

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

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

The weight  $F$  reading the scales on elevator is:

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

**Answer: 650 N.**