1. $W = U_g$

$= mgh$

$= 3 \times 9.81 \times 0.15$

$= 4.4145 \text{ J}$

4. $\Delta U_g = U_{g_f} - U_{g_i}$

a)

$= mgh_2 - mgh_1$

$= (5 \times 10^{-3} \times 9.81 \times 20) - 0 \quad (h_1 = 0)$

$= \underline{0.981 \text{ J}}$

b) $\Delta U_s = \Delta U_g$

$= \underline{0.981 \text{ J}}$

c) $U_s = \frac{1}{2} kx^2$

$k = \frac{2U_s}{x^2} = \frac{2(0.981)}{(8 \times 10^{-2})^2}$

$= \underline{306.5625}$

5. $F = kx$

$k = \frac{F}{x}$

$= \frac{8 \times 9.81}{0.1}$

$= \underline{784.8}$

$\Delta U_s = \frac{1}{2} kx^2$

$= \frac{1}{2} \times 784.8 \times (0.4)^2$

$= 62.784 \text{ J}$

$\Delta U_g = \Delta U_s$

$= 62.784 \text{ J}$

$\Delta U_g = mgh = 62.784$

$h = \frac{62.784}{mg}$

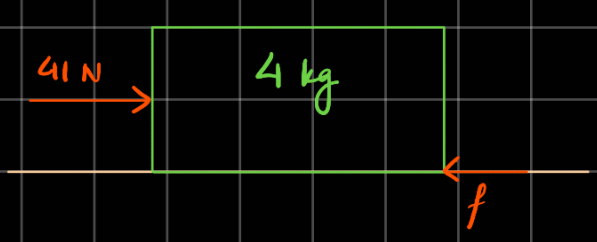
$= \frac{62.784}{8 \times 9.81}$

$= 0.8 \text{ m}$

6. $W = Fd$

$= 41 \times 2$

$= 82 \text{ J}$



Total Thermal Energy $= F_s d$

$= \mu_s mg d$

$= 0.6 \times 4 \times 9.81 \times 2$

$= 47.088$

Floor Thermal Energy = Total − Block

$= 47.088 - 40$

$= 7.088 \text{ J}$

$W = K + E_{thermal}$

$K = 82 - 47.088$

$= 34.912\ J$