2.1.2 In Class or Homework Exercise

1. You are a person in car traveling at 80 km/h. Explain in terms of inertia what happens to you if the driver brakes suddenly.
   Since the person in the car is also traveling at 80 km/h, they will continue traveling forward at 80 km/h until some force changes their motion. If the driver brakes suddenly, the person will continue traveling forward until they hit something (or is restrained by their seatbelt).

2. While you are in a car traveling at a constant velocity (with the windows closed), you throw a ball in the air. When the ball comes back down, does it land in front of your hand, in your hand, or behind your hand? Explain.
   Since the ball is in the car with the person, they are both traveling at the same velocity as the car. When the ball is tossed in the air, no horizontal force acts on the ball to change its motion, so it continues traveling forward at the same velocity (inertia). It will stay above the person's hand, which is also moving at the same velocity. When it comes back down, it will land in the person's hand.

3. When a person diets, is their goal to lose mass or to lose weight? Explain.
   The person generally want to become smaller and lose body mass; if they wanted to lose weight, they could simply go to a different location (such as the top of a mountain!)

4. A person states that "he has a weight of 82 kg". What is wrong with this statement? Provide values for his weight and mass.
   The problem is that he is using units of mass and referring it to as weight. His mass is probably 82 kg. To find his weight, we must calculate the force of gravity:

$$\begin{aligned} F_g &= mg \\ &= (82)(9.80) \\ &= 80\overline{0}N \end{aligned}$$

   The person's weight would therefore be 800 N.

5. If you weigh 784 N on Earth, how much would you weigh on the moon?
   Since it is mass that is the same on both Earth and moon, we must find this first:

Earth

$F_g = 784N$

$g = 9.80m/s^2$

$m = ?$

$$\begin{aligned} F_g &= mg \\ 784 &= m(9.80) \\ m &= 80.0kg \end{aligned}$$

Moon

$m = 80.0kg$

$g = 1.64m/s^2$ **(from Table 2)**

$F_g = ?$

$$\begin{aligned} F_g &= mg \\ &= (80.0)(1.64) \\ &= \boxed{131N} \end{aligned}$$

6. How much would a 3.2 kg rock weigh on Jupiter?

Using Table 2 to obtain the acceleration due to gravity on Jupiter,

$m = 3.2kg$

$g = 25.9m/s^2$

$F_g = ?$

$F_g = mg$

$= (3.2)(25.9)$

$= \boxed{83N}$