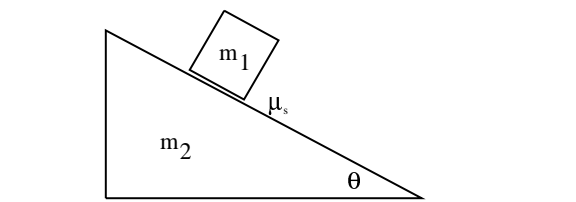


Due: 7 October

1. A block of mass m_1 sits on a wedge of mass m_2 tilted at angle θ from the horizontal. The surface between the box and the wedge has coefficient of static friction μ_s while the surface between the wedge and the Earth is smooth. The system is in static equilibrium.



- (a) Sketch free-body diagrams for the box, the wedge, and the Earth, labeling the forces carefully.
 - (b) In words, explain what each force acts on and what causes the force.
 - (c) Identify all action-reaction pairs.
 - (d) Give the magnitudes of all the forces you have drawn in terms of the givens: m_1 , m_2 , θ , and μ_s .
2. A boat can travel at 5 m/s in still water. A river 100 m wide is flowing at 3 m/s due North.
 - (a) What is the shortest time it takes to cross the river?
 - (b) At what angle must the bow point in order for the boat to cross the river in a straight line perpendicular to the river? (Quote the answer as, for example, 20° North of East.)
 - (c) How long does this take?
 3. An elevator has acceleration a_{eg} with respect to the ground. Find the acceleration (magnitude and direction) of a point mass inside the elevator as measured by an observer inside the elevator if
 - (a) $a_{eg} = 2$ m/s up
 - (b) $a_{eg} = 2$ m/s down
 - (c) $a_{eg} = 9.8$ m/s down
 - (d) $a_{eg} = 15$ m/s down(That is, find the *effective* gravity inside the elevator.)

4. Marion & Thornton 2.53
5. Marion & Thornton 2.54
6. Marion & Thornton 2.56
7. A point mass is subject to the time-dependent driving force $F(t) = F_0 \sin(\omega t)$ in one dimension.
 - (a) If the mass starts from rest at the origin at time 0 seconds, what is the position of the particle for all future times?
 - (b) Plot the position $x(t)$ versus time.
 - (c) How many times does the particle pass through the origin?