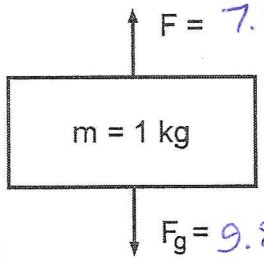
Anne Sirs

SPH3U-2 FBD'S & NEWTON'S 2nd LAW (VERTICAL) WS#9

Let ↑ +

Each of the following free body diagrams represents a different problem. From the given data, solve for the missing quantities. Complete solutions for each problem should be shown (use a separate sheet if necessary). {Use $g = 9.8\ m/s^2$}

1)



$F_g = -mg$
$= -(1\ kg)(9.8\ N/kg)$
$= -9.8\ N$

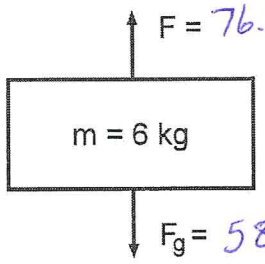
$a = 2.0\ m/s^2 \Downarrow$
$= -2.0\ m/s^2$

$F_{net} = ma$
$= (1kg)(-2.0\ m/s^2)$
$= -2N$

$F = +7.8\ N$

$\vec{F}_{net} = \vec{F} + \vec{F}_g$
$-2N = +7.8N + (-9.8N)$

2)



$F_g = -(6kg)(9.8\ m/s^2)$
$= -58.8\ N$

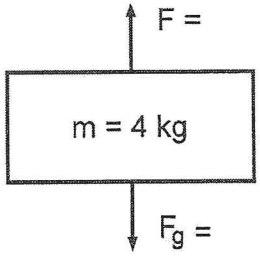
$a = 3.0\ m/s^2 \Uparrow$
$= +3\ m/s^2$

$F_{net} = ma$
$= (6kg)(+3\ m/s^2)$
$= +18\ N$

$F = +76.8\ N$

$(+18N = +76.8N + (-58.8N))$

3)



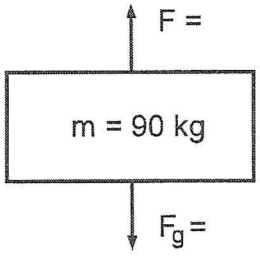
$F_g = -(4)(9.8)$
$= -39.2\ N$

$a = 2.0\ m/s^2 \Downarrow$

$F_{net} = (4)(-2)$
$= -8\ N$

$F = +31.2\ N$

4)



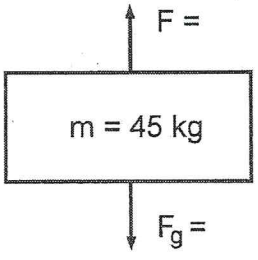
$F_g = -(90)(9.8)$
$= -882\ N$

$a = 0.5\ m/s^2 \Downarrow$

$F_{net} = (90)(-0.5)$
$= -45\ N$

$F = +837\ N$

5)



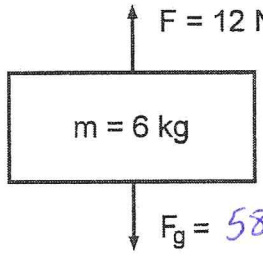
$F_g = -(45)(9.8)$
$= -441\ N$

$a = 1.0\ m/s^2 \Uparrow$

$F_{net} = (45)(+1)$
$= +45\ N$

$F = +486\ N$

6)

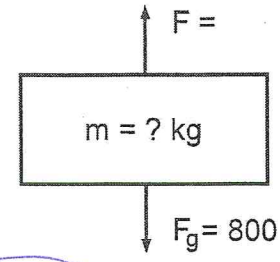


$F_g = -(6)(9.8)$
$= -58.8\ N$

$F_{net} = +12N + (-58.8N)$
$= -46.8\ N$

$a = \frac{F_{net}}{m}$
$= \frac{-46.8\ N}{6\ kg}$
$= -7.8\ N/kg$
or
$= -7.8\ m/s^2$

7)



$F_g = m \cdot g$

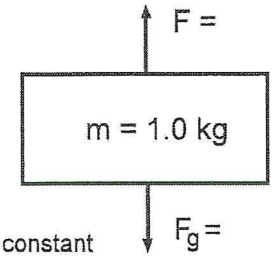
$m = \frac{F_g}{g} = \frac{800\,N}{9.8\,N/kg} = 81.6\,kg$

$a = 1.0\ m/s^2$ ⇓

$F_{net} = m \cdot a$
$= (81.6)(-1)$
$= -81.6\,N$

$F = +718.4\,N$

8)



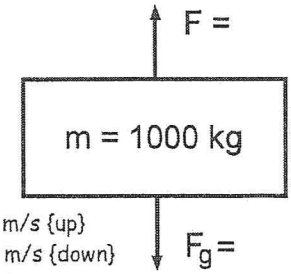
$F_g = -(1)(9.8)$
$= -9.8\,N$

$a = 0$

$F_{net} = 0$

$F = +9.8\,N$

9)



$a = \frac{v_2 - v_1}{\Delta t} = \frac{-2\,m/s - (+2\,m/s)}{4.0\,s} = \frac{-4\,m/s}{4\,s}$

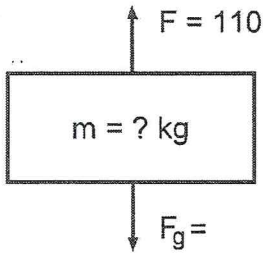
$= -1\,m/s^2$

$F_g = -mg$
$= -(1000)(9.8)$
$= -9800\,N$

$F_{net} = ma$
$= (1000)(-1)$
$= -1000\,N$

$F = +8800\,N$

10)



$a = 1.0\ m/s^2$ {up}

$F_g = -mg$
$= -(10.2)(9.8)$
$= -99.96\,N$

$F_{net} = +110 + (-mg)$
$= 110 - 9.8m$

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

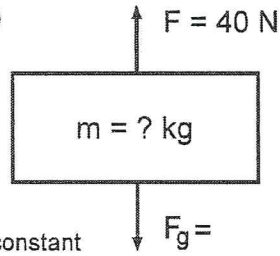
$m = \frac{110 - 9.8m}{+1}$

$+1m = 110 - 9.8m$

$\frac{10.8m}{10.8} = \frac{110}{10.8}$

$m = 10.2\,kg$

11)



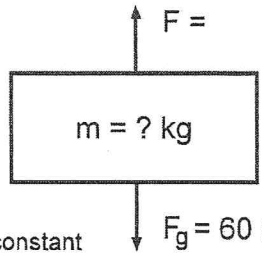
$a = 0$

$F_{net} = 0$

$F_g = -40\,N$

$m = \frac{F_g}{g} = \frac{-40\,N}{-9.8\,N/kg} = 4.08\,kg$

12)



$a = 0$

$F = +60\,N$

$F_{net} = 0$

$m = \frac{F_g}{g} = \frac{-60\,N}{-9.8\,N/kg} = 6.12\,kg$