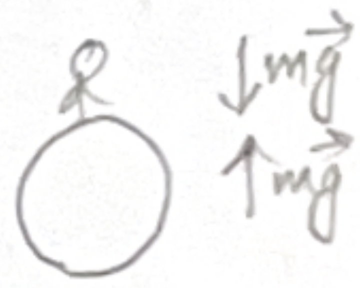
Solutions

Midterm Exam 02 (PHYS-205A-001) Spring 2023

Problem 1

While falling freely the mass does not push against the weighing scale. Thus, the normal force is zero. So, the weighing scale measures zero.

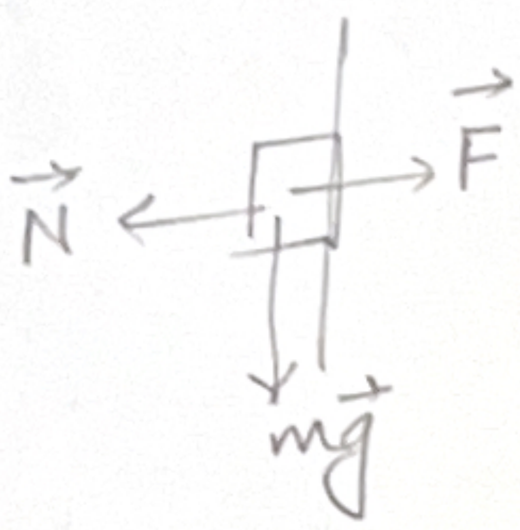
Problem 2



$m\vec{g}$ acting vertically down (by Earth on mass m)

$m\vec{g}$ acting vertically up (by mass m on Earth)

Problem 3

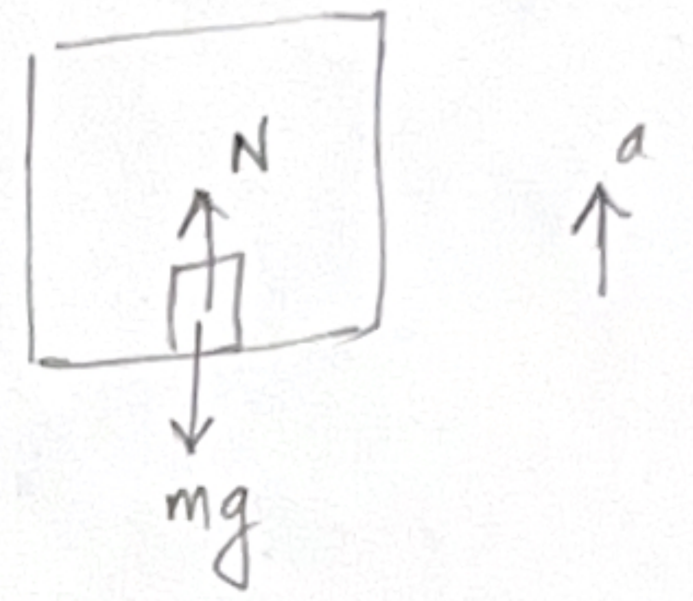


$m\vec{g}$ is not cancelled. So, the mass can not stay at rest.

Problem 4

Right turn requires circular motion, which amounts to accelerating. In the absence of friction there is no force to cause this acceleration. Thus, you can not take a right turn on a frictionless unbanked road.

Problem 5



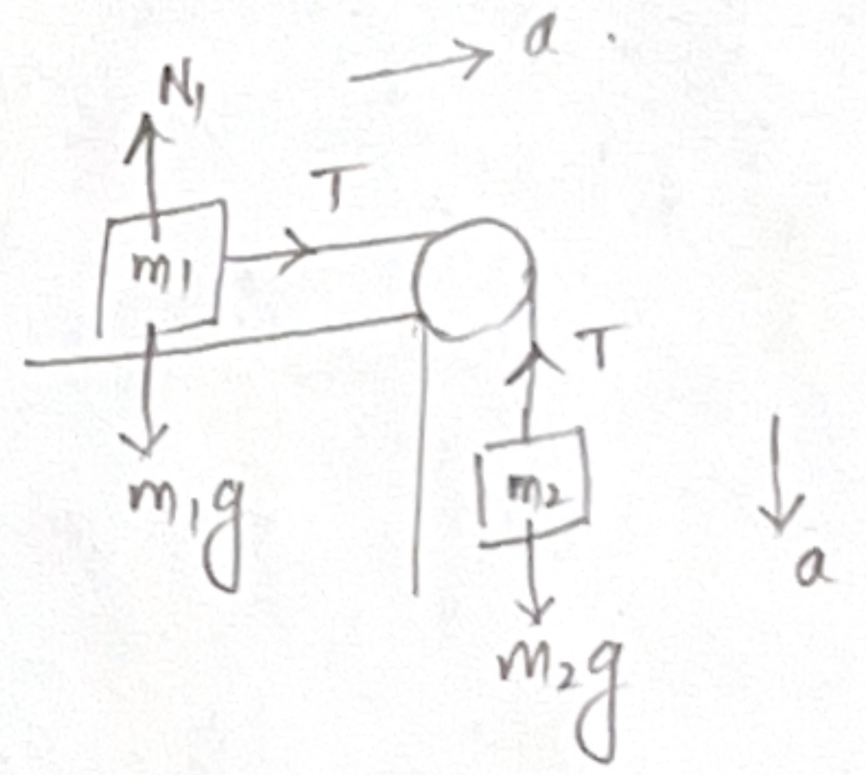
$ma = -mg + N$

$N = mg + ma$

$= 75\,(9.8 + 2.0)$

$= 890$ Newtons.

Problem 6



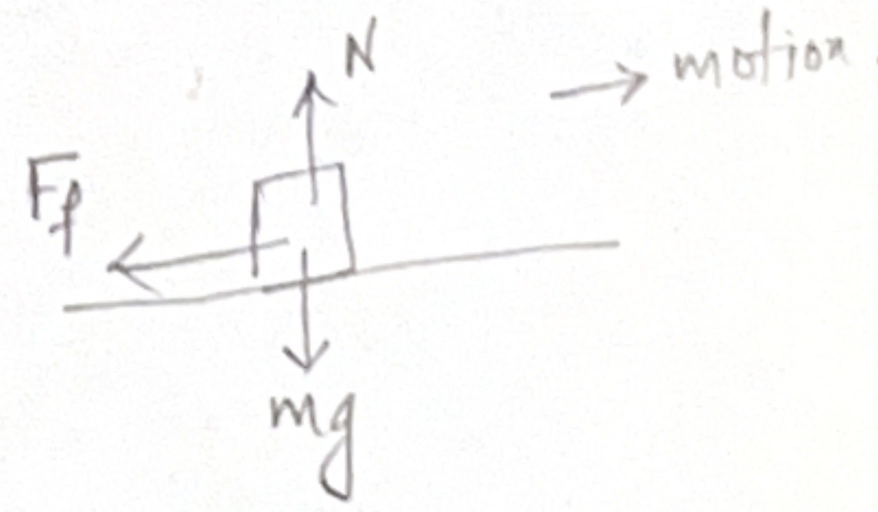
m_1: $m_1 a = T$ and $N_1 = m_1 g$.

m_2: $m_2 a = m_2 g - T$

$(m_1 + m_2)\,a = m_2 g$

$a = \dfrac{m_2 g}{m_1 + m_2} = \left(\dfrac{2.0}{1.0 + 2.0}\right) 9.8 = 6.5\ \frac{m}{s^2}$

Problem 7



$ma = \mu_k N$ and $N = mg$.

$ma = \mu_k m g$

$a = \mu_k g$

$= (0.60)\,9.8$

$= 5.6\ \frac{m}{s^2}$

$V_i = 31.3\ \frac{m}{s}$ $\quad a = -5.6\ \frac{m}{s^2}$.

$\Delta x = ?$

$\Delta t =$ missing $\quad V_f = 0$

$2a\,\Delta x = V_f^2 - V_i^2$

$2(-5.6)\,\Delta x = 0 - (31.3)^2$

$\Delta x = 88$ m