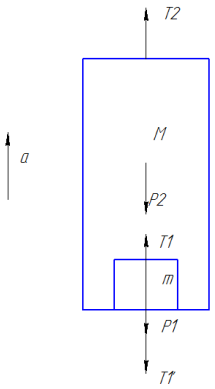
Task:

A woman stands on a scale in a moving elevator. Her mass is 53.0 kg, and the combined mass of the elevator and scale is an additional 815 kg. Starting from rest, the elevator accelerates upward. During the acceleration, the hoisting cable applies a force of 9860 N. What does the scale read during the acceleration?

Solution:



Force on M: $\sum F = T_2 - T_1{}' - P_2 = Ma$

$P_1 = mg$

$P_2 = Mg$

$T_2 = 9860\ N$

Force on m: $\sum F = T_1 - P_1 = ma$

$T_1 = ma + P_1$

$T_2 - (ma + mg) - Mg = Ma$

$T_2 - ma - mg - Mg = Ma$

$T_2 - g(m + M) = a(M + m)$

$$a = \frac{T_2}{M + m} - g$$

$$T_1 = \frac{mT_2}{M + m} - mg + mg = \frac{m}{M + m}T_2 = \frac{53\ kg}{868\ kg}9860\ N = 602.051\ N = 61.371\ kgf$$

Answer:

$T_1 = 602.051\ N = 61.371\ kgf$