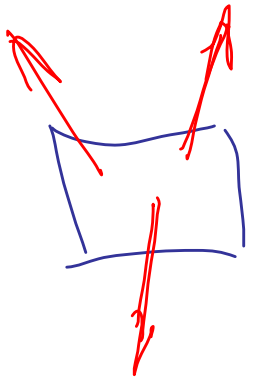
Phys 2110-4 2/13/13

Note Title 2/13/2013

Forces

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



$$F_x = ma_x$$

$$F_y = ma_y$$

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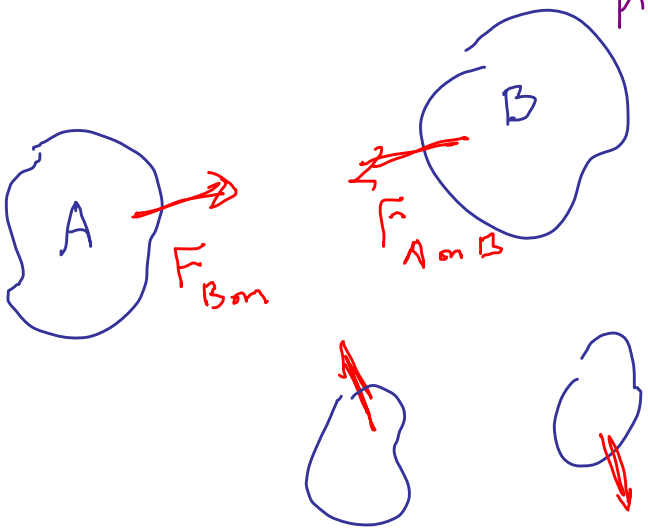


Newton's 3rd Law

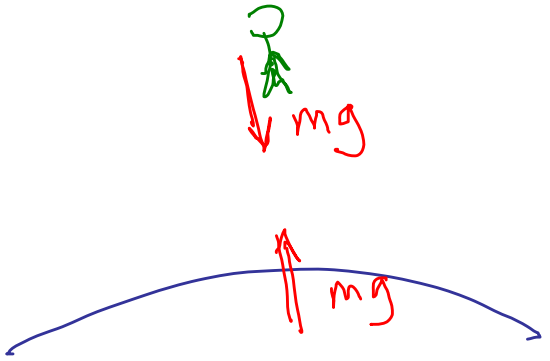
If A exerts force on B
B exerts force on A

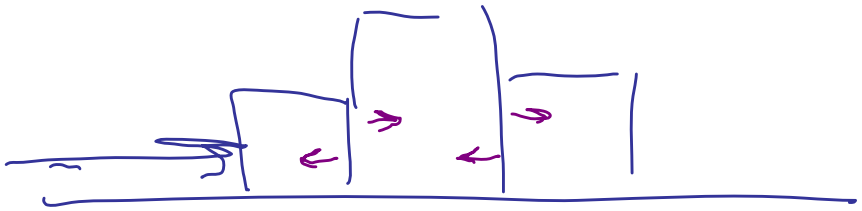
forces are opp in dir, equal in mag

Misstated

Action – Reaction.

"Action-Reaction Pair"





Forces between blocks.

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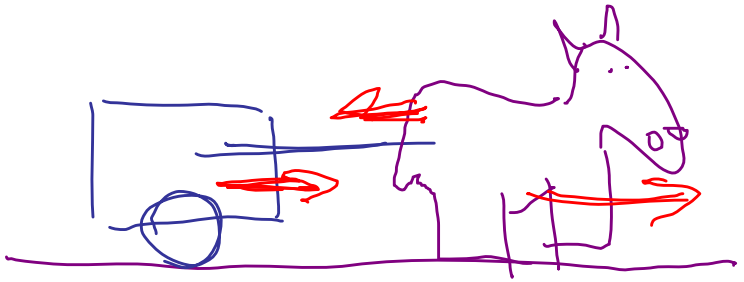
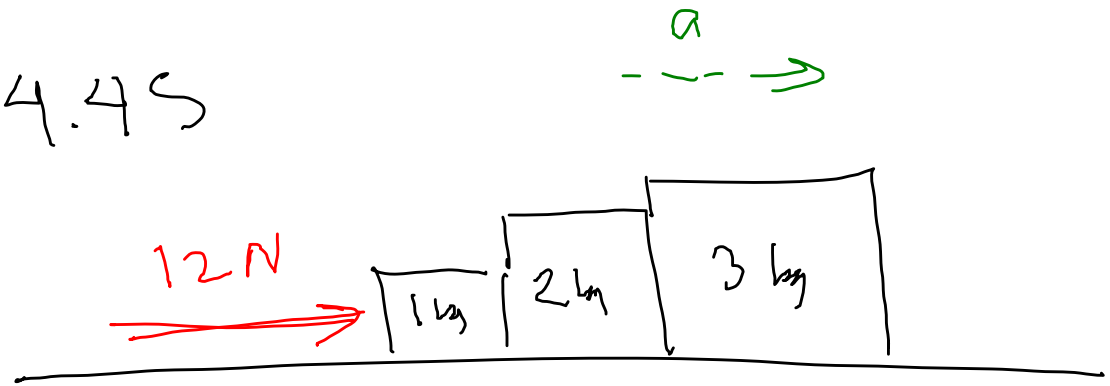


$\vec{F} = m\vec{a}$

4.45

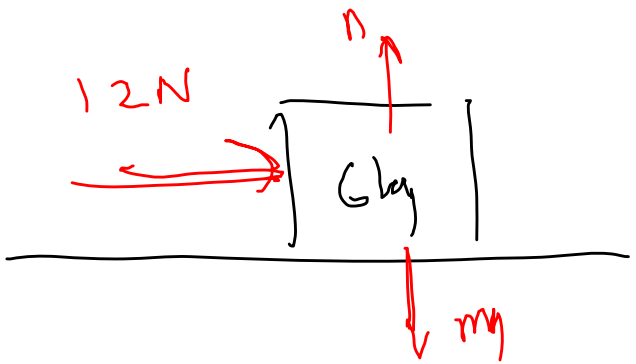


Blocks on table.

A 12 N force is applied to left most block.

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

When all blocks move together treat them as one object.

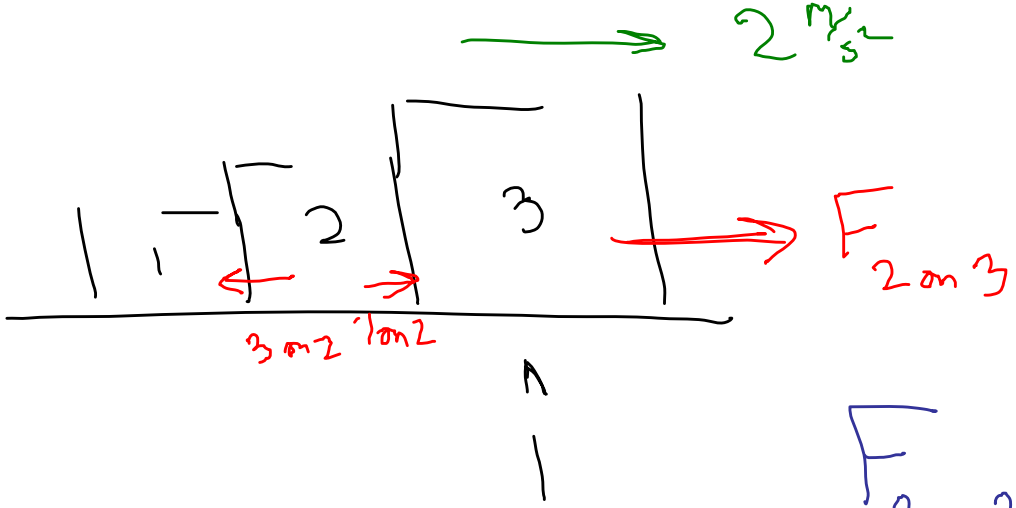


"Only" external force is 12 N

$F_x = ma_x$

$a_x = 2.0\ m/s^2$

Each block has this acceleration.



$F_{2 \text{ on } 3} = ma$

$= (3\text{kg})(2 \frac{m}{s^2})$

$= 6.0\ N$

Another way

opposite

1) $12N + F_{2 \text{ on } 1} = (1\text{kg})a$

2) $F_{1 \text{ on } 2} + F_{3 \text{ on } 2} = (2\text{kg})a$

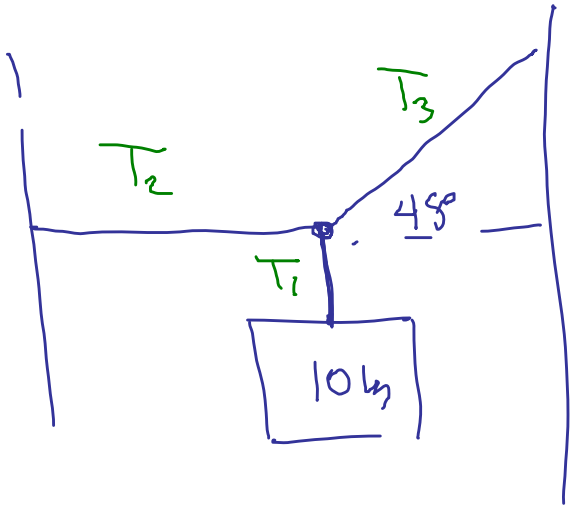
3) $F_{2 \text{ on } 3} = (3\text{kg})a$

opposite

unk

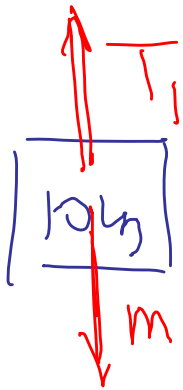
3 eqns 3 unknowns

Example



10 kg mass is suspended as shown.

Find tensions in all strings



Knot:

$$F_{Tot} = T_1 - mg = 0$$

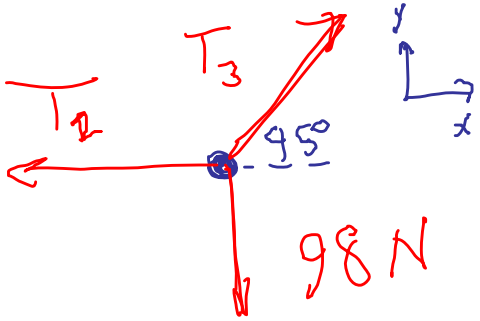
$$T_1 = mg = 98\ N$$

$\Sigma F_y = 0$

$T_3 \sin 45° - 98\ N = 0$

Solve

$T_3 = 98\ N \sqrt{2} = 139\ N$



F_x's add to zero

F_y's add to zero.

$$\Sigma F_x = 0$$

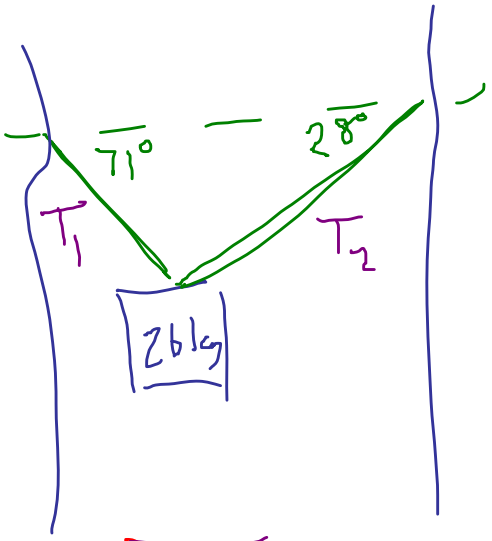
$$-T_2 + T_3 \cos 45^\circ = 0$$

$$T_2 = T_3 \cos 45^\circ = 98\ N$$

5.36 Camper hangs pack as shown.

(26 kg)

Find tensions in the ropes.

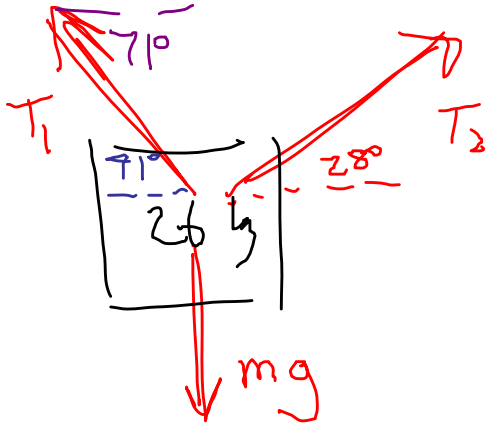


$$\Sigma F_x = 0$$

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

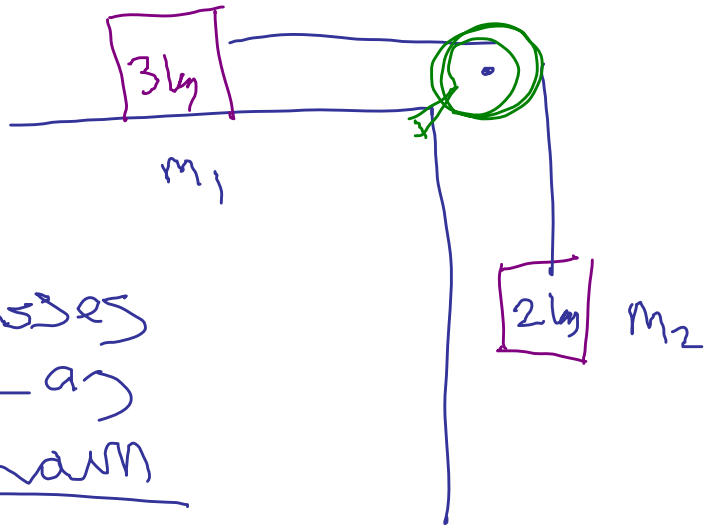
$$\Sigma F_y = 0$$

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



2 eqns, 2 unknowns

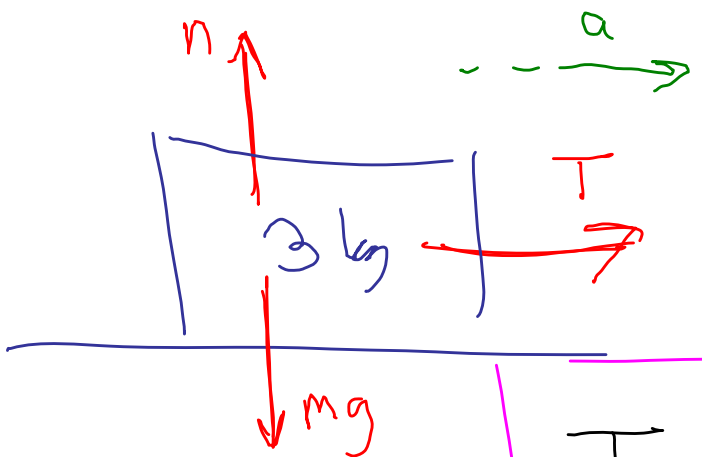
Example



Masses are as shown

Accelerations same, a

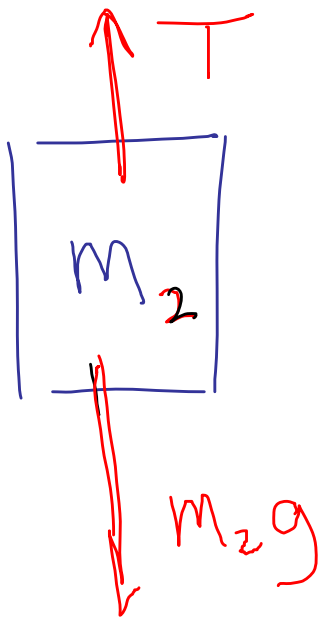
Find accel a.



$n = mg$

$T = m_1 a$

Tension is same on both ends



a

$$m_2 g - T = m_2 a$$

$$T = m_1 a$$

a. T, a Solve for a