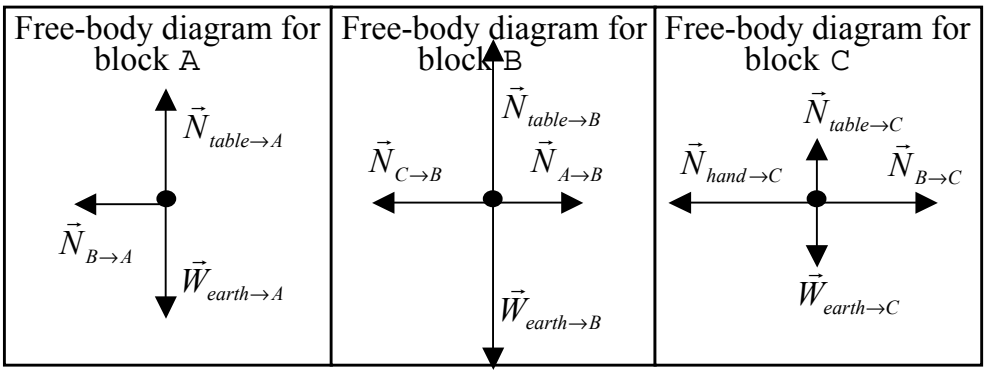
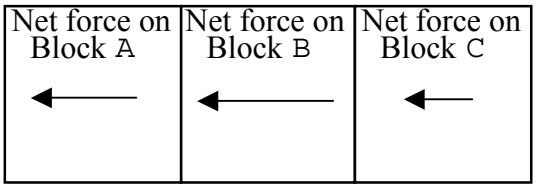
# Spring 2001 Physics 2048 Test 3 solutions

**Problem 4** (15 points)

A. [6 pts] Draw separate free-body diagrams for each of the three blocks. Label your forces to make clear (1) the object on which the force acts, (2) the object exerting the force, and (3) the type of force (normal, frictional, gravitational, etc.)




B. [4pts] In the spaces at right, draw a vector that represents the *net force* on each block. Make sure your vectors are drawn with correct relative magnitudes. Explain how you knew to draw the net force vectors as you did.




*Each block is accelerating to the left at the same rate so by Newton's 2nd law, the net force for each block is inversely proportional to the mass so that the ratio of $F^{net}/m$ is constant for each block.*

C. [5 pts] Suppose the mass of block B were doubled (the other blocks are left unchanged) and the hand pushes with the ***same force*** as in part A.

i. Has the *magnitude* of the acceleration of block A *increased, decreased,* or *remained the same?* Explain.

*Decreased, the three blocks accelerate as one system and since $\vec{a} = \frac{\vec{F}^{net}}{m}$, if you increase the mass of the system and keep the net force on the system the same (i.e. the force of the hand), the acceleration of the system of three blocks must decrease*

ii. Has the *magnitude* of the net force on block A *increased, decreased,* or *remained the same?* Explain.

*Decreased, if the acceleration of block A decreases and the mass of A doesn't change, then the net force needed to cause that acceleration is less.*