

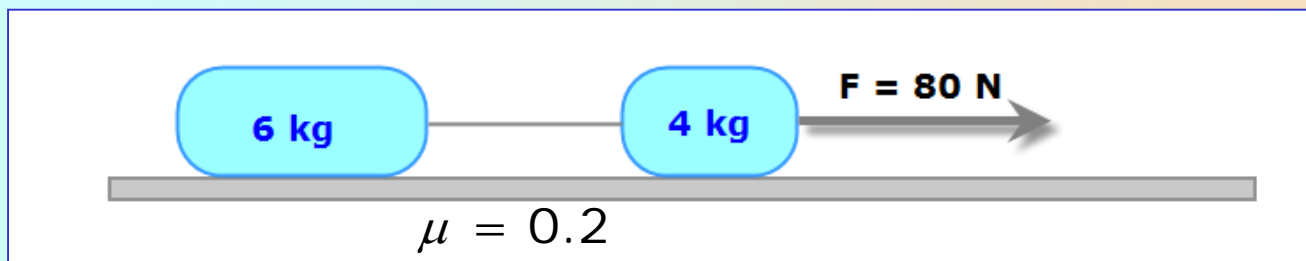
Dynamics: horizontal motion of two bodies

Problem

An external force of 80 N is applied to a system of two bodies.

Determine:

- the acceleration of the system
- the value of the tension



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Let's start by drawing the forces and determining their values

$$W_1 = m_1 * g = 40 \text{ N}$$

$$W_2 = m_2 * g = 60 \text{ N}$$

The net vertical force on each body is 0, because the bodies don't move in that direction:

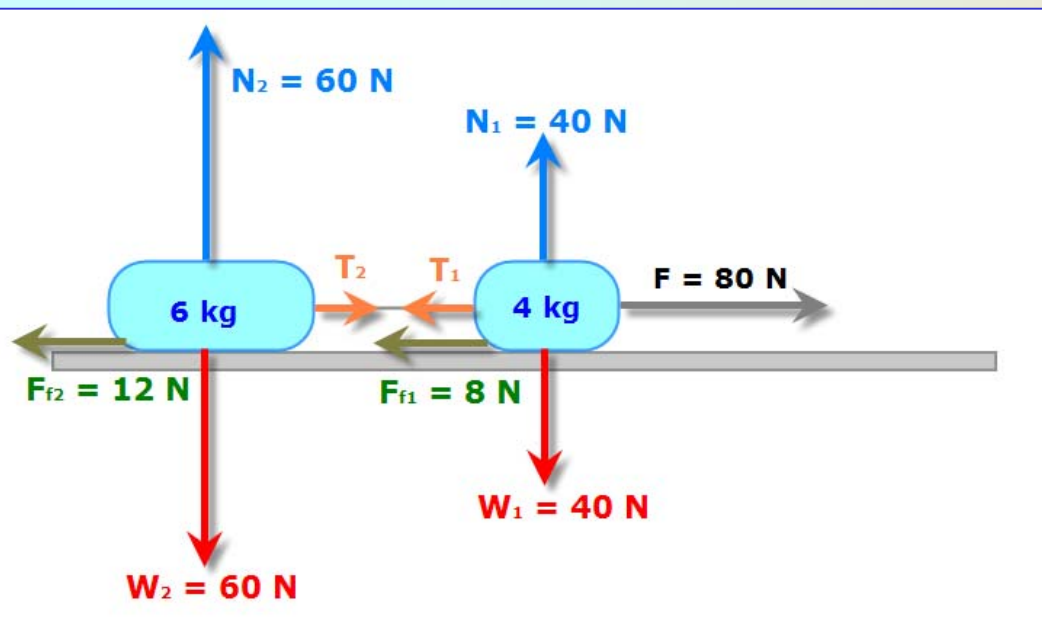
$$N_1 = W_1 = 40 \text{ N}$$

$$N_2 = W_2 = m_2 * g = 60 \text{ N}$$

The values of the friction forces are:

$$F_{f1} = \mu * N_1 = 0.2 * 40 \text{ N} = 8 \text{ N}$$

$$F_{f2} = \mu * N_2 = 0.2 * 60 \text{ N} = 12 \text{ N}$$



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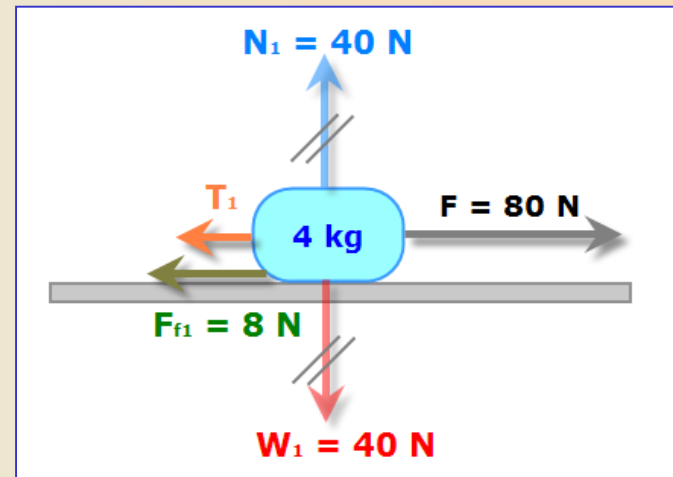
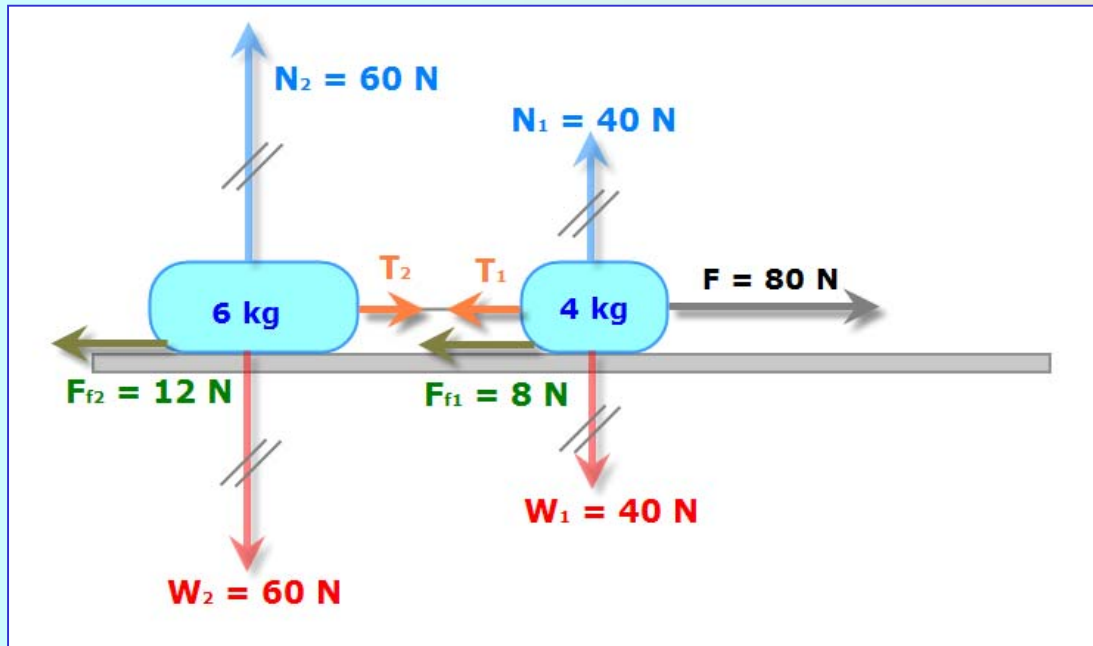
Now, we'll apply the Newton's equation to the whole system, in order to know the acceleration:

$$F_{\text{net}} = m_t * a$$

$$80 \text{ N} - 8 \text{ N} - 12 \text{ N} = (6 \text{ kg} + 4 \text{ kg}) * a$$

$$a = \frac{60 \text{ N}}{10 \text{ kg}} = 6 \frac{\text{m}}{\text{s}^2}$$

To finish, we'll apply the equation again but on an isolated body:



$$80 \text{ N} - 8 \text{ N} - T_1 = 4 \text{ kg} * 6 \frac{\text{m}}{\text{s}^2}$$

$$T_1 = T_2 = 48 \text{ N}$$

Dynamics: horizontal motion of two bodies

Problem

An external force of 135 N is applied to a system of two bodies.

Determine:

- the acceleration of the system
- the value of the tension

