PP|168

6. $m = 1.2 \times 10^3\,kg$

$\vec{V}_1 = 45\,km/h\,[W]$ ($\times 1000$, $\div 3600$) → $12.5\,m/s$

$\vec{V}_2 = 0$

$\Delta d = 35\,m$

$a = ?$

$\mu = ?$

Find the acceleration:

$$V_2^2 = V_1^2 + 2a\Delta d$$

$$V_2^2 - V_1^2 = 2a\Delta d$$

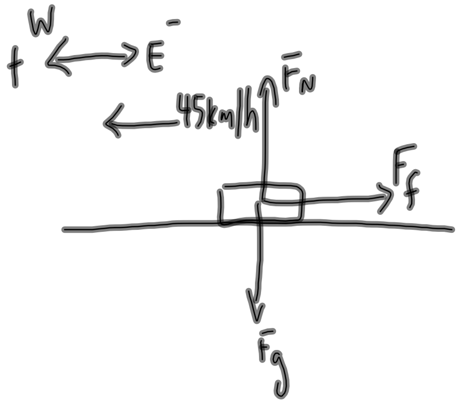
$$a = \frac{V_2^2 - V_1^2}{2\Delta d}$$

$$a = \frac{0^2 - (12.5\,m/s)^2}{2(35\,m)}$$

$$\boxed{a = -2.2\,m/s^2}$$

$$\vec{a} = 2.2\,m/s^2\,[E]$$

Draw a FBD:



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

$$-F_f = ma$$

$$-F_f = (1.2 \times 10^3\,kg)(-2.2\,m/s^2)$$

$$\boxed{F_f = 2678.57\,N} \rightarrow \mu$$

$$\vec{F}_f = 2.7 \times 10^3\,N\,[E]$$

$$F_f = \mu F_N$$

$$F_f = \mu F_g$$

$$F_f = \mu mg$$

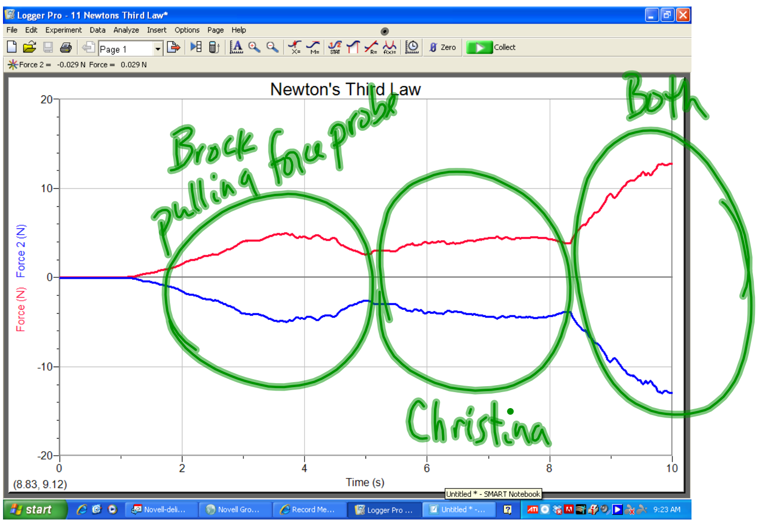
$$\mu = \frac{F_f}{mg}$$

$$\mu = \frac{2678.57\,N}{(1.2 \times 10^3\,kg)(9.81\,m/s^2)}$$

$$\boxed{\mu \doteq 0.23}$$

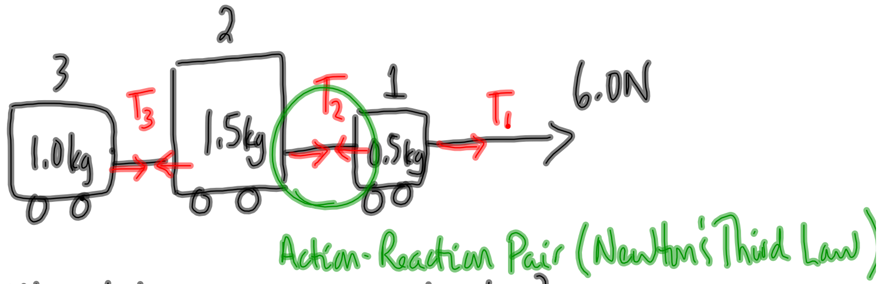
Newton's Third Law (Action-Reaction)

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



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

Example - A childs pull toy (neglect friction)

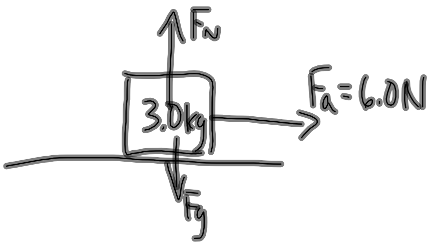


a) What is the acceleration of the toy?

b) what is the force in the strings connecting the carts (T)?

. . . .

a) 6.0N is applied to a total of 3.0kg

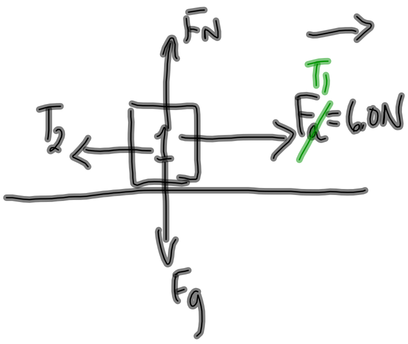


$$\vec{F}_{net} = m\vec{a}$$

$$6.0N = (3.0kg)a$$

$$\boxed{a = 2.0m/s^2}$$

b) Consider cart 1:



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

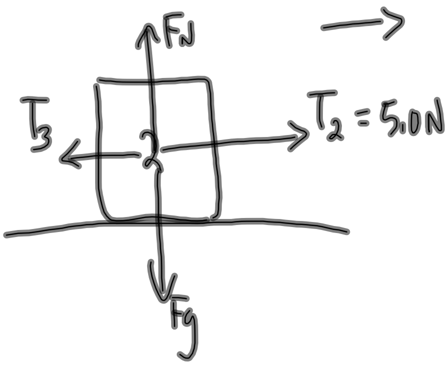
$$T_1 - T_2 = ma$$

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

$$6.0N - T_2 = 1.0N$$

$$\boxed{T_2 = 5.0N}$$

Consider Cart 2:



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

$$T_2 - T_3 = ma$$

$$5.0N - T_3 = (1.5kg)(2.0$$

$$5.0N - T_3 = 3.0N$$

Apparent Weight

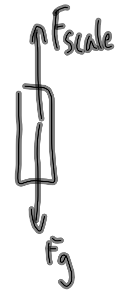
MP|184

$m = 55 kg$

a) $F_{scale} = ?$ (not moving)

b) $F_{scale} = ?$ ($\vec{a} = 0.75 m/s^2$ [up])

a)



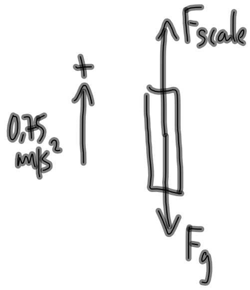
$a = 0$

$F_{scale} = F_g$

feel normal → $F_{scale} = (55 kg)(9.81 m/s^2)$

$F_{scale} \doteq 5.4 \times 10^2 N$

b)



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

$F_{scale} - F_g = ma$

$F_{scale} = ma + F_g$

$F_{scale} = (55 kg)(~~0.75 m/s^2~~ -9.81 m/s^2) + 539.55 N$ (cut the cable)

"feel" heavier → $F_{scale} \doteq 5.8 ~~\times 10^2~~ N$

ON feel weight less.

+ acc make you feel "heavier"
(going up | speeding up
or going down | slowing down)

− acc make you feel "lighter"
(going up | slowing down
OR going down | speeding up)

TO DO:

1. PP|182|18+19 (towing)
2. PP|186 (elevator)