4.
$$v^2 = v_0^2 + 2ad$$
$$(9.6 \text{ m/s})^2 = 2(a)(0.60 \text{ m})$$
$$a = 76.8 \text{ m/s}^2$$
$$F_{net} = ma$$
$$= (3.0 \text{ kg})(76.8 \text{ m/s}^2)$$
$$= 2.3 \times 10^2 \text{ N}$$
$$a = \frac{v - v_0}{t}$$
$$76.8 \text{ m/s}^2 = \frac{9.6 \text{ m/s} - 0}{t}$$
$$t = 0.125 \text{ s}$$

Magnitude of the net force on the student
$$F_{net} = ma$$
$$a = \frac{F_{net}}{m}$$
$$= \frac{2.3 \times 10^2 \text{ N}}{45 \text{ g}}$$
$$= 5.12 \text{ m/s}^2$$
$$a = \frac{v - v_0}{t}$$
$$5.12 \text{ m/s}^2 = \frac{v - 0}{0.125 \text{ s}}$$
$$v = 0.64 \text{ m/s}$$

According to Newton's third law
$\vec{v} = 0.64$ m/s left

Practice Test

ANSWERS AND SOLUTIONS

1. Newton's First Law states that an object will remain at constant velocity (including zero) unless acted on by an unbalanced force.

   B is the answer.

2. Newton's Second Law in part tells us that the acceleration varies directly with the net force. This graph shows a direct relationship between acceleration and the net force.

   A is the answer.

3. Newton's Second Law in part tells us that the acceleration of an object varies inversely with the mass. This graph shows an inverse relationship.

   C is the answer.

4. The scale reading represents the applied (normal) force due to the tension of the cable.

$$F_{net} = F_T - F_g$$
$$F_T = F_{net} + F_g$$
$$F_g = mg$$
$$= (75\text{kg})(9.81 \text{ m/s}^2)$$
$$= 735.8 \text{ N}$$
$$\simeq 736 \text{ N}$$

   If this student was accelerated upward, $F_T > F_g$. But, if this student was accelerated downward, $F_T < F_g$.

   If the student was moving up or down at a constant velocity, the net force = 0.
   $F_T = F_g = 736$ N

   D is the answer.

5. Mass is defined as the quantitative measure of an object's inertia. Mass does not depend on gravity.

   C is the answer.

6. $$F_g = mg$$
$$m = \frac{F_g}{g}$$
$$= \frac{15 \text{ N}}{9.81 \text{ m/s}^2}$$
$$= 1.53 \text{ kg}$$

   Now, the mass of an object does not change as it travels from earth to planet F.

   The weight on planet F is
$$F_{g(F)} = mg_F$$
$$= (1.53 \text{ kg})(27 \text{ m/s}^2)$$
$$= 41.3 \text{ N}$$
$$\doteq 41 \text{ N}$$

   D is the answer.

7. If we ignore air friction, the acceleration of a falling object does not depend on the mass.

   D is the answer.