Ch. 3 Homework Solutions

Ch. 2 Homework

Questions 3, 5, 7, 17, 19, 25, 26
29, 31, 37, 40, 44, 47
50, 52

Exercises 1a+b, 3, 6, 7, 10
14, 17, 19, 24

Questions

(3.) No, Newton's 1st law states that an object will stay in motion in a straight line if not acted upon by a net external force. When you quit pushing the car, friction is no longer balanced i.e. there is a net force & the car stops.

(5.) If the subway train is moving in a line at a constant speed, it has no net force pushing it. So all cars will have the same experience — no net force — regardless of position in the train.

(7.)

Driving forward everything is normal.

Break suddenly...

Tassle swings forward because it was moving forward. The car breaks slowed the car, but did not act on tassle. (Newtons 1st)

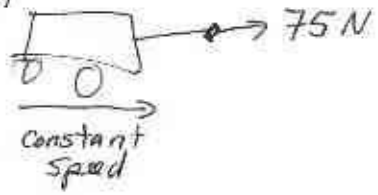
Q's

(17.) 4N → + 6N → = 10N → Largest force is the sum of two

or

4N →
← 6N = 2N ← Smallest force is the difference.

(19.) a)



$\Sigma F = 0$ Thus, $a = 0$

Only need 75N to keep wagon moving.

b)

$\Sigma F = 5N$, Thus $a > 0$

$a = \frac{5N}{m}$

There is a constant acceleration so the wagon will continually speed up.

(25.) $F_{old} = m a_{old}$

$a_{old} = \frac{F_{old}}{m}$

$F_{new} = 2F_{old} = m a_{new}$

$a_{new} = \frac{2F_{old}}{m}$

$\boxed{a_{new} = 2 a_{old}}$

(26.) $F_{old} = m a_{old}$

$a_{old} = \frac{F_{old}}{m}$

$F_{new} = \frac{1}{2} F_{old} = m a_{new}$

$a_{new} = \frac{F_{old}}{2m}$

$\boxed{a_{new} = \frac{1}{2} a_{old}}$

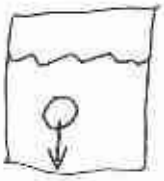
Qs

(29.) Mass is equal where ever you go. Weight is due to acceleration of gravity which varies from one planet to another. So the astronaut is 1/6 of her W_{earth} weight on the moon

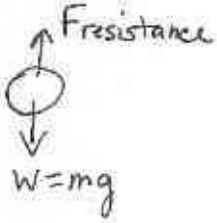
(31.) $W_{old} = m_{old} g$ if $m_{new} = 3m_{old}$

$$W_{new} = 3m_{old} g = 3 W_{old}$$

(37.)



Free body diagram →



$\Sigma F = W - F_{res.} = 0$

at terminal velocity

(40.)

Both crates are moving at a constant speed, so they both have no net force on them.

$F_{frict} = F_{pull}$

(44.)

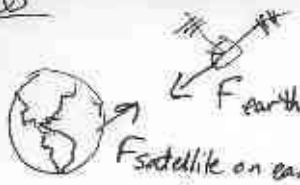
const. speed

12N are required for the pushing force to be equal to the force of kinetic friction. However, the force of static friction is greater, so 13N may not be enough to get the book moving.

(47.) The two forces are equal. Their accelerations are just different

Qs

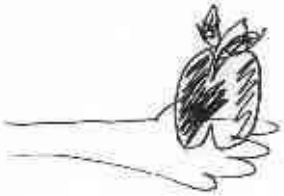
(50.)



$F_{earth\ on\ sat} = 500{,}000\ N$

$F_{satellite\ on\ earth} = 500{,}000\ N$ } in opposite directions

(52.)



F_{Hand}

apple

$F_{grav.}$

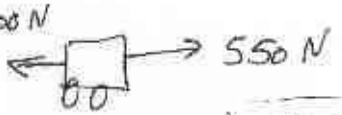
apple

$F_{grav} = 4N$

Exercises

(1) a) $6\ N \rightarrow \quad 8\ N \rightarrow \quad = \quad 14\ N \rightarrow$

b) $6\ N \rightarrow$ / $\leftarrow 8\ N$ $\quad = \quad 2\ N \leftarrow$

(3.) 

$\Sigma F = 550\ N - 300\ N = 250\ N$

an additional 250 N backward is needed

(6.) $2000\ kg = m \qquad F_{net} = 4000\ N \qquad a = ?$

$F = ma \qquad a = \frac{F}{m} = \frac{4000\ N}{2000\ kg} = \boxed{2\ m/s^2 = a}$

(7.) $m = 0.01\ kg \qquad F_{net} = 9000\ N \qquad a = ?$

$a = \frac{F}{m} = \frac{9000\ N}{0.01\ kg} = \boxed{9 \times 10^5\ m/s^2 = a}$

E's

(10) $m = 20\ kg$, $a = 4\ m/s^2$, $F = ?$

$F = ma = 20kg\,(4\ m/s^2) = \boxed{80\ N = F}$

(14.) $F = 24\ N$, $a = 0.6\ m/s^2$, $m = ?$

$m = \frac{F}{a} = \frac{24\ N}{0.6\ m/s^2} =$

(17.) $F = 400\ N$, $m = 80\ kg$, $a = ?$

$a = \frac{400\ N}{80\ kg} = \boxed{5\ m/s^2 = a}$

(19.) $m = 24\ kg$ $F_{push} = ?$ $F_{frict} = 90\ N$ $a = 3\ m/s^2$

$\Sigma F = F_{push} - F_{frict} = ma$

$F_{push} = F_{frict} + ma = 90\ N + (24kg)(3\ m/s^2)$

$\boxed{F_{push} = 162\ N}$

(24.)

Girl
$m = 25kg$
$a = 2\ m/s^2$

Mom
$m = 50kg$

$F_{girl} = F_{mom}$

$F_{girl} = ma = (25kg)(2\ m/s^2) = \boxed{50\ N = F_g}$

$F_{g\ on\ mom} = 50\ N$

$F_{mom\ on\ girl} = 50\ N$

$a_{mom} = \frac{50\ N}{50kg} = \boxed{1\ m/s^2 = a_{mom}}$