A pulley of mass \( m_p \), radius \( R \), and moment of inertia about its center of mass \( I_{cm} \), is attached to the edge of a table. An inextensible string of negligible mass is wrapped around the pulley and attached on one end to block 1 that hangs over the edge of the table. The other end of the string is attached to block 2 which slides along a table. The coefficient of sliding friction between the table and the block 2 is \( \mu_k \). Block 1 has mass \( m_1 \) and block 2 has mass \( m_2 \), with \( m_1 > \mu_k m_2 \). At time \( t = 0 \), the blocks are released from rest. At time \( t = t_1 \), block 1 hits the ground. Let \( g \) denote the gravitational constant. Find the magnitude of the acceleration of each block. Express your answer in terms of \( m_p, I_{cm}, R, m_1, m_2, \mu_k \), and \( t_1 \) as needed.

a) Find the direction and magnitude of the acceleration of the block 1 hanging over the edge of the table.

b) How far did the block 1 fall before hitting the ground?
\[ R(T_1 - T_2) \Rightarrow I_{cm} \frac{a}{R} \]

\[ T_2 - M_k m_2 g = m_2 a \Rightarrow T_2 = M_k m_2 g + m_2 a \]

\[ m_1 g - T_1 = m_1 a \Rightarrow T_1 = m_1 g - m_1 a \]

\[ a = \frac{g m_1}{(I_{cm} + m_1 + m_2)} \]

\[ d = \frac{1}{2} a t_1^2 \]

\[ d = \frac{1}{2} g \left( \frac{(m_1 - M_k m_2)}{(I_{cm} + m_1 + m_2)} \right) t_1^2 \]