A 24.0 kg box (m) rests on a table.

a) What is the weight of the box?

\[ \text{Weight} = mg \]

\[ \text{Weight} = (24.0 \text{ kg})(9.8 \text{ m/s}^2) = 235 \text{ N} \]

b) What is the normal force acting on it?

\[ \text{There is no acceleration in the y-direction, so:} \]

\[ (F_{net})_y = F_N - m_1g = 0 \]

\[ F_N = m_1g \]

\[ F_N = 235 \text{ N} \]

c) The table must now support the weight of both boxes.

\[ W_{total} = W_{24} + W_{13.5} \]

\[ = m_{24}g + m_{13.5}g \]

\[ = (24.0 \text{ kg})(9.8 \text{ m/s}^2) + (13.5 \text{ kg})(9.8 \text{ m/s}^2) \]

\[ = 235 \text{ N} + 132 \text{ N} = 367 \text{ N} \]

d) The 24 kg box must support the weight of the 13.5 kg box, so \[ F_N = 132 \text{ N} \]
6.4-3: How much tension must a rope withstand if it is used to accelerate a 1050 kg car horizontally along a frictionless surface at 1.22 m/s²?

1. \[ T = F \]

2. \[ F = F_x \]

3. \[ (F_{net})_x = F \]

4. \[ (F_{net})_x = ma \]
\[ F = ma \]
\[ F = (1050 \text{ kg})(1.22 \text{ m/s}^2) \]
\[ F = 1280 \text{ N} \]

6.4-4: What is the weight of a 54 kg astronaut in the following locations:

a) Earth \((g = 9.8 \text{ m/s}^2)\)

b) Moon \((g = 1.7 \text{ m/s}^2)\)

c) Mars \((g = 3.7 \text{ m/s}^2)\)

d) Outer space \(v \rightarrow \infty\) with constant velocity

\[ \text{Weight} = mg \]

a) \[ w = (54 \text{ kg})(9.8 \text{ m/s}^2) \]
\[ w = 529.2 \text{ N} \]

b) \[ w = (54 \text{ kg})(1.7 \text{ m/s}^2) \]
\[ w = 91.8 \text{ N} \]

c) \[ w = (54 \text{ kg})(3.7 \text{ m/s}^2) \]
\[ w = 200 \text{ N} \]

d) \[ w = (54 \text{ kg})(0 \text{ m/s}^2) \]
\[ w = 0 \]
What force is needed to accelerate a child on a sled (total mass = 63.0 kg) at 1.16 m/s²?

1. \[ F \]

2. \[ \rightarrow \]

3. \((F_{net})_x = F\)

4. \((F_{net})_x = \max\)
   \[ F = \max \]
   \[ F = (63.0 \text{ kg}) (1.16 \text{ m/s}^2) \]
   \[ F = 73.1 \text{ N} \]

64.2 A net force of 259 N accelerates a bike and rider at 2.22 m/s². What is the mass of the bike and rider together?

1. \[ F = 259 \text{ N} \]

2. \[ \rightarrow \]

3. \((F_{net})_x = 259 \text{ N} \)

4. \((F_{net})_x = \max\)
   \[ 259 \text{ N} = m (2.22 \text{ m/s}^2) \]
   \[ m = 117 \text{ kg} \]