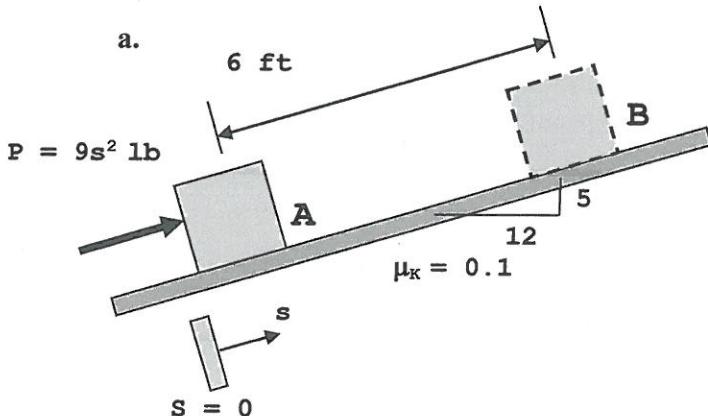


Work Energy I - Problem 1

Calculate the total work done by all the forces acting on the body between position A and position B. For each part, the block weighs 13 lbs, and the unstretched length of the spring is 5 feet and it has a spring constant, k , of 10 lb/ft.



WEIGHT

$$U_w = -13 \text{ lbs} \left(\frac{5}{13}(6) \right) = -30 \text{ Ft. lb}$$

FORCE

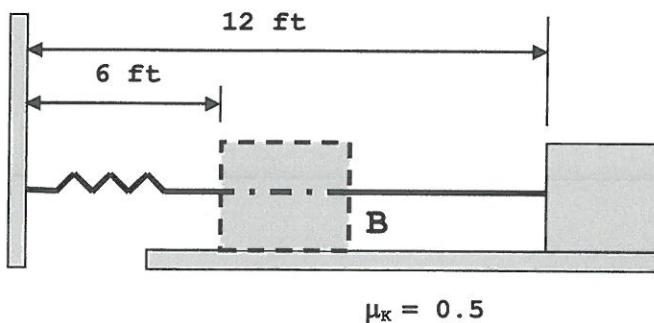
$$U_p = \int_0^{12} 9s^2 ds = 3s^3 \Big|_0^{12} = 648 \text{ Ft. lb}$$

FRICITION

$$U_{fr} = -M_k N d = -(0.1)(\frac{12}{13} \cdot 13)(6) \\ = -7.2 \text{ Ft. lbs}$$

$$U_{1-2} = -30 + 648 - 7.2 = \underline{\underline{611 \text{ Ft. lbs}}}$$

b.



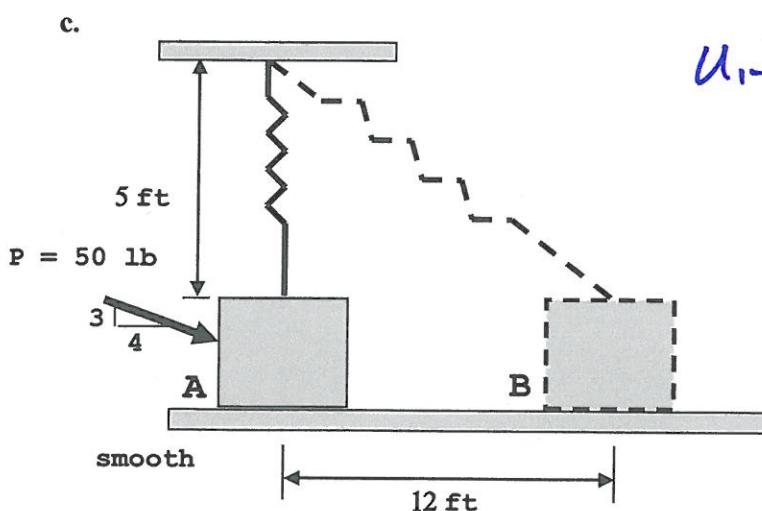
SPRING

$$S_2 = 6 - 5 = 1 \\ S_1 = 12 - 5 = 7 \\ U_s = -\frac{1}{2} k (S_2^2 - S_1^2) \\ = -\frac{1}{2} (10)(1^2 - 7^2) = 240 \text{ Ft. lb}$$

FRICITION

$$U_{fr} = -M_k N d = -(0.5)(13)(6) \\ = -39 \text{ Ft. lb}$$

$$U_{1-2} = 240 - 39 = \underline{\underline{201 \text{ Ft. lbs}}}$$



FORCE

$$U_p = \frac{4}{5}(50)(12) = 480 \text{ Ft. lb}$$

SPRING

$$S_2 = 13 - 5 = 8 \\ S_1 = 5 - 5 = 0 \\ U_s = -\frac{1}{2} k (S_2^2 - S_1^2) \\ = -\frac{1}{2} (10)(8^2 - 0^2) = -320 \text{ Ft. lb}$$

$$U_{1-2} = 480 - 320 = \underline{\underline{160 \text{ Ft. lbs}}}$$