Name:_____

Physics 117
Quiz 1 (2/12/2003)

A) The novel Galileo uses an elevator to go up a tower 45 meters high.

Q-A1: *If the elevator moves up at a constant velocity of 3 m/s, how much time will it take to reach the top of the tower?*
(Ignore acceleration and deceleration of the elevator respectively at the start and the end of the ride).

$$v = 3 \ m/s, \qquad d = 45 \ m$$
$$t = \frac{d}{v} = 15 \ s$$

Q-A2: *If the novel Galileo drops a cannon ball from the top of the tower (as said 45 m high), how much time will it take to reach the ground?*
(Consider the gravitational acceleration g=10 m/s^2 and ignore the air resistance)

$$\text{From the free fall law}: \ d = \frac{1}{2}gt^2$$
$$\text{so} \quad t = \sqrt{\frac{2d}{g}} = \sqrt{\frac{90}{10}} = 3 \ s$$

B) Fred is skating on ice with his dad David. Fred's mass is 40 Kg, David's mass is 80 Kg. Fred suddenly pushes David who moves away with an acceleration a_{David}=0.2 m/s^2. Ignore frictional forces and answer the following questions:

Q-B1: *How much force did Fred apply on David?*
Q-B2: *What is the correspondent force applied by David to Fred?*
Q-B3: *With what acceleration did Fred himself move after the push?*

$$Q-B1: \ \text{Using Newton's second law} \Rightarrow F_{David} = m_{David} a_{David} = 80 \cdot 0.2 = 16 \ N$$
$$Q-B2: \ \text{Using Newton's third law} \Rightarrow \quad F_{Fred} = -F_{David}$$
$$Q-B3: \ \text{Using Newton's second law} \Rightarrow a_{Fred} = \frac{F_{Fred}}{m_{Fred}} = \frac{16N}{40Kg} = 0.4 \ \frac{m}{s^2}$$