

PHYS 210 - General Physics I

- Newton's Laws of Motion
- Rotation and forces

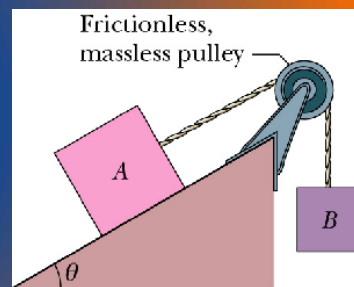
FORCES



EXAMPLE: Two blocks, m_A & m_B , are connected over a frictionless, massless pulley. The mass of block A is 10 kg and the coefficient of kinetic friction between block A and the incline is 0.20 . The angle of inclination is 30° . Block A slides down the incline at a constant acceleration of magnitude $a = 1.3\text{ m/s}^2$. Find the mass of block B.

KNOWNs:

- ▶ Massless pulley
- ▶ $m_A = 10\text{ kg}$
- ▶ $\theta = 30^\circ$
- ▶ $\mu_k = 0.20$
- ▶ Block A slides down @ const acceleration, $a = 1.3\text{ m/s}^2$.
- ▶ Find m_B



Newton's Third Law

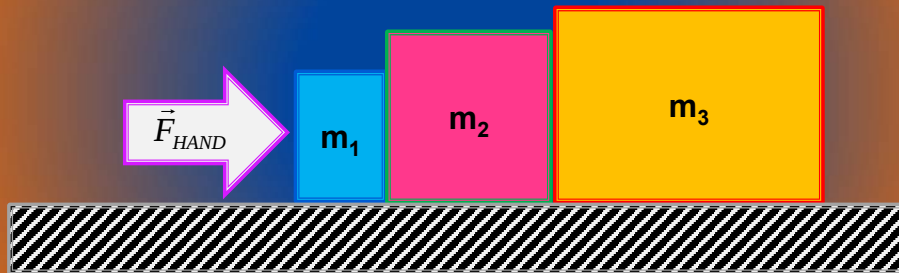
- Applies to the interaction between masses.
- The force mass 1 exerts on mass 2 is equal in magnitude to the force exerted on mass 1 by mass 2:

$$\vec{F}_{12} = -\vec{F}_{21}$$

- *“For every action there is an equal and opposite reaction.”*

Example: Pair up!

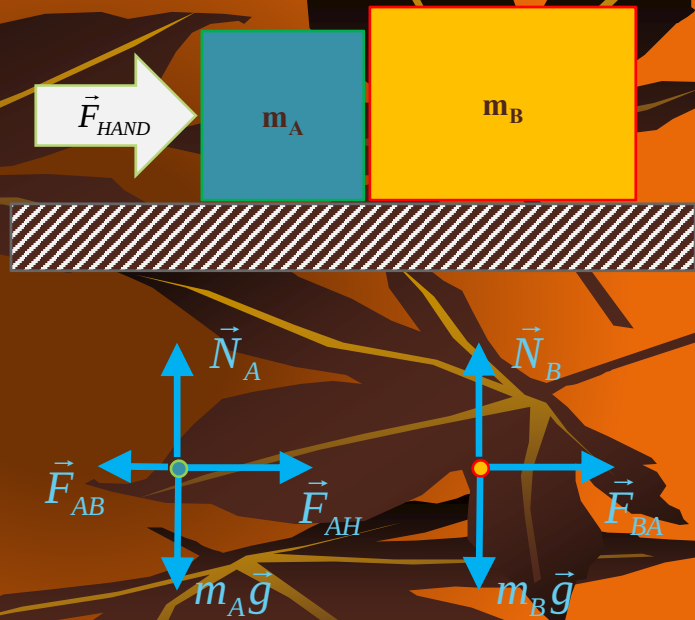
- ▶ Draw a complete free-body diagram for each mass



Example

- Two blocks of mass m_A and m_B are in contact on a frictionless table and are pushed to the right at a constant acceleration a .
- A. What force does the hand exert?
- B. What force does block B exert on block A?

Acceleration constraint: $a_A = a_B = a$



Example:

- A 15,000 kg helicopter lifts a 4500 kg truck with an upward acceleration of 1.4 m/s^2 . Find the force of air on the helicopter blades and the tension in the supporting cable.



