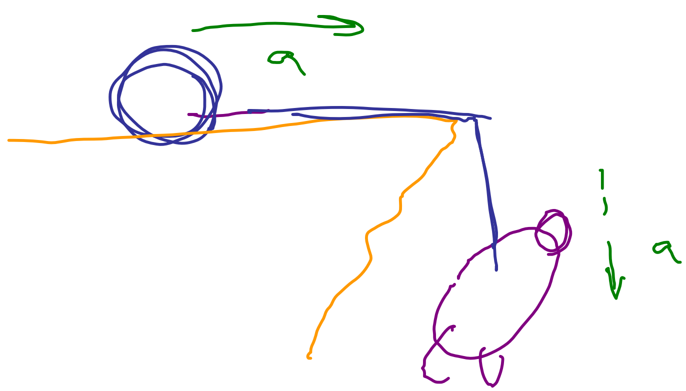
$m = 26\,kg$

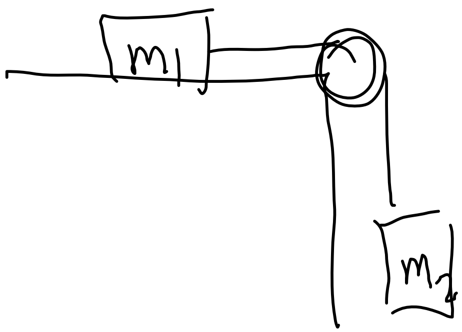
$g = 9.8\,\frac{m}{s^2}$

Example 3 kg mass, 2 kg mass connected by string which runs over ideal pulley. 3 kg block moves on a flat frictless table, 2 kg mass just hangs. Find the acceleration of masses



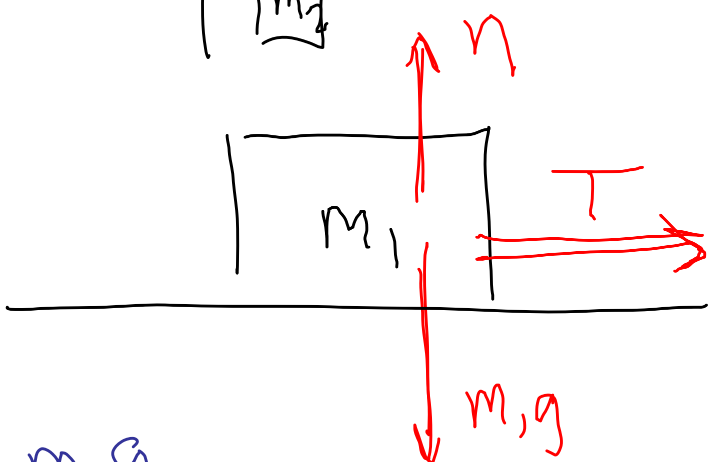
p. 70 Rescuing a climber





Multiple objects

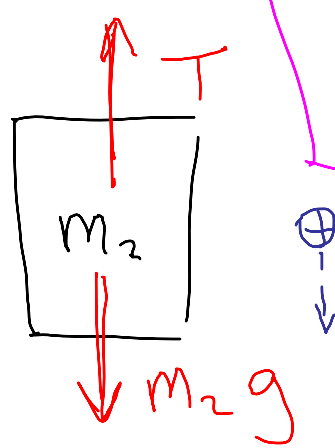
Force diagram for each object



$$\boxed{T = m_1 a}$$

$$n = mg$$

no vertical accel.



$$\boxed{m_2 g - T = m_2 a}$$

Unk's are T and a

Add eqns together:

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

$$= a(m_1 + m_2)$$

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

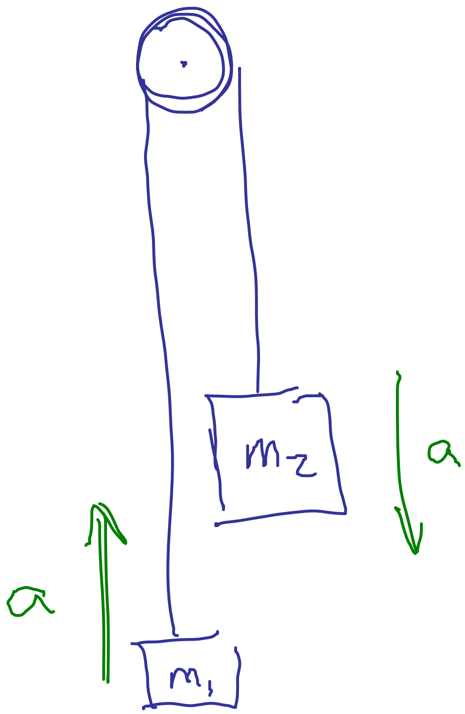
$$T = m_1 a = \frac{m_1 m_2 g}{(m_1 + m_2)}$$

$m_2 = 0$

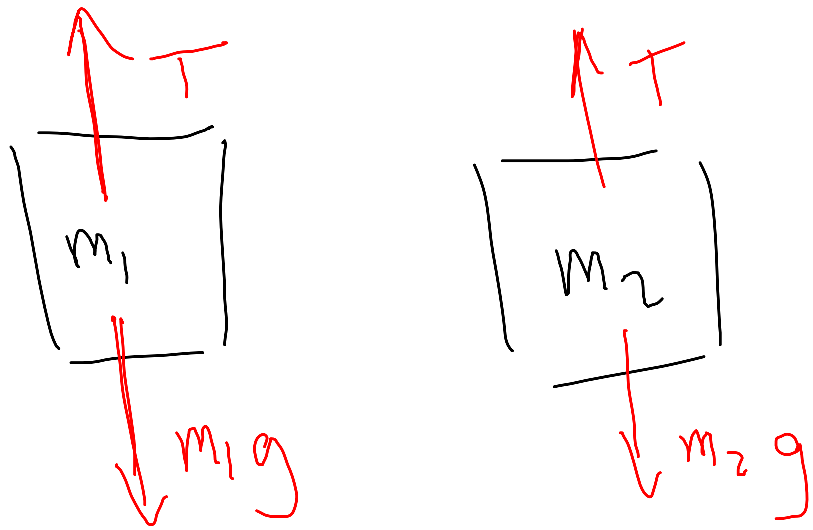
$a = 0$

$m_1 = 0$

$$a = \frac{m_2 g}{(0 + m_2)} = g$$



Atwood machine



Solve these next time.