41. (a) The work done on the block by the force in the rope is, using Eq. 7-7,

$$W = Fd\cos\theta = (7.68\,\text{N})(4.06\,\text{m})\cos 15.0^\circ = 30.1\ \text{J}\ .$$

(b) Using f for the magnitude of the kinetic friction force, Eq. 8-29 reveals that the increase in thermal energy is

$$\Delta E_{\text{th}} = fd = (7.42\,\text{N})(4.06\,\text{m}) = 30.1\ \text{J}\ .$$

(c) We can use Newton's second law of motion to obtain the frictional and normal forces, then use $\mu_k = f/N$ to obtain the coefficient of friction. Place the x axis along the path of the block and the y axis normal to the floor. The x component of Newton's second law is $F\cos\theta - f = 0$ and the y component is $N + F\sin\theta - mg = 0$, where m is the mass of the block, F is the force exerted by the rope, and θ is the angle between that force and the horizontal. The first equation gives $f = F\cos\theta = (7.68)\cos 15.0^\circ = 7.42\,\text{N}$ and the second gives $N = mg - F\sin\theta = (3.57)(9.8) - (7.68)\sin 15.0^\circ = 33.0\,\text{N}$. Thus

$$\mu_k = \frac{f}{N} = \frac{7.42\,\text{N}}{33.0\,\text{N}} = 0.22\ .$$