1) Two horizontal forces, \( \overrightarrow{F_1} \) and \( \overrightarrow{F_2} \), are acting on a box, but only \( \overrightarrow{F_1} \) is shown in the drawing. \( \overrightarrow{F_2} \) can point either to the right or to the left. The box moves along the x-axis. There is no friction between the box and the surface. Suppose that \( \overrightarrow{F_1} = 9.0 \text{ N} \) and the mass of the box is 3.0 kg. Find the magnitude and direction of \( \overrightarrow{F_2} \) when the acceleration of the block is: a) \(+5.0 \text{ m/s}^2\), b) \(-5.0 \text{ m/s}^2\), and c) \(0 \text{ m/s}^2\).

2) Two forces, \( \overrightarrow{F_1} \) and \( \overrightarrow{F_2} \), act on the 7.00 kg block as shown. The magnitudes of the two forces are \( \overrightarrow{F_1} = 59.0 \text{ N} \) and \( \overrightarrow{F_2} = 33.0 \text{ N} \). What is the horizontal acceleration of the block?

3) A space traveler weighs 540.0 N on the earth. What will the traveler weigh on another planet whose radius is twice that of earth and whose mass is three times that of earth?

4) The sun is much more massive than the moon but it is also much farther away from the earth. Which one exerts a greater gravitational force on a person standing on the earth? Give your answer by determining the ratio \( F_{\text{sun}}/F_{\text{moon}} \) of the magnitudes of the gravitational forces. Use the data \( M_{\text{moon}} = 7.35 \times 10^{22} \text{kg} \), \( M_{\text{sun}} = 1.99 \times 10^{30} \text{kg} \), distance to moon = \( 3.85 \times 10^8 \text{m} \), and distance to the Sun = \( 1.50 \times 10^{11} \text{m} \).

\[
1) \quad a = \frac{F_{\text{net}}}{m} = \frac{F_1}{m} + \frac{F_2}{m} = \left( \frac{9.0 \text{ N}}{3 \text{ kg}} \right) + \frac{F_2}{3 \text{ kg}} = 3 \text{ m/s}^2 + \frac{F_2}{3 \text{ kg}}
\]

\( a) \quad a = +5.0 \text{ m/s}^2; \quad 3 \text{ m/s}^2 + \frac{F_2}{3} \]

\[2 \text{ m/s}^2 = \frac{F_2}{3 \text{ kg}} \quad \Rightarrow \quad F_2 = +6 \text{ N} \]

\( b) \quad a = -5.0 \text{ m/s}^2; \quad 3 \text{ m/s}^2 + \frac{F_2}{3 \text{ kg}} \]

\[-8 \text{ m/s}^2 = \frac{F_2}{3 \text{ kg}} \quad \Rightarrow \quad F_2 = -24 \text{ N} \]

\( c) \quad a = 0; \quad 3 \text{ m/s}^2 + \frac{F_2}{m} \]

\[-3 \text{ m/s}^2 = \frac{F_2}{3 \text{ kg}} \quad \Rightarrow \quad F_2 = -9 \text{ N} \]
2) \[ F_2 = F_2 + F_1 \cos 70^\circ \]
\[ = 33.0 N + 59 N \cos 70^\circ \]
\[ = 53.18 N \]
\[ a_x = \frac{F_x}{m} = \frac{53.18 N}{7 kg} = \boxed{7.6 m/s^2} \]

3) \[ \frac{GM_e m}{R_e^2} = 540 N \quad \text{on Earth} \]

\[ \text{on other planet } R = 2 R_e, \ M = 3 M_e \]
\[ \frac{GM (3M_e) m}{(2R_e)^2} = \frac{3}{4} \left( \frac{GM_e m}{R_e^2} \right) = \frac{3}{4} (540 N) = \boxed{405 N} \]

4) \[ \frac{F_{sun}}{F_{moon}} = \left( \frac{\frac{GM_s m}{R_s^2}}{\frac{GM_m m}{R_m^2}} \right) = \left( \frac{\frac{M_s}{R_s^2}}{\frac{M_m}{R_m^2}} \right) = \left( \frac{M_s}{M_m} \right) \left( \frac{R_m}{R_s} \right)^2 \]
\[ = \left( \frac{1.99 \times 10^{30} kg}{7.35 \times 10^{22} kg} \right) \left( \frac{3.85 \times 10^8 m}{1.5 \times 10^9 m} \right)^2 = \boxed{178} \]

Forces due to sun is 178 x larger.