Practice Sheet

March 8, 2017 1:41 PM

① 

$F_g = mg$

$2325N = m(9.8)$

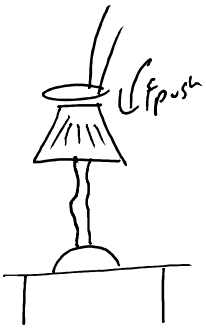
$\frac{2325N}{9.8} = \frac{m(9.8)}{9.8}$

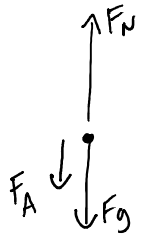
$237kg = m$

$F_g = mg$

$= (237)(3.71)$

$= 880N$

② 



Vertical (a=0)

$F_{Net} = ma$

$F_N - F_g - F_A = ma$ ($a = 0$)

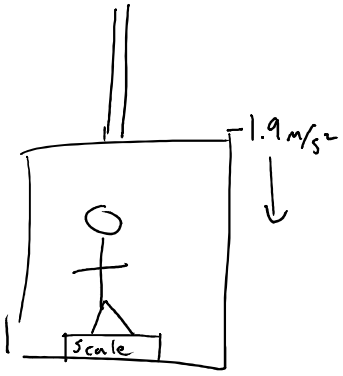
$F_N - F_g - F_A = 0$

$F_N = F_g + F_A$

$= mg + F_A$

$= (6)(9.8) + 44.2$

$F_N = 103N$

③ 

$m = 144kg$

Vertical

$F_{Net} = ma$

$F_N - F_g = ma$

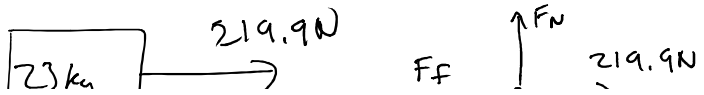
$F_N - mg = ma$

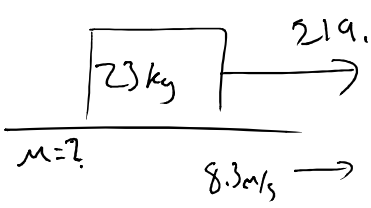
$F_N = ma + mg$

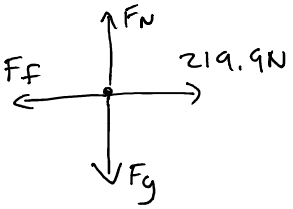
$= (144)(-1.9) + (144)(9.8)$

$= 1138N$

☆ Scales read F_N

④ 





Vertical ($a=0$)

$F_{Net} = ma$

$F_N - F_g = 0$

$F_N = F_g$

$= mg$

$= (23)(9.8)$

Horizontal ($a = 8.3\ m/s^2$)

$F_{Net} = ma$

$219.9 - F_f = ma$

$219.9 - \mu F_N = ma$

$219.9 - ma = \mu F_N$

$219.9 - (23)(8.3) = \mu F_g$

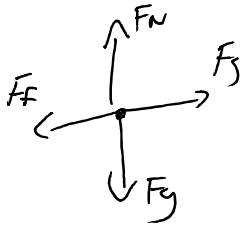
$\frac{219.9 - (23)(8.3)}{(23)(9.8)} = \mu$

$0.13 = \mu$

5

$k = 20\ N/m$

$x = 1.5\ m$



$\mu = 0.5$

$a = 0\ m/s^2$

Vertical ($a=0$)

$F_{Net} = ma$

$F_N - F_g = 0$

$F_N = F_g$

$F_N = mg$

Horizontal ($a=0$)

$F_{Net} = ma$

$F_S - F_f = ma$

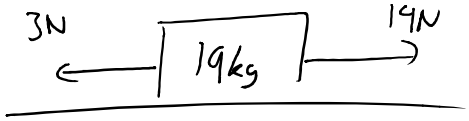
$xk - \mu F_N = ma$

$(1.5)(20) - (0.5)(m)(9.8) = 0$

$\frac{(1.5)(20)}{(0.5)(9.8)} = \frac{(0.5)(9.8)m}{(0.5)(9.8)}$

$6.12\ kg = m$

(6)



Horizontal

$F_{Net} = ma$

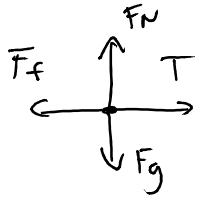
$19 - 3 = ma$

$\frac{11}{19} = \frac{19a}{19}$

$0.58\ m/s^2 = a$

right

(7)



$m = 70kg$

$V_i = 0 m/s$

$V_f = 14.5 m/s$

$t = 5.1 sec$

$a =$

$F_f = 2729N$

$V_f = V_i + at$

$\frac{14.5}{5.1} = \frac{a(5.1)}{5.1}$

$2.84\ m/s^2 = a$

Horizontal

$F_{Net} = ma$

$T - F_f = ma$

$T - 2729 = (70)(2.84)$

$T = (70)(2.84) + 2729$

$T = 2928N$

(8)

$m = 88kg$

$T_{max} = 513N$

Vertical

$F_{Net} = ma$

$T - F_g = ma$

$T - mg = ma$

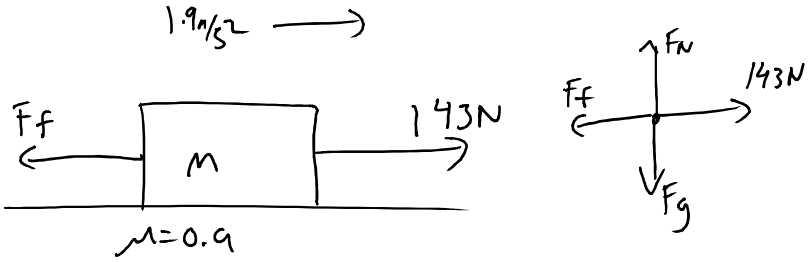
$\frac{513 - (88)(1.7)}{88} = \frac{88a}{88}$

$4.13\ m/s^2 = a$

(9)

$1.9 m/s^2 \longrightarrow$

9



Vertical (a=0)

$F_{Net} = ma$

$F_N - F_g = m(0)$

$F_N = F_g$

$F_N = mg$

Horizontal

$F_{Net} = ma$

$143 - F_f = ma$

$143 - \mu F_N = ma$

$143 - \mu mg = ma$

$143 = ma + \mu mg$

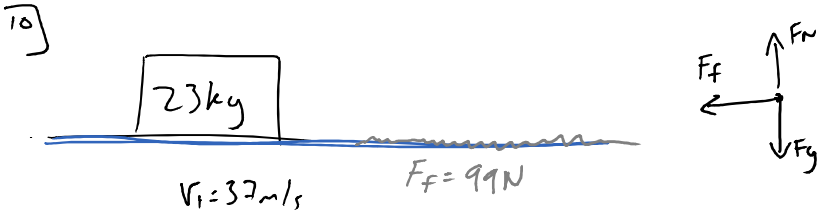
$143 = m[a + \mu g]$

$143 = m[1.9 + (0.9)(9.8)]$

$\frac{143}{10.72} = \frac{m(10.72)}{10.72}$

$13.3\,kg = m$

10



a)

Horizontal

$F_{Net} = ma$

$-F_f = ma$

$-\frac{99}{23} = \frac{23a}{23}$

$-4.3 m/s^2 = a$

b) $v_i = 37 m/s$

$v_f = 0 m/s$

$a = -4.3 m/s^2$

$d =$

$t =$

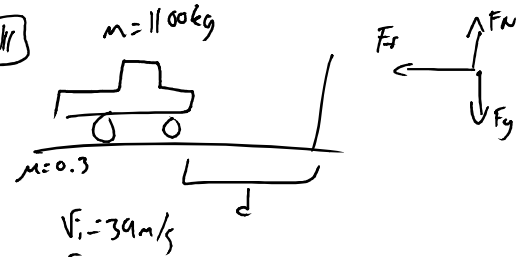
$v_f = v_i + at$

$0 = 37 - 4.3t$

$\frac{37}{4.3} = t$

$8.6 sec = t$

11



$V_f = 0\ m/s$

Vertical ($a=0$)

$F_{Net} = ma$

$F_N - F_g = 0$

$F_N = F_g$

$F_N = mg$

Horizontal

$F_{Net} = ma$

$-F_f = ma$

$-\mu mg = ma$

$-(0.3)(9.8) = a$

$-2.94\ m/s^2 = a$

$V_i = 39\ m/s$

$V_f = 0\ m/s$

$a = -2.94\ m/s^2$

$d =$

$V_f^2 = V_i^2 + 2ad$

$0 = 39^2 + 2(-2.94)d$

$d = \frac{39^2}{(2)(2.94)}$

$d = 259\ m$

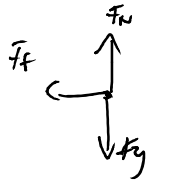
12

$m = 1260\ kg$

$32\ m/s$

$m = ?$

$240\ m$



Vertical $a=0$

$F_{Net} = ma$

$F_N - F_g = 0$

$F_N = F_g$

$F_N = mg$

$= (1260)(9.8)$

$F_N = 12348\ N$

$V_i = 32\ m/s$

$V_f = 0\ m/s$

$a =$

$d = 240\ m$

$V_f^2 = V_i^2 + 2ad$

$\frac{-32^2}{2(240)} = a$

$-2.13\ m/s^2 = a$

Horizontal ($a = -2.13\ m/s^2$)

$F_{Net} = ma$

$-F_f = ma$

$-\mu F_N = ma$

$\mu = \frac{ma}{-F_N}$

$= \frac{(1260)(-2.13)}{-(12348)}$

$\mu = 0.218$

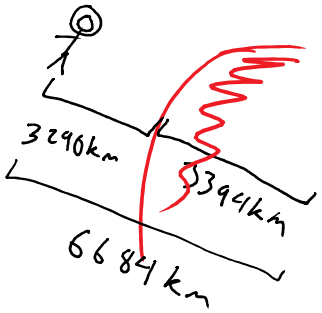
$\mu = 0.218$

(13)

$r_{mars} = 3394\,km$

$m_{mars} = 6.41 \times 10^{23}\,kg$

$m_{astrobuoy} = 184\,kg$



$$F_g = \frac{G m_1 m_2}{d^2}$$

$$= \frac{(6.67\times10^{-11})(6.4\times10^{23})(184)}{(6\,684\,000)^2}$$

← Change to meters

$$F_g = 99\,N$$

(14)

$m = 7.0\times10^{22}\,kg$

$g = 1.54\,m/s^2$

$r_{moon} = ?$

$$g = \frac{Gm}{d^2}$$

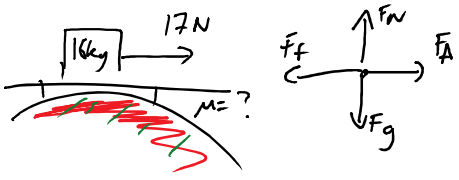
$$1.54 = \frac{(6.67\times10^{-11})(7.0\times10^{22})}{d^2}$$

$$d = \sqrt{\frac{(6.67\times10^{-11})(7.0\times10^{22})}{1.54}}$$

$$d = 17\,411\,611.699\,m$$

$$d = 1\,741\,km$$

15



Part A

Horizontal a=0

$F_{Net} = ma$

$F_A - F_f = ma$

$F_A = F_f$

$17 = \mu F_N$

Vertical a=0

$F_{Net} = ma$

$F_N - F_g = 0$

$F_N = F_g$

$F_N = 59.2\,N$

$$\frac{17}{59.2} = \frac{\mu\,59.2}{59.2}$$

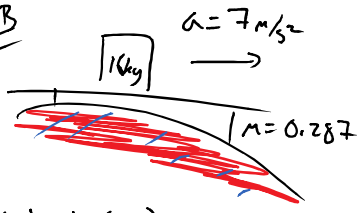
$$F_{g_{mercury}} = \frac{G m_{merc} m_b}{r_{merc}^2}$$

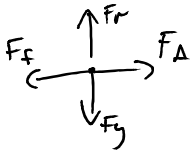
$$= \frac{(6.67\times10^{-11})(3.3\times10^{23})(16)}{(2\,440\,000)^2}$$

$$= 59.2\,N$$

$0.287 = \mu$

Part B





Vertical ($a = 0$)

$F_{net} = ma$

$F_N - F_g = m(0)$

$F_N = F_g$

$= \frac{GM_1M_2}{d^2}$

$= \frac{(6.67 \times 10^{-11})(6 \times 10^{23})(16)}{(3394000)^2}$

$F_N = 55.6\,N$

Horizontal ($a = 7\,m/s^2$)

$F_{net} = ma$

$F_A - F_f = ma$

$F_A - \mu F_N = ma$

$F_A = ma + \mu F_N$

$= (16)(7) + (0.287)(55.8)$

$F_A = 128\,N$

16

$F_g = \frac{GM_1M_2}{d^2}$

$F_g \propto M_2$ $\qquad$ $F_g \propto \frac{1}{d^2}$

increase $m_2 \Rightarrow$ increase F_g

decrease $m_2 \Rightarrow$ decrease F_g

decrease m_2 by 4 $\Rightarrow$ decrease F_g by 4

$F_{g_{new}} = \frac{F_{g_{old}}}{4}$

/4

increase distance by $x \Rightarrow$ decrease in F_g by x^2

increased d by 8 $\Rightarrow$ decrease F_g by 8^2

$F_{g_{new}} = \frac{F_{g_{old}}}{64}$

/64

$F_{g_{New}} = \frac{F_{g_{old}}}{4 \cdot 64} = \frac{730}{4 \cdot 64}$

$= 2.85\,N$

decrease by 1/256

old

$F_{g_{old}} = \frac{GM_1M_2}{12}$

New

$F_{g_{new}} = \frac{GM_1(M_2/4)}{(8d)^2}$

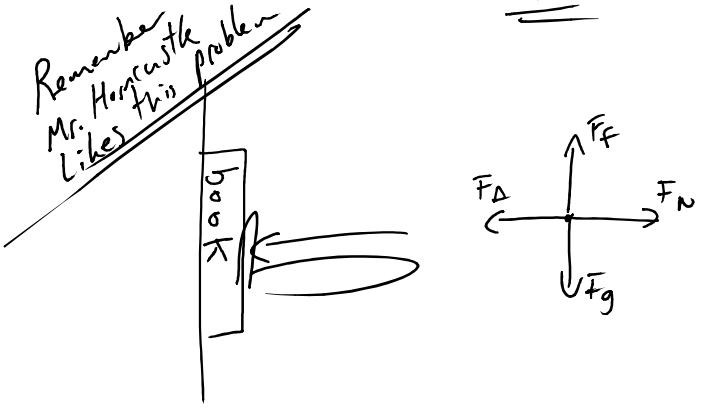
$$F_g = \frac{Gm_1m_2}{d^2} \qquad F_{g_{new}} = \frac{Gm_1\left(\frac{m_2}{4}\right)}{(8d)^2}$$

$$F_{g_{new}} = \frac{Gm_1m_2}{d^2(64)(4)}$$

$$F_{g_{new}} = \frac{F_g}{(64)(4)}$$

$$= \frac{730}{256}$$

$$= 2.85\,N$$



Competencies for the test

Dynamics 11
Applying Newtons three Laws
Drawing Free body diagrams
Force of gravity on surface (weights)
Questions where Fn ≠ Fg
General Force of gravity ($G=6.67 \times 10^{-11} Nkg^2/m^2$)
Combining forces in different directions
Accelerating questions
Tension in Rope
Connect: Kinematics & Dynamics
Apply Knowledge to real life Problems
Advance Problems