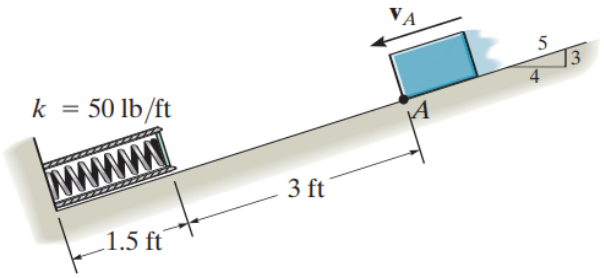
Upload a copy of your completed homework to uLearn AND turn in a physical copy in class. For full credit, you must show your work at how you arrived at the answer

1. A spring has an unstretched length of 2ft and initially starts off compressed at 1.5ft. A block that weighs 4 lb has an initial speed VA and slides down the ramp. The coefficient of friction is 0.2. If the block strikes the spring and moves it 0.25 ft before coming to a stop, determine the speed at A. V_A = 5.8 ft/s



$$+\nwarrow \Sigma F_y = 0; \qquad N_B - 4\left(\frac{4}{5}\right) = 0$$

$$N_B = 3.20 \text{ lb}$$

$$T_1 + \Sigma U_{1-2} = T_2$$

$$\frac{1}{2}\left(\frac{4}{32.2}\right)v_A^2 + (3 + 0.25)\left(\frac{3}{5}\right)(4) - 0.2(3.20)(3 + 0.25) - \left[\frac{1}{2}(50)(0.75)^2 - \frac{1}{2}(50)(0.5)^2\right] = 0$$

$$v_A = 5.80 \text{ ft/s} \qquad \textbf{Ans.}$$

2. A 150lb person runs up stairs that have a height of 15ft in 4 seconds. How much power was generated. P = 1.02 HP

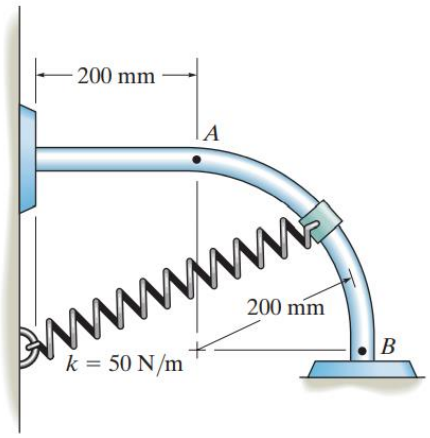
Power: The work done by the man is

$$U = Wh = 150(15) = 2250 \text{ ft} \cdot \text{lb}$$

Thus, the power generated by the man is given by

$$P_{man} = \frac{U}{t} = \frac{2250}{4} = 562.5 \text{ ft} \cdot \text{lb/s} = 1.02 \text{ hp} \qquad \textbf{Ans.}$$

3. A collar (m = 5 kg) has a velocity of 5 m/s directed to the right at position A. It travels along a frictionless guide. Determine the speed when it reaches point B. The spring has an unstretched length of 100 mm. Vb = 5.33 m/s



Potential Energy. With reference to the datum set through B the gravitational potential energies of the collar at A and B are

$$(V_g)_A = mgh_A = 5(9.81)(0.2) = 9.81 \text{ J}$$

$$(V_g)_B = 0$$

At A and B, the spring stretches $x_A = \sqrt{0.2^2 + 0.2^2} - 0.1 = 0.1828 \text{ m}$ and $x_B = 0.4 - 0.1 = 0.3 \text{ m}$ respectively. Thus, the elastic potential energies in the spring at A and B are

$$(V_e)_A = \frac{1}{2}kx_A^2 = \frac{1}{2}(50)(0.1828^2) = 0.8358 \text{ J}$$

$$(V_e)_B = \frac{1}{2}kx_B^2 = \frac{1}{2}(50)(0.3^2) = 2.25 \text{ J}$$

Conservation of Energy.

$$T_A + V_A = T_B + V_B$$

$$\frac{1}{2}(5)(5^2) + 9.81 + 0.8358 = \frac{1}{2}(5)v_B^2 + 0 + 2.25$$

$$v_B = 5.325 \text{ m/s} = 5.33 \text{ m/s}$$ **Ans.**