University Physics 1A

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Modified Atwood Machine

Two masses (cart m_A, hanging block m_B) are connected by an ideal string passing over an ideal pulley, as shown. Note that an "ideal string" has the same tension force T everywhere along its length, but that force pulls to the right on sliding cart m_A and up on the hanging mass m_B. Assume that the friction on the horizontal surface is negligible. Figure out the forces acting on the cart. Fill in the table.

Name of force on cart	**x-component**	**y-component**
gravity	0	$-m_A g$
normal	0	N
tension	T	0
total	T	$N - m_A g$

Now do the same for the forces acting on the weight.

Name of force on weight	**x-component**	**y-component**
gravity	0	$-m_B g$
tension	0	T
total	0	$T - m_B g$

Apply Newton's Second Law. You should end up with a set of two useful equations.

$$T = m_A a_A$$

$$T - m_B g = m_B a_B$$

Combine the equations to eliminate variables:

$$\begin{aligned} T &= m_A a_A \\ T - m_B g &= m_B a_B \\ m_A a - m_B g &= -m_B a \\ m_A a + m_B a &= m_B g \\ a(m_A + m_B) &= m_B g \\ a &= \frac{m_B}{m_A + m_B} g \end{aligned}$$

Friction

Kinetic Friction:

$$F_{kinetic} = \mu_k N$$

μ_k is the coefficient of kinetic friction.
Static friction is as large as it needs to be to stop motion.

$$F_{static} = \mu_s N$$

Reminders and Homework

Complete the homework on TheExpertTA and WebAssign.
Remember to bring the Activities Manual

You can find all my notes at `http://omgimanerd.tech/notes`. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech