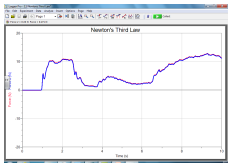
Re-visit Thought Experiments on p153:

	A	B	C	D
1	0	1	17	6
2	0	0	3	22
3	7	9	2	7

TODAY



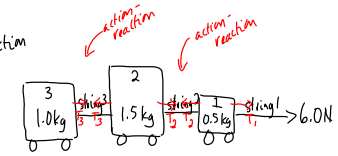
I forgot to calibrate a probe with a neg sign, red graph should be in the negative section.

Newton's Third Law

For every force on object B due to object A, there is a reaction force, equal in magnitude but opposite in direction, on object A due to object B.

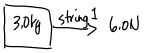
$$\vec{F}_{A\text{ on }B} = -\vec{F}_{B\text{ on }A}$$

Example
*neglect friction



find the tension in each string.

Consider all 3 carts as one object with a mass of 3.0kg



$F_{net} = ma$

$F_a = ma$

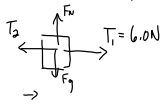
$6.0N = (3.0kg)a$

$a = 2.0m/s^2$

Each cart has the same acceleration since they are all connected.

The tension in string 1 is 6.0N

Consider Cart 1



$\vec{F}_{net} = m\vec{a}$

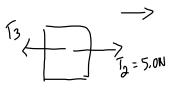
$T_1 - T_2 = m_1 a$

$6.0N - T_2 = (0.5kg)(2.0m/s^2)$

$6.0N - T_2 = 1.0N$

$T_2 = 5.0N$

Consider Cart 2:



$\vec{F}_{net} = m\vec{a}$

$T_2 - T_3 = ma$

$5.0N - T_3 = (1.5kg)(2.0m/s^2)$

$5.0N - T_3 = 3.0N$

$T_3 = 2.0N$

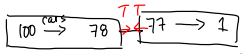
Summary:

$T_1 = 6.0N$

$T_2 = 5.0N$

$T_3 = 2.0N$

Consider a train with 100 cars and you want to find the tension between cars 77 and 78.



The tension in the coupling must act on cars 78 to 100

TO DO: PP|182 (18 + 19)

PP 168

4. $m = 15kg$

$\vec{F}_a = 5.5N\ [N]$

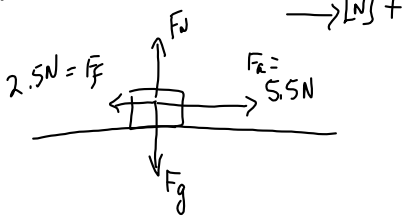
$\vec{F}_f = 2.5N\ [S]$

$V_1 = 0$

$\Delta t = 4.0s$

$\Delta d = ?$

FBD:



$\vec{F}_{net} = m\vec{a}$

$F_a - F_f = ma$

$5.5N - 2.5N = (15kg)a$

$3.0N = (15kg)a$

$a = \frac{3.0N}{15kg}$

$a = +0.20\ m/s^2$

$\vec{a} = 0.20\ m/s^2\ [N]$

$\vec{\Delta d} = \cancel{V_1 t}^{0} + \frac{1}{2}\vec{a}t^2$

$\vec{\Delta d} = \frac{1}{2}\vec{a}t^2$

$\vec{\Delta d} = \frac{1}{2}(0.20 m/s^2\ [N])(4.0s)^2$

$\vec{\Delta d} = 1.6m\ [N]$

5.

$m = 45kg + 4kg = 49kg$

$\vec{F}_a = 325N\ [E]$

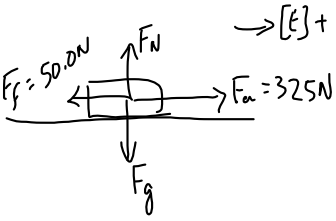
$\vec{F}_f = 50.0N\ [W]$

a) $a = ?$

b) $\Delta d = ?$

$V_1 = 3.0 m/s\ [E]$

$\Delta t = 8.0s$



$\vec{F}_{net} = m\vec{a}$

$F_a - F_f = ma$

$325N - 50.0N = (49kg)a$

$275N = (49kg)a$

$a = \frac{275N}{49kg}$

$a = +5.6\ m/s^2$

$\vec{a} = 5.6\ m/s^2\ [E]$

$\Delta d = V_1 t + \frac{1}{2}at^2$

$\Delta d = (3.0 m/s)(8.0s) + \frac{1}{2}(5.6 m/s^2)(8.0s)^2$

$\Delta d = 24m + 179.2m$

$\Delta d = 203.2m$

$\Delta d = +2.0 \times 10^2 m$

$\vec{\Delta d} = 2.0 \times 10^2 m\ [E]$