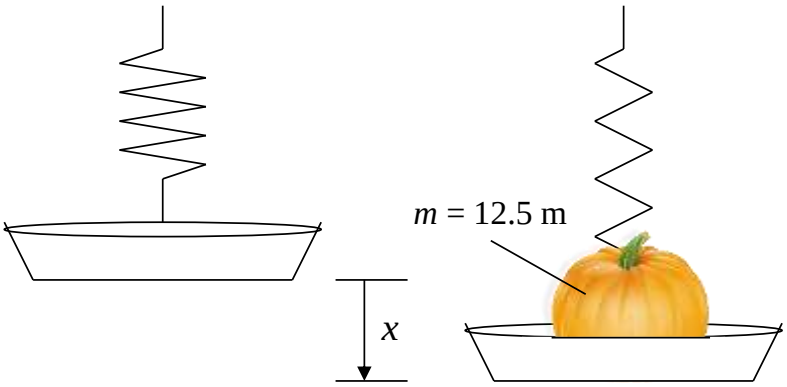
1.10 At the grocery store you place a pumpkin with a mass of 12.5 lb on the produce spring scale. The spring in the scale operates such that for each 4.7 lbf applied, the spring elongates one inch. If local acceleration of gravity is 32.2 ft/s^2, what distance, in inches, did the spring elongate?

KNOWN: Pumpkin placed on a spring scale causes the spring to elongate.

FIND: Distance spring elongated, in inches.

SCHEMATIC AND GIVEN DATA:



ENGINEERING MODEL:
1. Spring constant is 4.7 lbf/in.
2. Local acceleration of gravity is 32.2 ft/s^2.

ANALYSIS:
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

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