2. A spring is compressed by 0.05 in for every 1 lb_f of applied force. Determine the deflection of the same spring when the applied force is 6.5 lb_m. Let g_o =32.0 ft/sec^2.

According to Newton's Second Law of Motion:

$$F = m\left(\frac{a_o}{g_c}\right)$$

$$F = 6.5\ lb_m\left(\frac{32.0\ \frac{ft}{sec^2}}{32.2\ \frac{lb_m-ft}{lb_f-sec^2}}\right)$$

$$F = 6.4596\ lb_f$$

Multiply the calculated force by the spring's compression rate (0.05 in/lb_f):

$$deflection = s = 6.4596\ lb_f\left(\frac{0.05\ in}{1\ lb_f}\right)$$

$$s = 0.3230\ in$$

Because the local gravity on this planet or environment $\left(32.0\ \frac{ft}{sec^2}\right)$ *is slightly weaker than standard Earth gravity* $\left(32.2\ \frac{ft}{sec^2}\right)$*, a 6.5$lb_m$ object pulls down with slightly less than 6.5lb_f of actual force (specifically,* $6.4596\ lb_f$*). Consequently, the spring compresses just a fraction less than it would under standard Earth conditions, resulting in a final deflection of* $0.3230\ in.$