

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

Solution

Let's apply Newton's second law to the forces felt in an elevator. If you are accelerating upward you feel heavier, and if you are accelerating downward you feel lighter.

An elevator accelerates upward, so apparent weight F is the sum of the net force acting on woman $m * a$ and her weight $m * g$:

$$F = m * a + m * g = m(a + g).$$

We know that the weight is 500 N:

$$W = mg \rightarrow m = \frac{W}{g} = \frac{500}{10} = 50 \text{ kg}.$$

The weight F reading the scales on elevator is:

$$F = 50 * (3 + 10) = 650 \text{ N}.$$

Answer: 650 N.