

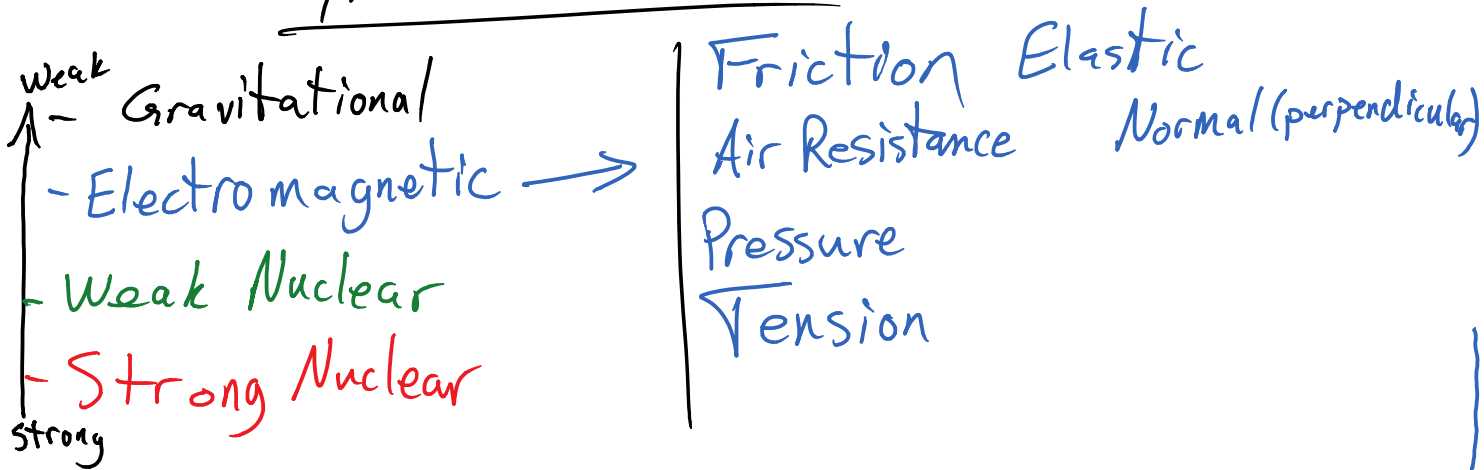
Dynamics & Free Body Diagrams

November-06-15 11:22 AM

Dynamics: the study of the motion of bodies under the action of a force.

Force: A push or a pull on an object.

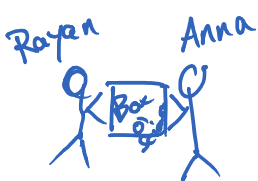
Types of Forces



4 Fundamental Forces

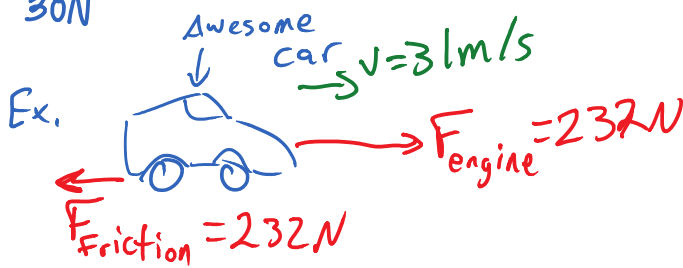
Balanced vs. Unbalanced Forces

On an object if forces are balanced on an object it will experience no change in motion.



Balanced: All the forces on the object are equal and opposite.

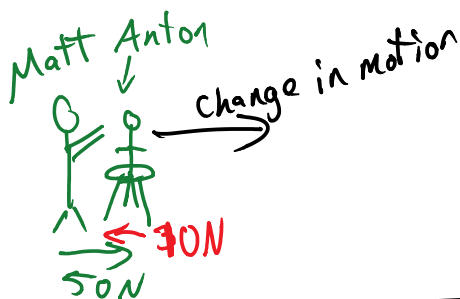
→ 30N ← 30N



Balanced forces
means $\vec{a} = 0$

Unbalanced:

On an object if the forces are unbalanced the object will experience a change in motion.



Unbalanced forces
means $\vec{a} \neq 0$

Units: Force has units of
Newtons (N)

$$N = \text{kg} \cdot \text{m} / \text{s}^2$$

Free Body Diagrams

- A simple sketch of a single object that shows all the forces on it.
1. Draw a quick sketch of the object (Box, circle)
 2. Place a dot in the center of the object

3. For each Force on that object draw an arrow from the dot in the direction of the force.

4. Label your arrows.

Ex. Draw a Free body Diagram (FBD) of a book being held by a person



Common Forces

F_g = Force of gravity

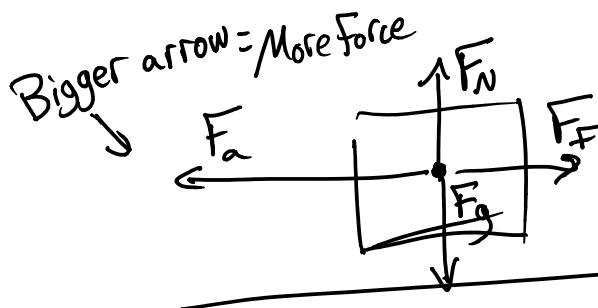
F_a = applied force

F_f = Friction force

F_T = Tension force

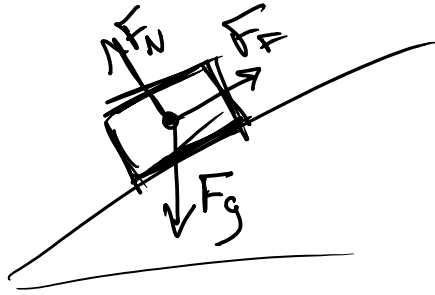
F_N = Normal force (perpendicular force = F_{\perp})

A Box is on the ground and is being slid to the left. Draw a FBD

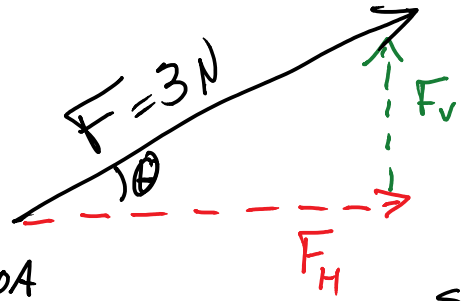


Unbalanced Forces.
acceleration to the left.

F_{\perp} — Forces at Angles



Forces at Angles



SOH CAH TOA
 $\sin \theta = \frac{O}{H}$ $\tan \theta = \frac{O}{A}$
 $\cos \theta = \frac{A}{H}$

$$\sin \theta = \frac{F_v}{F}$$

$$\cos \theta = \frac{F_h}{F}$$

$$F \cos \theta = F_h$$

$$F \sin \theta = F_v$$

FBD

