37. ***REASONING*** Since the piston and the plunger are at the same height, Equation 11.5, $F_2 = F_1(A_2 / A_1)$, applies, and we can find an expression for the force exerted on the spring. Then Equation 10.1, $F = kx$, can be used to determine the amount of compression of the spring.

SOLUTION Substituting the right hand side of Equation 11.5 into Equation 10.1, we find that

$$F_1\left(\frac{A_2}{A_1}\right) = kx$$

From the drawing in the text, we see that the force on the right piston must be equal in magnitude to the weight of the rock, or $F_1 = mg$. Therefore,

$$mg\left(\frac{A_2}{A_1}\right) = kx$$

Solving for x, we obtain

$$x = \frac{mg}{k}\left(\frac{A_2}{A_1}\right) = \frac{(40.0\text{ kg})(9.80\text{ m/s}^2)}{1600\text{ N/m}}\left(\frac{15\text{ cm}^2}{65\text{ cm}^2}\right) = \boxed{5.7\times10^{-2}\text{ m}}$$