

2) (25 points) Two blocks on a ramp

A block of mass M_1 is resting on a ramp that forms an angle θ with the horizontal, and a second block of mass M_2 rests on top of the first block, as shown in the diagram. The static and kinetic coefficients of **friction** between the two blocks and between the lower block and the ramp are μ_s and μ_k , respectively. For parts a-d, assume that the two blocks are sliding down the ramp together so that they have the same velocity and are not moving with respect to each other.

- Draw two separate free body diagrams, one for each block, showing all the forces acting on each block.
- What is the magnitude of the normal force acting on the lower block M_1 **from the ramp**?
- What is the magnitude of the acceleration of the blocks?
- What is the minimum possible value for μ_s given that the blocks are moving together in this way? Express your answer in terms of μ_k and any other variables in the problem description, and as always show your work and/or justify your answer.
- Now someone briefly pushes the upper block M_2 so that it is sliding downward to the right faster than the lower block M_1 after the person is no longer touching the block. What is the magnitude of the acceleration of the lower block M_1 ?

