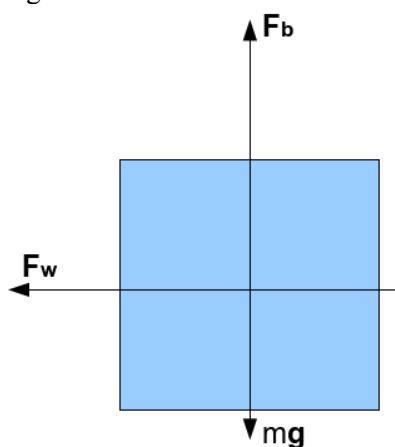**Question 5263**

1) A 6 kg cart on a level surface is pulled at a constant velocity of 2 m/sec by a constant force of 10 N . what is the acceleration? what is the friction force opposing the motion ?

If the cart is moving at a constant velocity of 2m/sec, so the acceleration is zero. Due, to the Newtons laws, if there's no acceleration, the net force (the total force acting on an object) is zero. So, the friction force is equal by absolute value to our constant force of 10 N. So, the friction force is 10 N.

2) A hot air balloon (with bucket) has a mass of 900 kg . the balloon has a buoyant force upward of 12,000 N and a westward wind force of 500 N . Find the acceleration of the balloon . What is the force of gravity (weight) of the balloon and bucket ?

First, lets show all the forces, acting on an air balloon:

F_b is the buyoant force, $m\,\boldsymbol{g}$ is the force of gravity, F_w is the westward wind force.

We know the secons Newton's law: $\boldsymbol{F} = m\,\boldsymbol{a}$. Here, $\boldsymbol{F}$ is the net force. So, to find the absolute value of acceleration, we find the absolute value of the net force, and divide it by m :

$$F = \sqrt{(F_b - mg)^2 + F_w^2}\,; a = \frac{F}{m} = \frac{\sqrt{(F_b - mg)^2 + F_w^2}}{m} \qquad a \approx \frac{3210.18\,N}{900\,kg} \approx 3.57\frac{m}{s^2}$$

The force of gravity: $P = mg = 900\text{kg} \cdot 9.81\frac{m}{s^2} = 8829\,N$