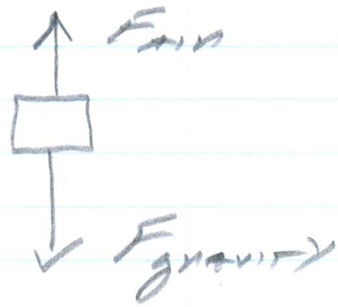
Chapter 5 EVEN solutions:

24, 36, 38, 44

(24) STEADY VELOCITY implies NET FORCE IS ZERO:

VECTORS: $\vec{F}_{NET} = \vec{F}_{AIR} + \vec{F}_{GRAVITY} = 0$

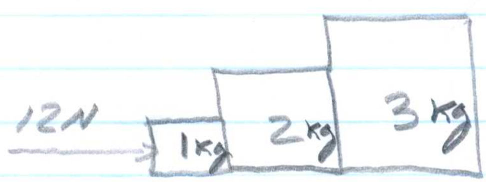


SCALARS: $F_{AIR} - F_{GRAVITY} = 0$

$F_{AIR} = F_{GRAVITY} = mg = 50(9.8)\,N$

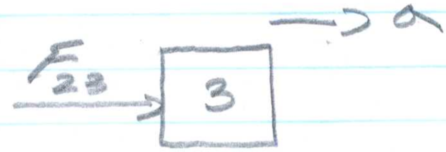
$= \boxed{490\,N \text{ up}}$

(36)



- ALL BLOCKS MOVE TOGETHER WITH SAME ACCELERATION, a:
  - $\vec{F} = m_{TOT}\,\vec{a}$
  - $12 = (1+2+3)a \Rightarrow a = 2\,\frac{m}{s^2}$

To find force on rightmost block due to middle block use Newton's 2nd law



$$F_{23} = m_3 a = 3(2) = \boxed{6\ N}$$

(38) Force of astronaut on satellite:

$$F_{AS} = M_S a_s$$

$$120 = 420\, a_s$$

$$\Rightarrow a_s = \frac{120}{420} \frac{m}{s^2} = .286 \frac{m}{s^2}$$

$\Rightarrow$ Speed of satellite after $t_{push} = .89\,s$

$$V = V_0 + a\, t_{push} = 0 + .286(.89) = \boxed{.25 \frac{m}{s}}$$

$\Rightarrow$ NEXT

Distance travelled by satellite in one minute:

$$X_s = X_0 + V_0 t + \frac{1}{2} a t^2$$

$$X_s = 0 + .25\frac{m}{s}(60\ s) + 0$$

$$X_s = 15.26\ m$$

Force of satellite on astronaut:

$$F_{SA} = m_A a_A$$

$$120 = 64\ a_A$$

$$a_A = \frac{120}{64} = 1.88\ \frac{m}{s^2}$$

speed of astronaut after t_{push}:

$$V = a_A t_{push} = 1.88(.89)$$

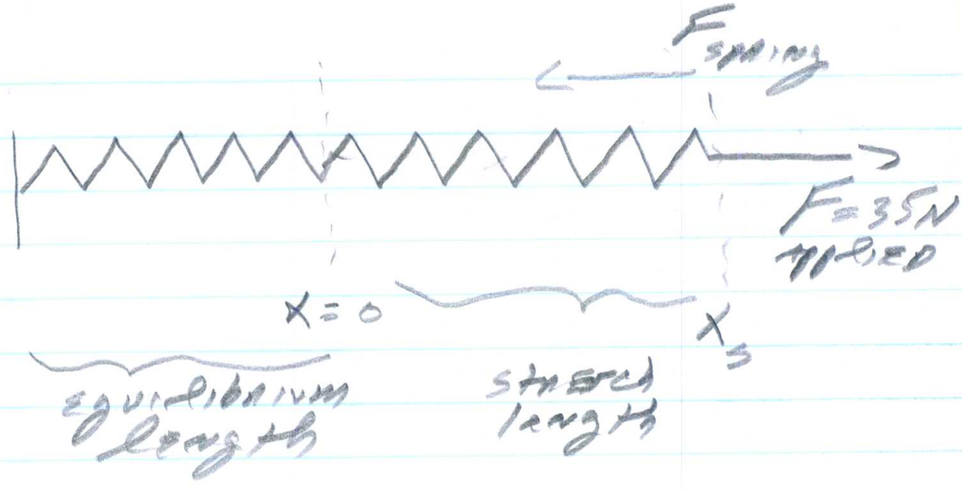
$$\boxed{V = 1.67\ \frac{m}{s}}$$

Distance travelled by astronaut in one minute: $X_A = 1.67(60)$

$$= 100.1\ m$$

$$\text{Separation} = X_s + X_A = \boxed{115.39\ m}$$

(44)



$$\vec{F}_{applied} + \vec{F}_{spring} = 0$$

$$35 - kx_s = 0$$

$$\Rightarrow x_s = \frac{35}{k} = \frac{35}{220}$$

$$= \boxed{.16\,m}$$