

Dynamics

November 07-16 11:14 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

Gravitational Force
Electromagnetic Force
Weak Nuclear Force
Strong Nuclear Force

4 Fundamental Forces

Mechanical Forces

Hydraulic Force

Tension Forces

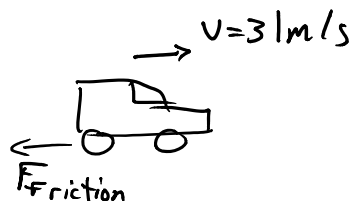
Friction → Air resistance

Elastic

Normal (surface) forces

Balanced vs Unbalanced Forces

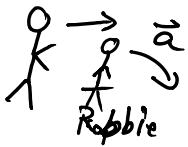
If Forces on an object are balanced, the object will experience no change in motion



To keep going at a constant speed the engine needs to provide a force equal to the force of friction

No acceleration

If Forces on an object are unbalanced the object will experience an acceleration.



Unbalanced Forces
 $a \neq 0$

Units of Force

Newton (N)

$$1N = 1 \text{ kg} \cdot \frac{\text{m}}{\text{s}^2}$$

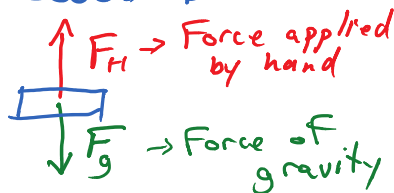
Free Body Diagram

* Must be included
in all force problems!

A simple sketch of a single object that shows the forces acting on the object.

1. Draw a quick sketch of the object. \square
2. For each force acting on that object draw an arrow from the box going in the direction of the force.
3. Label the arrows.

Ex. A person holds a book. Draw the FBD of the book



Common Forces w/subscript

$F_g \rightarrow$ gravity

$F_a \Rightarrow$ applied force

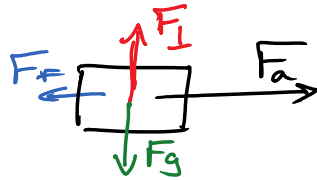
$F_f \rightarrow$ friction

$F_T \Rightarrow$ Tension force

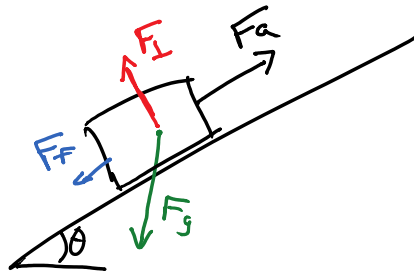
$T \rightarrow$ tension

$F_{\perp} \rightarrow$ Normal/Perpendicular
(F_N) Force

A box is slid across the floor.
Draw a FBD.



The box is slid up a ramp.



SOH $\sin \theta = \frac{F_{g\parallel}}{F_g}$
CAH $\cos \theta = \frac{F_{g\perp}}{F_g}$
TOA

$$\begin{aligned} &= 90 - (90 - \theta) \\ &= 90 - 90 + \theta \\ &= 0 + \theta \\ &= \theta \end{aligned}$$

