

4-01

Forces - introduction

Forces

Contact vs. Field Forces

- Field force acts at a distance
 - No direct contact
 - Gravity, magnetism, electrical force, etc.
- Contact force
 - A push or pull requiring direct contact between objects
 - Microscopic level: no such thing as a contact force

Forces Units

- Forces are measured in newtons
 - Abbreviated “N”
- Forces change the motion of objects
 - Acceleration
 - $1 \text{ N} = 1 \text{ kg accelerated by } 1 \text{ m/s}^2$
- Since acceleration is a vector, so is a force

Forces

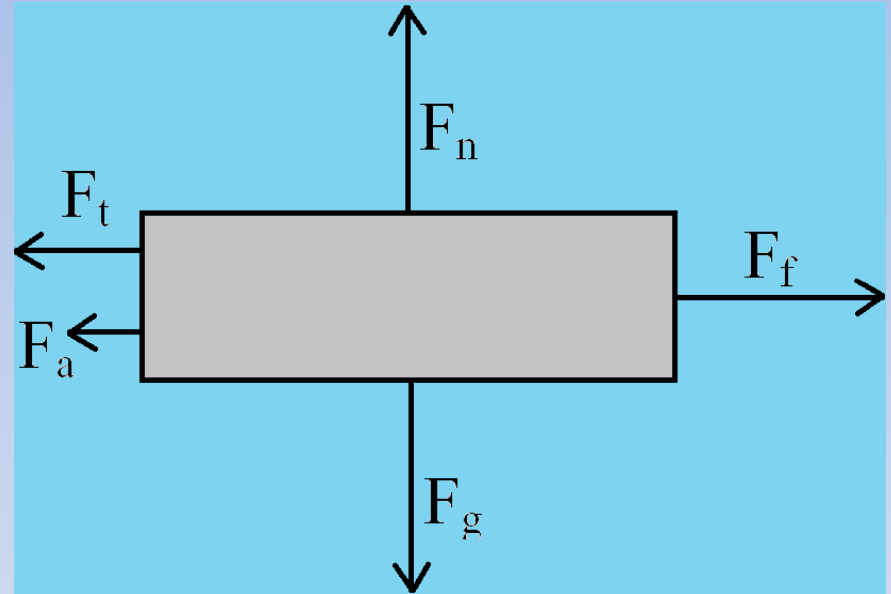
Terms you should recognize

- F_n = The normal force. Typically the “push back” force of a surface (table, floor, etc.)
- F_g = Force of gravity (weight). Always acts straight down.
- F_a = Applied force. Any external force.
- F_t = Force of tension. Force exerted by a rope of similar object capable of pulling, but not pushing.
- F_f = Frictional force. Force from rubbing that ALWAYS opposes the motion of an object.

Forces

Free body diagram with common terms

- Don't need to show actual shape – a box will do fine
- Show the forces ON an object – not BY an object
- Only forces ON an object influences motion of an object
- Arrow show force direction
- Arrow length signifies magnitude of force



Forces

Free body diagram – mass on tilted surface

- Gravity (F_g) pulls mass straight down
- Part of F_g pushes into surface, part tries to slide
- Surface push-back (F_n) same as F_{gy}
- If applied force + F_{gx} is as big as friction, mass will slide
- Do you see why we break up F_g like we do?
- Do the force sizes and directions make sense?

