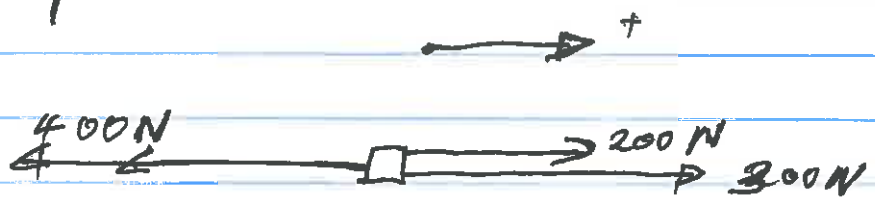
Example 3.1



$$F_r = \Sigma = 200 + 300 - 400$$

$$F_r = +100\ N$$

From N II : $F = ma$.

$$a = \frac{F}{m}$$

$$= \frac{100}{1200}$$

$$= 0.083\ ms^{-2}.$$

Example

$$g_E = \frac{G M_E}{R_E^2} = 9.8\ ms^{-2}$$

$$M_p = 2\ M_E$$
$$R_p = R_E^2$$

$$g_p = \frac{G M_p}{R_p^2}$$

$$g_p = \frac{G\ 2\ M_E}{R_E^2}$$

$$g_p = 2\ \frac{G M_E}{R_E^2}$$

But $\frac{G M_E}{R_E^2} = 9.8\ ms^{-2}$

$$g_p = 2\ 9.8\ ms^{-2}$$
$$g_p = 19.6\ ms^{-2}$$

Example 3.2

$R_E = 6.38 \times 10^6\ m$, $G = 6.67 \times 10^{-11}\ Nm^2 kg^{-1}$

$$g = \frac{G M_E}{R_E^2}$$
$$g R_E^2 = G M_E$$
$$M_E = \frac{g R_E^2}{G}$$

$$= \frac{9.8 \times (6.38 \times 10^6)^2}{6.67 \times 10^{-11}}$$

$$= 5.98 \times 10^{24}\ kg$$

Example 3.3

$$g = \frac{GM_E}{R^2}$$

$$R = R_E + 200\,000$$

$$= \frac{G M_E}{(R_E + 200{,}000)^2}$$

$$= \frac{6.67 \times 10^{-11} \times 5.98 \times 10^{24}}{(6.38 \times 10^6 + 200\,000)^2}$$

$$\Rightarrow \underline{9.2\ ms^{-2}}$$

Example 3.4

$$F_r = N - W$$

From NII: $F_r = ma$

$$\therefore N - W = ma$$

$$N = ma + W$$

Where $W = mg = 60 \times 9.8$

$$= 588\ N$$

a) $a = 0 \Rightarrow N = m(0) + 588$

$N = \underline{588\ N}$

b) $a = 2\ ms^{-2} \Rightarrow N = 60 \times 2 + 588$

$= 120 + 588 = \underline{708\ N}$

c) $a = -2\ ms^{-2} \Rightarrow N = 60(-2) + 588 = \underline{468\ N}$

d) $a = -9.8\ ms^{-2} \Rightarrow N = 60(-9.8) + 588$

$-588 + 588 = \underline{0\ N}$