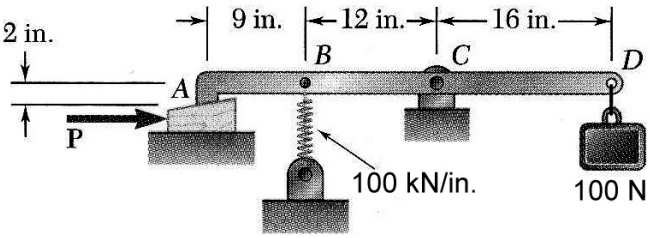
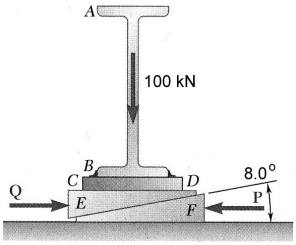
ES201 Problem set #10

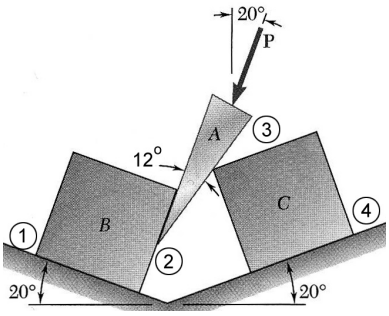
(NOTE: for all questions, use acceleration due to gravity as 9.80665 m/sec^2.)

(1) A 100 N weight is hung from a lever which is rests against a 14° wedge at A and is supported by a frictionless hinge at C. If μ_s=0.32 for all surfaces in contact with the block, and that for the position shown the spring is stretched 4.00 in., determine (a) the magnitude of the force P for which the motion of the block is impending to the right, and (b) the corresponding reaction forces at C.

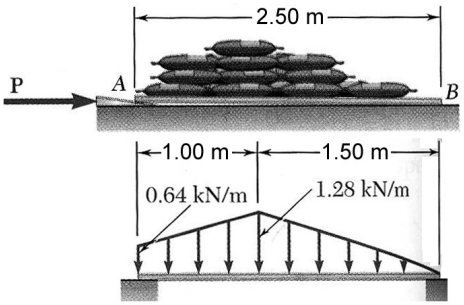




(2) The height of the beam shown in cross section is controlled by the wedges E and F. The beam load is 100 kN and μ_s=0.22 between the wedges and μ_s=0.72 between the bottom wedge and the ground. If the horizontal motion of the assembly is prevented by the force Q, determine (a) the forces P and Q required to raise the beam while maintaining equilibrium, and (b) the forces P and Q required to lower the beam.



(3) Wedge A is placed between two 50.0 kg blocks B and C as shown; μ_s=0.30 for surfaces ②, ③, ④. Determine the magnitude of the load P for which motion of the wedge is impending when (a) μ_s=0.32 for surface ①, (b) when μ_s=0.50 for surface ①.



(4) The stacked material on board AB can be represented by the distributed load shown. If μ_s=0.43 for all surfaces, and the 10° wedge is driven under at A as shown, determine (a) the force P at which motion of the wedge is impending, and (b) whether the board AB is expected to slide if no restraint is applied at B.

(5) The turnbuckle shown connects rods A and B with a right-handed thread on A and a left-handed thread on B. All threads have a mean radius of 6.00 mm and a pitch of 1.25 mm, and μ_s=0.15. Determine the torque that is needed to shorten the turnbuckle with the loading shown.