5: Forces and Newton's Laws

Name: Key

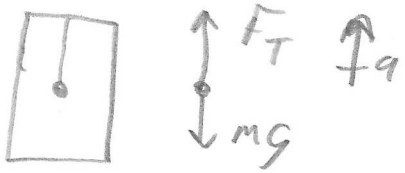
1. In the absence of all forces, a moving object will
   a) Slow down and eventually stop
   b) Move at constant velocity
   c) Immediately come to rest
   d) Cannot determine without more detail

2. Action-reaction forces
   a) sometimes act on the same object
   b) always acts on the same object
   c) may be at right angles
   d) always act on different objects

3. An object of mass m sits on a flat table. The earth pulls on this object with a force mg, which we will call the action force. What is the reaction force?
   a) The table pushing up on the object with force mg
   b) The object pushing down on the table with force mg
   c) The table pushing down on the floor with force mg
   d) The object pulling upward on the earth with force mg

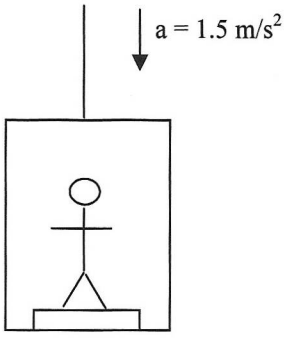
4. Mass and weight
   a) Both measure the same thing
   b) Are exactly equal
   c) Are two different quantities
   d) Are both measured in kg

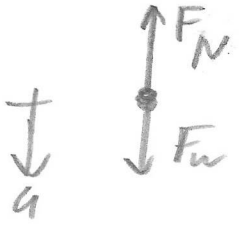
5. An object of mass M is hanging by a string from the roof of an elevator. The elevator is moving upward and is speeding up. What is the tension in the string?
   a) equal to Mg
   b) less than Mg
   c) greater than Mg
   d) zero



1. A 100 kg man stands in an elevator on a scale that reads weight in Newtons. What does the scale read if the elevator is accelerating downward at 1.5 m/s^2? (8 points)

a. Draw the free body diagram for the man. (2 points)





b. Determine the force of the scale pushing on the man. (4 points)

$$F_N - F_w = ma$$

$$F_N - mg = ma$$

$$F_N - 100(9.8) = 100(-1.5)$$

$$F_N = 980 - 150$$

$$\boxed{F_N = 830\text{N}}$$

c. If the elevator was accelerating upward, would the scale read a higher or lower value than when the elevator is accelerating downward? Explain. (2 points)

higher, scale balances gravity plus provides acceleration

$$F_N - F_w = ma$$

$$F_N = F_w + ma$$