PROBLEM 1.10

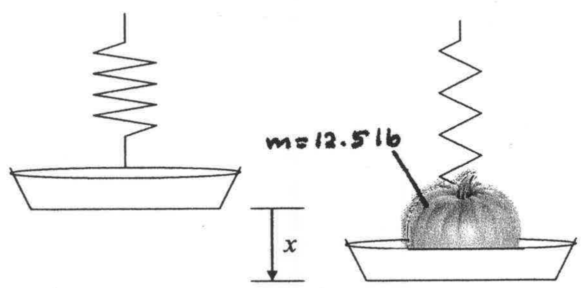
Using magnitudes,

$$|F| = m|a| \quad , \; |a| = 60g$$
$$= m(60g) = 60mg$$
$$= 60(50\,lb)\left(32.2\,\frac{ft}{s}\right)\left|\frac{1\,lbf}{32.2\,lb\cdot ft/s^2}\right| = 3000\,lbf$$

rounded

PROBLEM 1.11

Spring constant is 4.7 lbf/in.
Local acceleration of gravity is 32.2 ft/s².



The force applied to the spring to cause it to elongate can be expressed as the spring constant, k, times the elongation, x.

$$F = kx$$

The applied force is due to the weight of the pumpkin, which can be expressed as the mass (m) of the pumpkin times acceleration of gravity, (g).

$$F = Weight = mg = kx$$

Solving for elongation, x, substituting values for pumpkin mass, acceleration of gravity, and spring constant, and applying the appropriate conversion factor yield

$$x = \frac{mg}{k} = \frac{(12.5\,lb)\left(32.2\,\frac{ft}{s^2}\right)}{\left(4.7\,\frac{lbf}{in}\right)}\left|\frac{1\,lbf}{32.174\,\frac{lb\cdot ft}{s^2}}\right| = \underline{\mathbf{2.66\ in}}$$

PROBLEM 1.12

The spring is known to deflect 0.14 inch for every 1 lbf of applied force. Thus, we begin by determining the weight of the object (F_{grav}) using the deflection (Δx) given as 1.8 inches.

$$\Delta x = 1.8\text{ inches} = (0.14\,\tfrac{in.}{lbf})(F_{grav})$$

$$(F_{grav}) = \frac{1.8\text{ inches}}{(0.14\,\frac{in.}{lbf})} = 12.86\text{ lbf}$$

The mass can be solved from the expression $F_{grav} = mg$.

rounded

$$m = \frac{(F_{grav})}{g} = \frac{12.86\,lbf}{31\,\frac{ft}{s^2}}\left|\frac{32.2\,ft\cdot lb/s^2}{1\,lbf}\right| = 13.36\,lb$$

$m = 13.36$ lb