

73. We note that $N = mg$ in this situation, so $f_k = \mu_k mg = (0.32)(220) = 70.4 \text{ N}$ and $f_{s,\max} = \mu_s mg = (0.41)(220) = 90.2 \text{ N}$.

- (a) The person needs to push at least as hard as the static friction maximum if he hopes to start it moving. Denoting his force as P , this means a value of P slightly larger than 90.2 N is sufficient. Rounding to two figures, we obtain $P = 90 \text{ N}$.
- (b) Constant velocity (zero acceleration) implies the push equals the kinetic friction, so $P = 70 \text{ N}$.
- (c) Applying Newton's second law, we have

$$P - f_k = ma \implies a = \frac{\mu_s mg - \mu_k mg}{m}$$

which simplifies to $a = g(\mu_s - \mu_k) = 0.88 \text{ m/s}^2$.