The block of mass \( m = 2.75 \text{ kg} \) is pushed up the inclined plane at constant speed by the force \( F \), directed as shown. \( \mu_s = 0.600, \mu_k = 0.400 \)

(a) Calculate the magnitude of the force \( F \). Clear free-body and force diagrams are a necessary part of this problem for full credit.
(b) Calculate the work done on the block by gravity when it moves 1.27 m up the plane.
(c) Calculate the work done by friction on the block when it moves 1.27 m up the plane.

\[
\begin{align*}
\Sigma F_x &= F \cos 40^\circ - f_k - mg \sin 30^\circ = 0 \\
\Sigma F_y &= N - mg \cos 30^\circ - F \sin 40^\circ = 0 \\
f_k &= \mu_k N \\
F &= \frac{mg(\sin 30^\circ + \mu_k \cos 30^\circ)}{\cos 40^\circ - \mu_k \sin 40^\circ} = 44.8 \text{ N} \\
W &= -mg \cdot 5 \sin \theta = -mg \cdot 5 \cdot 0.5 = -2.75 \times 9.8 \times 1.27 \times \frac{1}{2} \text{ J} \\
&= -17.1 \text{ J}. \\
W &= -f_k s = -\mu_k (mg \cos 30^\circ + F \sin 40^\circ) \cdot s \\
&= -0.4 \left( 2.75 \times 9.8 \cdot 0.866 + 44.8 \cdot 0.6427 \right) \cdot 1.27 \text{ J} \\
&= -26.5 \text{ J}. 
\end{align*}
\]