p. 113 - 114 Chapter 4 Review (#59 - 80 odds)

#59.

$F_{net} = \underline{\ ?\ }\ N$

$m = 1.0\ kg$

$g = 9.8\ \frac{m}{s^2}$

$F_{net} = ma$

$= (1.0\ kg)(9.8\ \frac{m}{s^2})$ (+1)

$F_{net} = 9.8\ N$ (+1)

#61.

$m = 2300\ kg$

$a = 3.0\ m/s^2$

$F_{net} = \underline{\qquad}\ N$

$F_{net} = ma$

$= (2300\ kg)(3.0\ \frac{m}{s^2})$ (+1)

$F_{net} = 6900\ N$ (+1)

6.9×10^3

#63

$W = 100\ lb$

$* 2.2\ lb = 1\ kg$

$\frac{100\ lb}{} \cdot \frac{1\ kg}{2.2\ lb} = \underline{45}\ kg$ (+1)

$W = mg$

$= (45\ kg)(9.8\ \frac{m}{s^2})$ (+1)

$W = 441\ N$ (+1)

#65.

$m_{shot\ put} > m_{basketball} > m_{balloon}$

(a) Balloon, Basketball, Shot put (+1)

(b) shotput, basketball, balloon (+1)

#67

$m = 7.50\ kg$

$F_{sp} = 78.4\ N$

$F_g = W = mg$

$g = \_\_\_\_\ \frac{m}{s^2}$

$\sum F = F_{sp} - F_g$ $F_{net} = \emptyset N$

$\sum F = F_{net} = \emptyset N$ (@ rest)

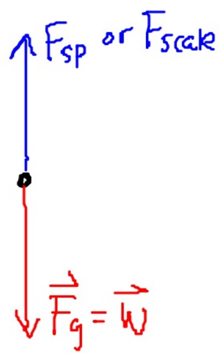
$F_{sp} - F_g = \emptyset N$

$+F_g \quad +F_g$

$F_{sp} = F_g$ (+1)

$78.4N = mg$

$\frac{78.4N}{7.50 Kg} = \frac{(7.50 Kg) g}{7.50 Kg}$ (+1)



(+1) $g = 10.5 \frac{m}{s^2}$

#69

$m = 53\ kg$

$F_{scale} = \underline{\ ?\ }$

$g = 9.8 \frac{m}{s^2}$

$\vec{W} = mg$

$= (53 kg)(9.8 \frac{m}{s^2})$

$W = 519.4\ N$

$(520\ N)$

2SF

+1

+1

$\Sigma F = F_{scale} - W$

$\Sigma F = F_{net} \rightarrow \underline{0 N}$ at rest or constant speed

$\searrow \underline{ma}$ accelerating (slowing down/speeding up)

$0 N = F_{scale} - W$

or

$ma = F_{scale} - W$

(d)

(a) constant speed (balanced) $\Rightarrow F_{net} = 0 N$

$0 N = F_{scale} - W$

$+W \qquad\qquad +W$

$W = F_{scale}$ +1

$520 N = F_{scale}$ +1

(b) slows at $2.0\frac{m}{s^2}$ upward

unbalanced $\Rightarrow F_{net} = ma$

$ma = F_{scale} - W$

$+W \qquad\qquad +W$

$W + ma = F_{scale}$ (+1)

$520\,N + (53\,kg)(-2.0\frac{m}{s^2}) = F_{scale}$

acceleration (determine the sign!!!)

direction: up (+)

velocity: slow (−)

acceleration (−)

$a = -2.0\frac{m}{s^2}$ (+1)

$414\,N =$

$410\,N = F_{scale}$ (+1)

2 SF

(c) speeds up @ $2.0\frac{m}{s^2}$ downward

direction: down (−)

velocity: speeds up (+)

accel: (−) $\Rightarrow a = -2.0\frac{m}{s^2}$

(e) unbalanced

$ma = F_{scale} - W$

$+W \qquad\qquad +W$

$ma + W = F_{scale}$

$ma + mg = F_{scale}$

$m(a+g) = F_{scale}$

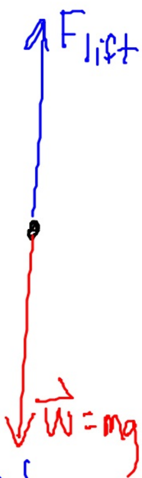
(+1)

#71.

$m = 0.50\,kg$

$g = 9.8\frac{m}{s^2}$

$F_{lift} =$ ____ N



$F_{lift} > W$

$F_{lift} > mg$

$F_{lift} > 4.9\,N$

(+1) (+1)

#73. $m = 65\,kg$ $\quad d_i = 10.0\,m$

(a)

$v_i = 0.0\,m/s$

$d_i = 10.0\,m$

$v_f^2 = v_i^2 + 2a(d_f - d_i)$

$\therefore a = \dfrac{v_f^2 - v_i^2}{2(d_f - d_i)}$

$a = \dfrac{-196}{-4}$

$a = g = -9.8\,\frac{m}{s^2}$

$d_f = 0.0\,m$

$v_f = \_\_\_\ m/s$

$F_{net} = (65)(49)$

3185

3200 N

$a = 49\,\frac{m}{s^2}$

$d_i = 0\,m$

$v_i = 14\,\frac{m}{s}$

$F_{net} = \_\_\_$

$F_{net} = ma$

$d_f = -2.0\,m$

$v_f = 0.0\,\frac{m}{s}$

Equation

$v_f^2 = v_i^2 + 2a(d_f - d_i)$ (+1)

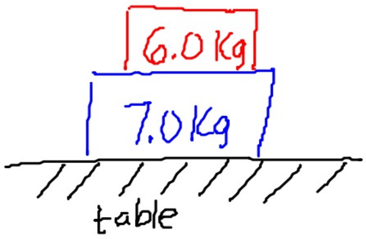
$v_f = \sqrt{v_i^2 + 2a(d_f - d_i)}$

$v_f = \sqrt{(0\,\frac{m}{s})^2 + 2(-9.8\,\frac{m}{s^2})(0\,m - 10\,m)}$ (+1)

$v_f = \sqrt{196}$

$v_f = 14\,\frac{m}{s}$ (+1)

#75.



FBD (7.0 Kg)

$F_{table\ on\ 7.0\,kg\ block}$ (a.k.a F_n)

$F_{Earth\ on\ 7.0\,kg\ block}$ (aka $F_g = W$)

$F_{6.0\,kg\ block\ on\ 7.0\,kg\ block}$ (a.k.a. W of 6.0 kg block)

FBD (6.0 kg)

$F_{7.0\,kg\ block\ on\ 6.0\,kg\ block}$ (a.k.a. F_N)

$F_{Earth\ on\ 6.0\,kg\ block}$ (a.k.a. $F_g = W$)

* Remember Newton's 3rd Law
$F_{A\ on\ B} = -F_{B\ on\ A}$

(a) $F_{7.0\,kg\ on\ 6.0\,kg} = W_{6.0\,kg} = mg$

$= (6.0\,kg)(9.8\,\frac{m}{s^2})$

$= 58.8\,N$

$=$ **59 N** $\quad$ 2SF

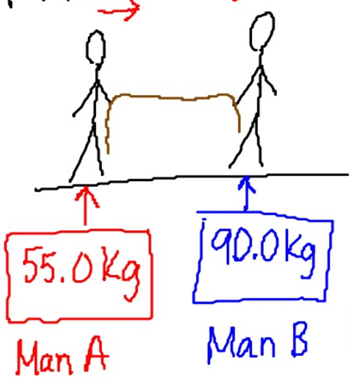
(b) $F_{6.0\,kg\ on\ 7.0\,kg}$

$\Downarrow$

$-(F_{7.0\,kg\ on\ 6.0\,kg}) = -(59\,N)$

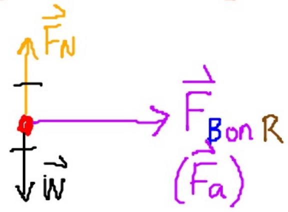
$=$ **$-59\,N$**

#77. $\vec{a} = 0.025 \frac{m}{s^2}$



Rope (R)

F.B.D. (Man A)



$F_{A on R} = -F_{R on A}$

$F_{B on R} = -F_{R on B}$

$F_{R on A} = -F_{R on B}$

$\sum F = F_{net}$

$F_a = ma$

$= (55.0 Kg)(0.025 \frac{m}{s^2})$

$F_a = 1.375 N = 1.4 N$ 2 SF

$\Downarrow$

$F_{B on R} = 1.4N$ so $F_{R on B} = -1.4N$

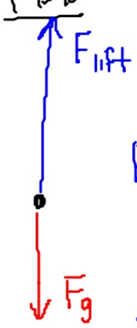
#79.

$m = 4500 Kg$

$a = 2.0 \frac{m}{s^2}$

$F_{lift} =$ ___ N

FBD



$F_{lift} > F_g$
b/c accelerating upward

$\sum F = F_{lift} - W$

$\sum F = F_{net} = ma$

so, $ma = F_{lift} - W$
$+W \quad +W$
$ma + W = F_{lift}$

$ma + W = F_{lift}$

$ma + mg = F_{lift}$

$(4500 Kg)(2.0 \frac{m}{s^2}) + (4500 Kg)(9.8 \frac{m}{s^2}) =$

$53100 N = F_{lift}$

$53,000 N = F_{lift}$ 2 SF

Newton's Laws

- First (4.1)
- Second (4.1)
- Third (4.3)

Forces: Newtons (N)

Mass: Kilograms (Kg)

acceleration: m/s^2

Weight: $W = mg$ ⇒ units: Newtons

Free Body Diagrams (4.1)

$\sum F_x =$ ______

$\sum F_y =$ ______

$\sum F = F_{net}$

→ const. speed/@rest Balanced (Equil.): $F_{net} = 0\,N$

→ accelerating (unbalanced): $F_{net} = ma$

* Know your Kinematic Equations

1. $d_f = d_i + \bar{v}t$
2. $v_f = v_i + at$
3. $d_f = d_i + v_i t + \frac{1}{2}at^2$
4. $v_f^2 = v_i^2 + 2a(d_f - d_i)$

$F_{net} = ma$

$a = \frac{F_{net}}{m}$