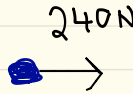


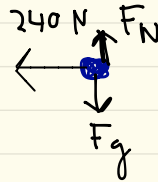
Pg. 141

#1. a)

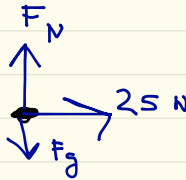
FBD of Road



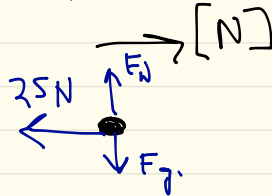
FBD of Tire



b) FBD of Desk



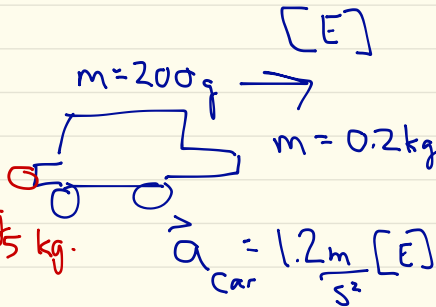
FBD of Person



Pg 141 #6.

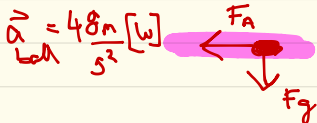
ACTION

$$F_A = 0.24 \text{ N [W]}$$



$m = 50\text{g}$
 $m = 0.05 \text{ kg}$
 $\vec{a}_{ball} = 0.24 \frac{\text{km}}{\text{s}^2}$

0.05kg FBD Ball



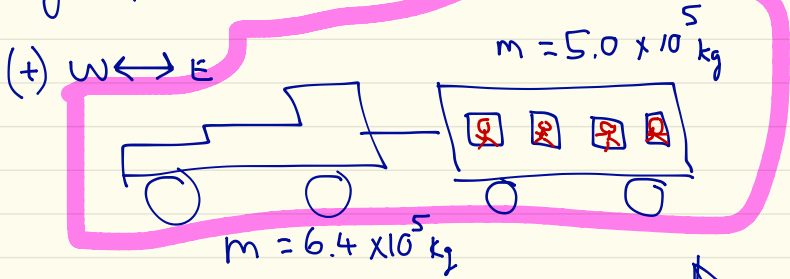
$$\vec{a}_{Car} = 1.2 \frac{\text{m}}{\text{s}^2} [\text{E}]$$



$$\begin{aligned} F_A &= F_{NET} \\ &= ma \\ &= (0.2 \text{ kg}) \left(1.2 \frac{\text{m}}{\text{s}^2} \right) \\ &= 0.24 \text{ N [E]} \\ &\text{(Reaction)} \end{aligned}$$

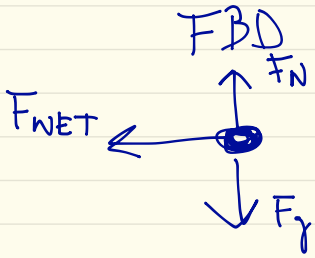
Section 3.5 Using Newton's Laws

Pg. 144 # 2.



$$\vec{a} = 0.12 \text{ m/s}^2 \text{ [W]}$$

entire train
1 object
∴ 1 FBD.

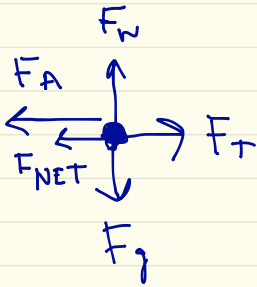


$$\begin{aligned} F_{\text{NET}} &= ma \\ &= (6.4 \times 10^5 \text{ kg} + 5.0 \times 10^5 \text{ kg}) (0.12 \frac{\text{m}}{\text{s}^2}) \text{ [W]} \\ &= (11.4 \times 10^5 \text{ kg}) (0.12 \text{ m/s}^2) \text{ [W]} \\ &= 136800 \text{ N [W]} \therefore 140000 \text{ N [W]} \end{aligned}$$

$$(+)$$

$$\omega \longleftrightarrow E$$

b) FBD Locomotive



$$F_{NET} = F_A - F_T$$

2 unknowns

$$F_{NET} = ma$$

$$= (6.4 \times 10^5 \text{ kg}) \left(0.12 \frac{\text{m}}{\text{s}^2} \right) [W]$$

$$F_{NET} = 76800 \text{ N } [W]$$

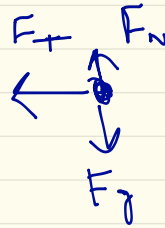
$$F_{NET} = F_A - F_T$$

$$76800 \text{ N} = F_A - 60000 \text{ N}$$

$$76800 \text{ N} + 60000 \text{ N} = F_A$$

$$136800 \text{ N} = F_A$$

FBD TRAIN
CAR



$$F_T = F_{NET}$$

$$F_T = ma$$

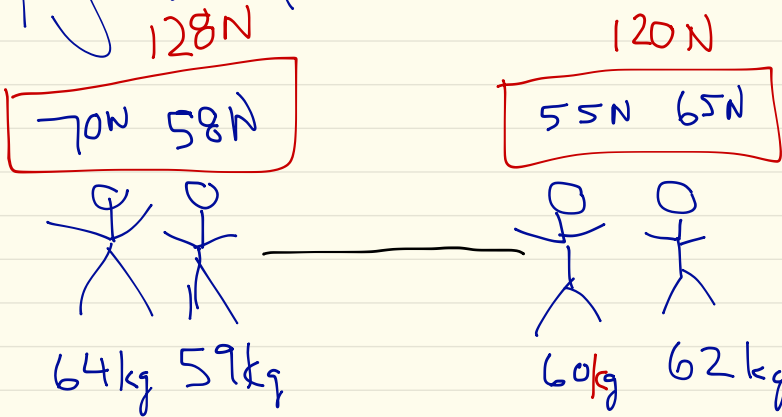
1 unknown.

$$F_T = (5.0 \times 10^5 \text{ kg}) \left(0.12 \frac{\text{m}}{\text{s}^2} \right) [W]$$

$$F_T = 60000 \text{ N } [W]$$

∴ The locomotive
applies a force
of $140000 \text{ N } [W]$

Pg 157 # 54



$$F_{NET} = 8 \text{ N [Left]}$$

$$m = 64 \text{ kg} + 59 \text{ kg} + 60 \text{ kg} + 62 \text{ kg}$$

$$m = 245 \text{ kg}$$

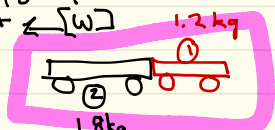
$$\vec{F}_{NET} = m\vec{a}$$

$$8 \text{ N [Left]} = 245 \text{ kg}(\vec{a})$$

$$\vec{a} = \frac{8 \text{ N [Left]}}{245 \text{ kg}}$$

$$\vec{a} = 0.03 \text{ m/s}^2 \text{ [Left]}$$

Pg. 146 #1



object

a)



$$F_A = F_{NET} = ma$$

$$18.9 \text{ N [W]} = (1.8 \text{ kg} + 1.2 \text{ kg}) \vec{a}$$

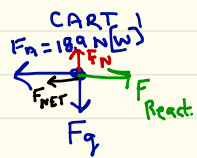
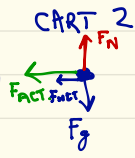
$$18.9 \text{ kg} \frac{\text{m}}{\text{s}^2} \text{ [W]} = (3.0 \text{ kg}) \vec{a}$$

$$\vec{a} = \frac{18.9 \text{ kg} \frac{\text{m}}{\text{s}^2} \text{ [W]}}{3.0 \text{ kg}}$$

$$\vec{a} = 6.3 \text{ m/s}^2 \text{ [W]}$$

(+) [W] ←

b)



$$F_{NET} = F_A - F_{REACT}$$

$$ma = 18.9 \text{ N} - F_{REACT}$$

$$(1.2 \text{ kg}) (6.3 \frac{\text{m}}{\text{s}^2}) = 18.9 \text{ N} - F_{REACT}$$

$$7.56 \text{ N} = 18.9 \text{ N} - F_{REACT}$$

$$7.56 \text{ N} - 18.9 \text{ N} = -F_{REACT}$$

$$-11.34 \text{ N} = -F_{REACT}$$

$$F_{REACT} = 11 \text{ N}$$

∴ CART 1 Applies a force of 11 N [W] on CART 2.

c)



$$18.9 \text{ N [E]} \rightarrow (+)$$

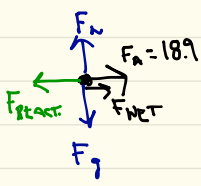
$$F_{NET} = ma$$

$$18.9 \text{ N [E]} = 3 \text{ kg} (\vec{a})$$

$$\frac{18.9 \text{ N [E]}}{3 \text{ kg}} = \vec{a}$$

$$\vec{a} = 6.3 \text{ m/s}^2 \text{ [E]}$$

FBD CART 2



FBD CART 1



$$F_{NET} = F_A - F_{REACT}$$

$$ma = 18.9 \text{ N} - F_{REACT}$$

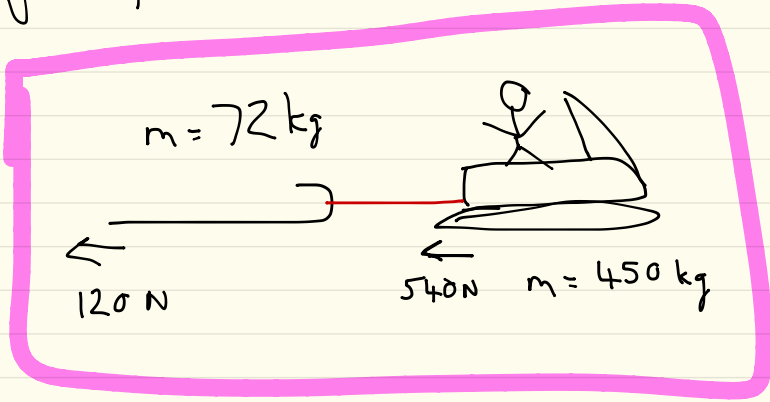
$$(1.8 \text{ kg}) (6.3 \frac{\text{m}}{\text{s}^2}) = 18.9 \text{ N} - F_{REACT}$$

$$11.3 \text{ N} - 18.9 \text{ N} = -F_{REACT}$$

$$-7.6 \text{ N} = -F_{REACT}$$

∴ CART 1 exerts a force of 7.6 N [W] on CART 2.

Pg. 147 #2.



$$\vec{a} = 2.0 \text{ m/s}^2 \text{ [Forward]}$$

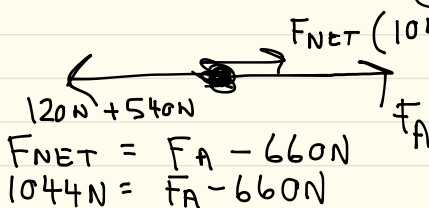
$$\vec{F}_{\text{NET}} = m \vec{a}$$

$$= (72 \text{ kg} + 450 \text{ kg}) 2.0 \text{ m/s}^2 \text{ [Forward]}$$

$$\vec{F}_{\text{NET}} = (522 \text{ kg})(2.0 \text{ m/s}^2) \text{ [Forward]}$$

$$\vec{F}_{\text{NET}} = 1044 \text{ N [Forward]}$$

FBD of Combined (Snowmobile + Sled)

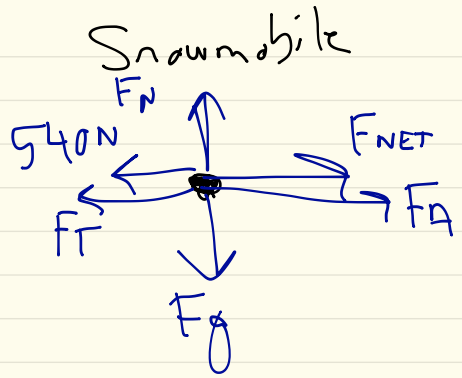
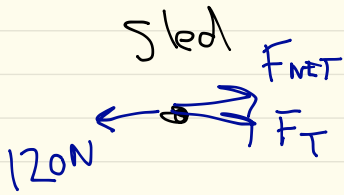


$$F_{\text{NET}} = F_A - 660 \text{ N}$$

$$1044 \text{ N} = F_A - 660 \text{ N}$$

$$F_A = 1044 \text{ N} + 660 \text{ N}$$

$$F_A = 1704 \text{ N [Forward]}$$



$$F_{NET} = F_T - 120N$$

$$ma = F_T - 120N$$

$$(72\text{ kg})(2.0\text{ m/s}^2) = F_T - 120N$$

$$144N = F_T - 120N$$

$$144N + 120N = F_T$$

$$264N = F_T$$

$$\therefore F_T = 260N.$$

Pg 147 #5, 7, 8

Remember Big 5
Quiz Friday!