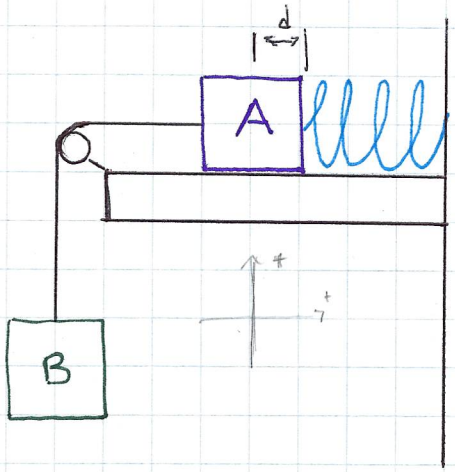
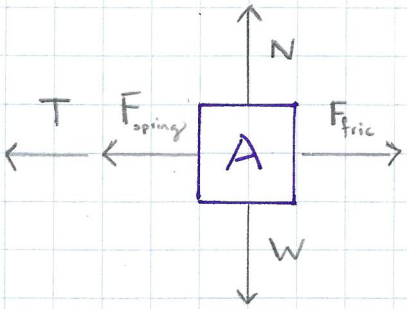
20-P-FA-AF-003

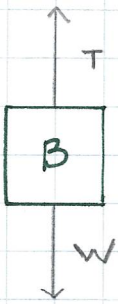
Multi-dimensional Motion: Intermediate

Q: The friction coefficient is U and both blocks has a mass of M kg. When the spring is compressed D m, what is the acceleration of block B and tension in the rope? w/ k val of K

A:







$|F_{spring}| = K \cdot D$, $|F_{fric}| = U \cdot N$, $N = W = M \cdot g$

for block A

$\uparrow + \sum F_y = 0 = N - W \Rightarrow N = W$

$\rightarrow + \sum F_x = F_{fric} - T - F_{spring} = UN - T - KD = -MA \Rightarrow UN - KD + MA = T$

for block B ↳ T and A are the same for both!

$\uparrow + \sum F_y = -M \cdot A = T - W$

↳ sub in eqn from part A

$-MA = MA - W + UN - KD$

$W - UN + KD = 2MA \Rightarrow A = \frac{W - UN + KD}{2M}$

$T = W - MA$