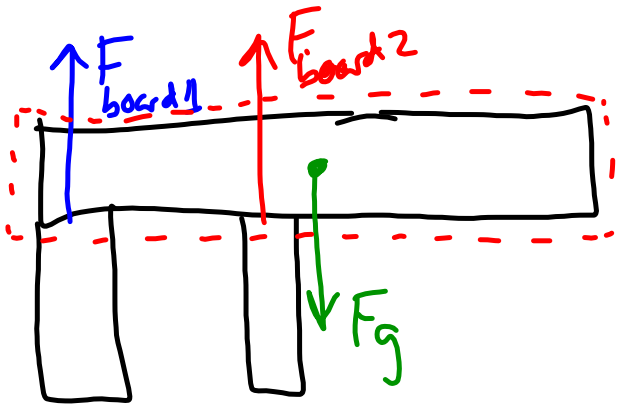
Force and Free-Body Diagrams

- Important Points
  - System vs. surroundings
  - Notation: $F_{\text{kind, on object, by agent}}$
  - Example: F_g
  - Forces are vectors
  - Forces can act at a distance

Force Diagram

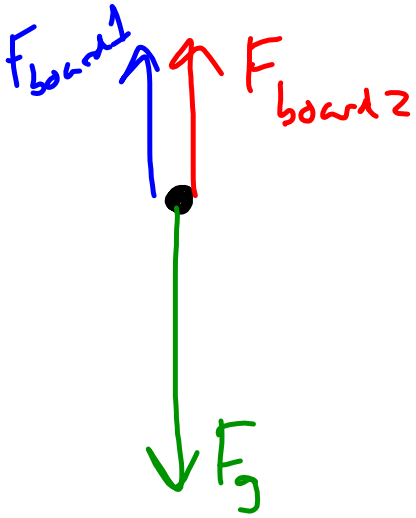
- Diagram that shows where the forces are actually happening.



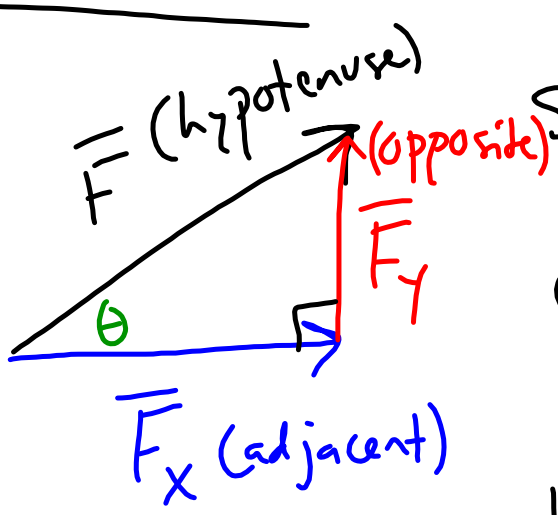
* Every force gets unique name

Free-Body Diagram

- Diagram that shows forces acting on the center of mass of the object



"Force Triangles"



$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

Free-Body Diagram (FBD) Guidelines

1) Draw a dot

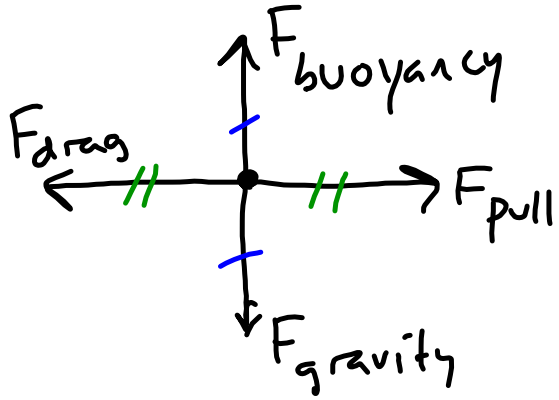
2) Draw forces in the "actual" direction

3) Label each force with the kind
(ex: $F_{gravity}$, $F_{tension}$, $F_{electric}$)

4) If forces have same magnitude,
draw congruency marks

Worksheet 1b

1)

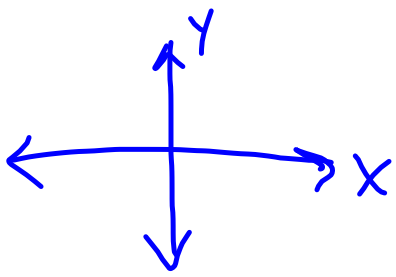


Is there acceleration in some direction?

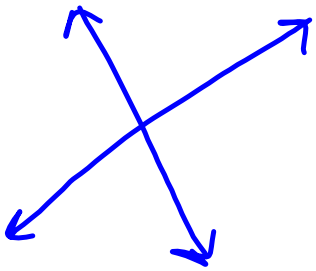
* assume constant velocity

You are allowed to choose a coordinate system.

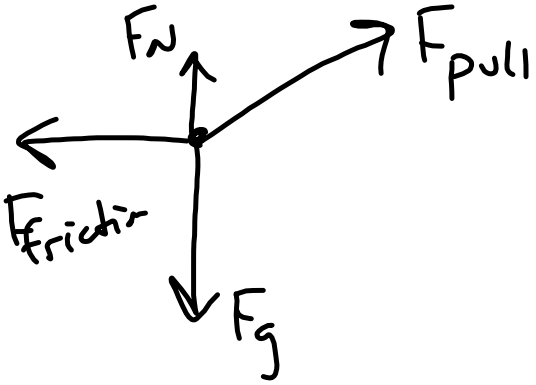
- "Normal" → Cartesian



- "Rotated" cartesian



2)



* F_N → normal force is ALWAYS perpendicular to a surface