

The Task:

An elevator accelerates upward at 3 m/s^2 for a brief time. A 500 N woman standing on bathroom scales notices the reading is not what she expected. What do the scales read?

Solution:

The gravitational acceleration of the Earth $g = 9.8\text{ m/s}^2$ acts on a woman when she is on the ground, and it gives her a weight $P_0 = 500\text{ N}$. So we can find a mass m of the woman:

$$m = \frac{P_0}{g} = \frac{500\text{ N}}{9.8\text{ m/s}^2} = 51\text{ kg}$$

When a woman is standing on the elevator, it gives her to the acceleration of gravity additional acceleration $a = 3\text{ m/s}^2$, and thus her weight increases:

$$P = m(g + a) = 51 \cdot (9.8 + 3) = 653\text{ N}$$

The Answer: **P=653 N**