1. A 4.0 kg cart has a force of 20.0 N pushing East and a force of 5.0 N pushing west. The initial speed of the cart is 20. m/sec. At time = 12.0 sec, what will Vf and (delta)X be?

2. A 200kg person is standing on a bathroom scale inside an elevator that is accelerating up at 2.5 m/s^2. What will the bathroom scale read? How far will he travel in 1.5sec?

Solution.

1.

$$m = 4kg, F_E = 20N, F_W = 5N, v_i = 20\frac{m}{s}, t = 12s;$$

$$v_f - ?\ \Delta x - ?$$

Newton's second law in vector form:

$$m\vec{a} = \overrightarrow{F_E} + \overrightarrow{F_W};$$

Projection on OX:

$$ma = F_E - F_W.$$

Acceleration:

$$a = \frac{F_E - F_W}{m}.$$

$$v_f = v_i + at;$$

$$v_f = v_i + \frac{F_E - F_W}{m}t.$$

$$v_f = 20 + \frac{20 - 5}{4}12 = 65\left(\frac{m}{s}\right).$$

$$\Delta x = v_i t + \frac{at^2}{2};$$

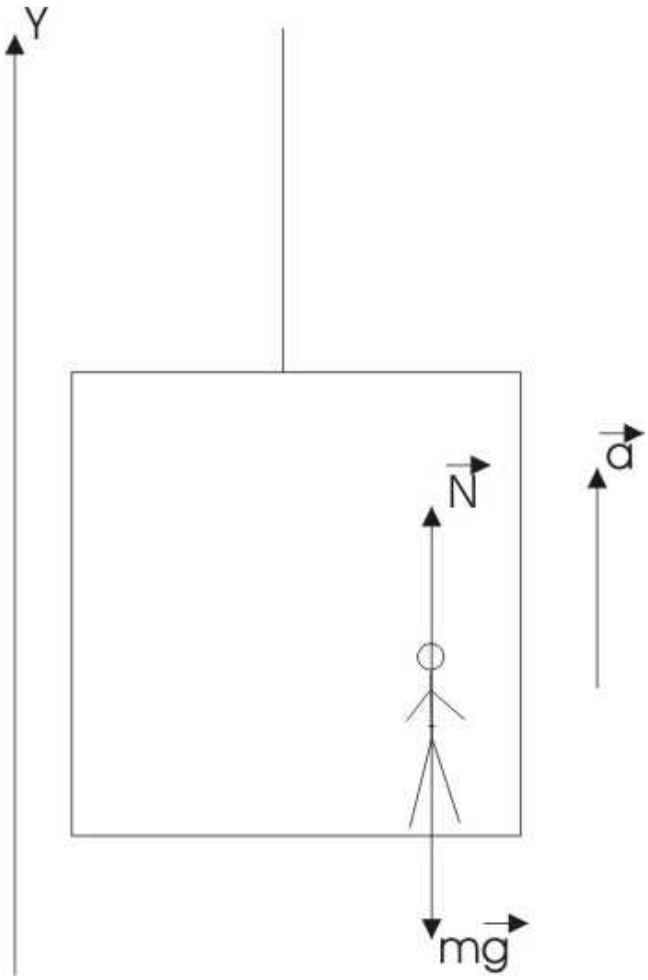
$$\Delta x = v_i t + \frac{(F_E - F_W)t^2}{2m}.$$

$$\Delta x = 20 \cdot 12 + \frac{(20 - 5)12^2}{2 \cdot 4} = 510(m).$$

2.

$$m_0 = 200kg, a = 2.5\frac{m}{s^2}, t = 1.5s;$$

$$m - ?\, h - ?$$



The weight of the person when an elevator at rest:

$$G_0 = m_0 g.$$

The weight of the person when an elevator is accelerating up in vector form:

$$\vec{G} = m_0(\vec{g} - \vec{a}).$$

Projection on Y:

$$G = m_0(g + a).$$

The bathroom scale read (mass):

$$m = \frac{G}{g};$$

$$m = \frac{200(9.8 + 2.5)}{9.8} = 251(kg).$$

How far will he travel in 1.5sec:

$$h = \frac{2.5 \cdot 1.5^2}{2} = 2.81(m).$$

Answer:

1. $v_f = 65\frac{m}{s}, \Delta x = 510m.$

2. $m = 251kg, h = 2.81m.$