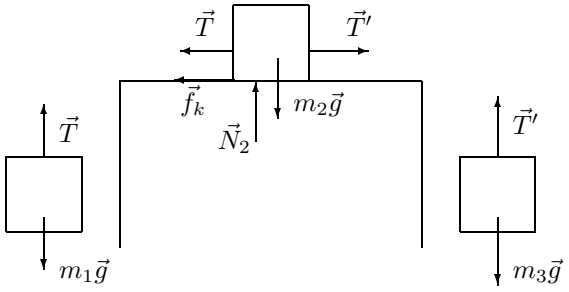
55. In the following sketch, T and T' are the tensions in the left and right strings, respectively. Also, $m_1 = M = 2.0$ kg, $m_2 = 2M = 4.0$ kg, and $m_3 = 2M = 4.0$ kg. Since it does, in fact, slide (presumably rightward), the type of friction that is acting upon m_2 is *kinetic* friction.



We use the familiar axes with $+x$ rightward and $+y$ upward for each block. This has the consequence that m_1 and m_2 accelerate with the same sign, but the acceleration of m_3 has the opposite sign. We take this into account as we apply Newton's second law to the three blocks.

$$\begin{aligned} T - m_1 g &= m_1(+a) \\ T' - T - f_k &= m_2(+a) \\ T' - m_3 g &= m_3(-a) \end{aligned}$$

Adding the first two equations, and subtracting the last, we obtain

$$(m_3 - m_1)\, g - f_k = (m_1 + m_2 + m_3)\, a$$

or (using M as in the problem statement)

$$Mg - f_k = 5Ma \ .$$

With $a = 1.5$ m/s^2, we find $f_k = 4.6$ N.