Worksheet Solution p. 120 &134

Thursday, February 2, 2017 2:10 PM

worksheet p. 120 Top:

FBD for person

The normal force from the scale is what the scale reads

$\sum F = ma \quad \uparrow +$

$N - mg = ma$

N: reading on the scale, also called "apparent weight", This can change

mg: actual weight (force of gravity acting on you), This Never changes

For person A, acceleration is in the positive direction

$N - mg = ma$

$N = ma + mg$

$= m(a + g)$

Find m:

$F = mg$ (I'll use $10 \frac{m}{s^2}$ instead of $9.8 \frac{m}{s^2}$ to make the math easier)

$500 N = m(10)$

$m = 50 kg$

$N = 50(2 + 10)$

50: mass of person; 2: acceleration (given in problem); 10: acceleration of gravity, g

$N = 600 N$

scale reads 600 N

you feel heavier because your inertia is resisting the upward acceleration

For person B: same FBD as person A

$\sum \vec{F} = m\vec{a} \quad \uparrow +$

$N - mg = ma$

$N = m(a+g)$ — same as person A to this point

$N = 50(-2+10)$

↑ acceleration is in the Negative direction for person B

$N = 400\ N$

Bottom: using equation from above:

$N = m(a+g)$ ↑+

$m = 60\ kg$

$g = 10\ \frac{m}{s^2}$

$N_A = 60(2+10) = 720\ N$

$N_B = 60(-2+10) = 480\ N$

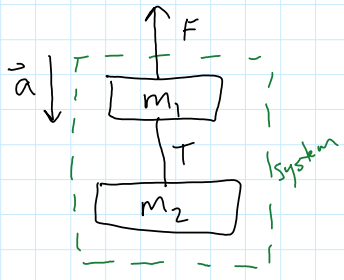
$N_C = 60(0+10) = 600\ N$ — Just the person's normal weight

$N_D = 60(2+10) = 720\ N$

velocity does not matter, only acceleration

---

worksheet p. 134



$m_1 = 6\ kg$

$m_2 = 10\ kg$

$a = 3\ \frac{m}{s^2}$ ↓

FBD for m_1

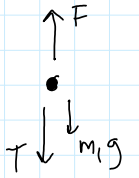
↑F

FBD for m_2

↑T

FBD for system $(m_1 + m_2)$

↑F



$\Sigma F = m_1 a \quad \uparrow +$

① $F - T - m_1 g = m_1 a$

$\Sigma F = m_2 a \quad \uparrow +$

② $T - m_2 g = m_2 a$

$\Sigma F = (m_1+m_2) a \quad \uparrow +$

③ $F - (m_1+m_2) g = (m_1+m_2) a$

a) $m_1 \rightarrow 5\ kg$

$m_2 \rightarrow 11\ kg$

using ② above: $T - m_2 g = m_2 a$

$T = m_2 (g + a)$

10, -3 ↑ a is negative

$T = m_2 (7)$

↑ if m_2 increases, so does T

Answer: (i)

b) $m_1 \rightarrow 7\ kg$

$m_2 \rightarrow 9\ kg$

Same logic as part a

Answer: (ii)

c) $a \rightarrow 2\ \frac{m}{s^2} \downarrow$

using equation 2:

$T = m_2 (g + a)$

↑ $a = -2$ now

$T = m_2 (10 - 2)$

$= m_2 (8)$

T increases from original value

Answer: (i)

d) $a \rightarrow 4\ \frac{m}{s^2} \downarrow$

$T = m_2 (10 - 4)$

↑ $a = -4$ now

$= m_2(6)$

T decreases from original value

Answer: (ii)