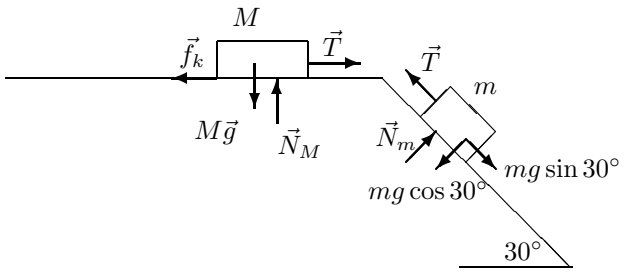
78. Since the problem is allowing for student creativity and research here, we only present a problem and solution for part (a).

(a) We show below two blocks M and m, the first on a horizontal surface with $\mu_k = 0.25$ and the second on a frictionless incline. They are connected by a rope (not shown) in which the tension is T. The goal is to find T given $M = 2.0$ kg and $m = 3.0$ kg. We assume f_s is not relevant to this computation.



Solution: We apply Newton's second law to each block's x axis, which for M is positive rightward and for m is positive downhill:

$$\begin{aligned} T - f_k &= Ma \\ mg\sin 30° - T &= ma \end{aligned}$$

Adding the equations, we obtain the acceleration.

$$a = \frac{mg\sin 30° - f_k}{m + M}$$

For $f_k = \mu_k N_M = \mu_k Mg$, we obtain $a = 1.96$ m/s^2. Returning this value to either of the above equations, we find $T = 8.8$ N.