
Discussion 5: More with Forces

Objective

Practice and gain experience relating force and acceleration.

Problems

There is not room on this worksheet for your work. Use scratch paper.

1. A 3.50-kg block slides uphill at an initial speed of 0.80 meters per second on a ramp at an angle of 25° above horizontal. The coefficient of static friction between the block and the ramp is 0.50, and the coefficient of kinetic friction between the block and the ramp is 0.42.
 - a. What is the weight of the block?
 - b. What is the component of the block's weight perpendicular to the ramp?
 - c. What is the component of the block's weight parallel to the ramp?
 - d. What is the magnitude of the normal force on the block?
 - e. What is the magnitude of the force of friction on the block?
 - f. What is the direction of the force of friction on the block: uphill or downhill?
 - g. What is the magnitude of the net force on the block?
 - h. What is the direction of the net force on the block?
 - i. What is the acceleration of the block?
 - j. How far does the block slide uphill until it stops?
 - k. When the block stops, does it stay at rest, or does it begin to slide back downhill?
 - l. If the block slides downhill (it may need a push to start it), what is its acceleration?

2. A block of mass m_1 rests atop a larger block of mass m_2 , which is being pulled by a force F along a level surface. The coefficient of static friction between the two blocks is μ_{1s} , and the coefficient of kinetic friction between the large block and the base surface is μ_{2k} .
 - a. What is the greatest magnitude of the force F that does *not* make the top block slip off the bottom block? Phrased another way, what is the *least* magnitude of F that *does* make the top block slip?
 - b. Let's suppose some reasonable numbers: $m_1 = 1.00$ kg, $m_2 = 4.00$ kg, $\mu_{1s} = 0.45$, and $\mu_{2k} = 0.32$. What is the smallest F that will make the top block slip?