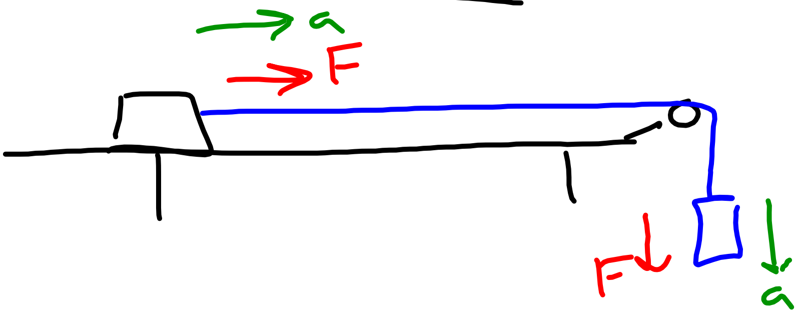
# Pulling a Cart

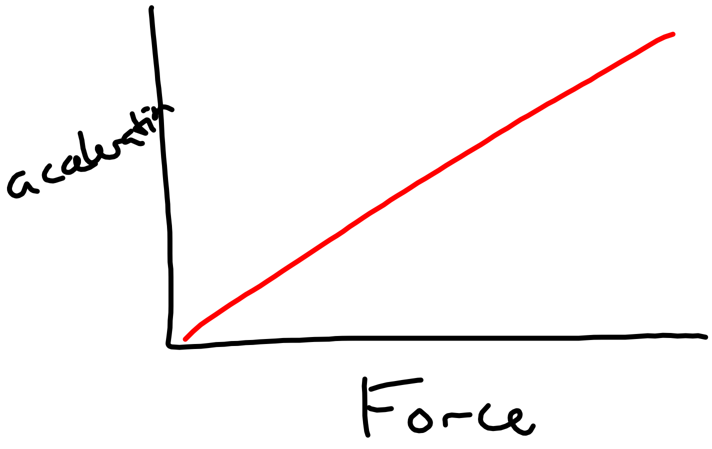



mass on cart goes to hanging mass

- Measure
  - acceleration of cart
  - force of the hanging mass(es)

  6 or 7 data points

- Graph
  - acceleration vs. Force
  - determine the function of best fit




slope = $\frac{\text{acceleration}}{\text{force}}$

$$F_g = m a_g$$

$$\frac{F_g}{F_g} = \frac{m a_g}{F_g}$$

$$\frac{1}{m}(1) = \left(\frac{m a_g}{F_g}\right)\frac{1}{m}$$

$$\frac{1}{m} = \frac{a_g}{F_g} \qquad \frac{\frac{m}{s^2}}{kg\frac{m}{s^2}} = \frac{1}{kg}$$

$1.983 \frac{1}{kg} \rightarrow 0.504\ kg$

$0.65\ kg$

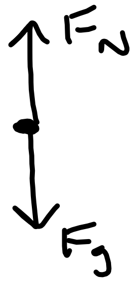
Newton's 2nd Law

$$\sum \bar{F} = m\bar{a}$$

net force and acceleration vectors point in the same direction

WS 1

1) a. ↑+




b. $\Sigma F = ma$ ↗ $\emptyset$

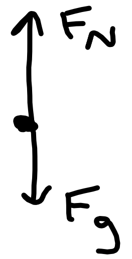
$F_N - F_g = \emptyset$

$F_N = F_g = m a_g$

$= (85\,kg)(9.8\,m/s^2)$

$= 833\,N$

2) a. pt




b. $\sum F = ma$

$F_N - F_g = ma$

c. $F_N = F_g + ma$

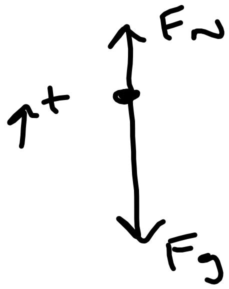
$= ma_g + ma$

$= m(a_g + a)$

$= (85\,kg)(9.8\,m/s^2 + 2.0\,m/s^2)$

$= 1003\,N$

3) a.




b. $\sum \vec{F} = m\vec{a}$

$F_N - F_g = ma$

c. $F_N = m(a_g + a)$

$= (85\,kg)\left[9.8\,m/s^2 + (-3\,m/s^2)\right]$

$= 578\,N$

4) Elevator and person fall at same rate, so no normal force.

5) a. $9.8\ m/s^2$

b. $\uparrow$

$F_{AR} = 300N$

$F_g = ma_g$
$= (70kg)(9.8\ m/s^2)$
$= 686\ N$

$\Sigma F = -386\ N$

$\Sigma F = ma$

$a = \frac{\Sigma F}{m} = \frac{-386N}{70kg} = -5.51\ m/s^2$

constant velocity ⎤
rest/∅ velocity ⎦ → Balanced Forces

acceleration → Unbalanced forces