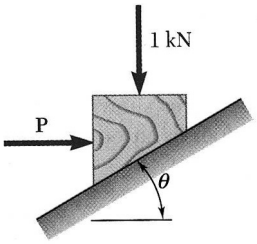
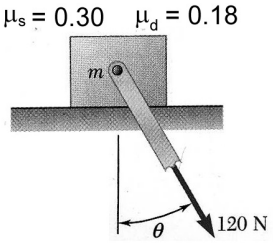
ES201 Problem set #9 – Friction

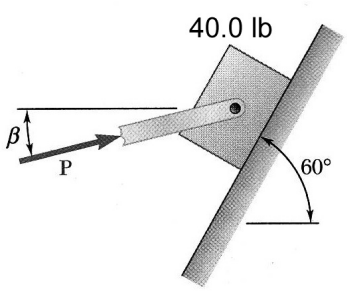
(NOTE: for all questions, use acceleration due to gravity as 9.80665 m/sec^2.)



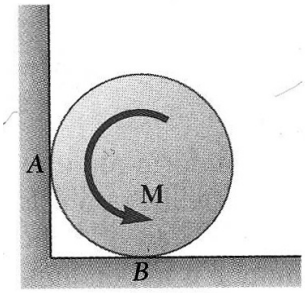
(1) Determine if the block shown is in equilibrium, and find the magnitude and direction of the friction force when θ=30°, P=300 N, and μ_s=0.40, μ_d=0.20.



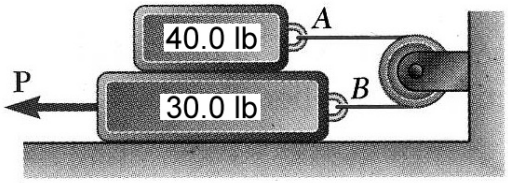
(2) For $\theta < 90°$, determine the smallest value of θ for which motion of the block to the right is impending when (a) m=20.0 kg; (b) m=35.0 kg.



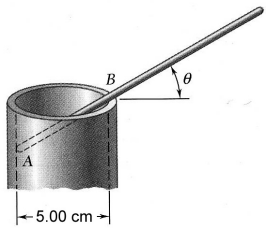
(3) If μ_s=0.40, determine (a) the smallest value of P required to keep the block in equilibrium, (b) the corresponding value of β.



(4) The cylinder shown is of weight W and radius r. Express in terms of W and r the magnitude of the largest couple M that can be applied to the cylinder if it to not rotate if the coefficients of static friction are: (a) 0 at A and 0.20 at B, (b) 0.30 at A and 0.25 at B.



(5) Given that μ_s=0.30, μ_d=0.25 for all surfaces, determine the force P for which motion of block B is impending if cable AB (a) is attached as shown, (b) is removed.



(6) The slender rod of length 30.0 cm is placed inside the tube as shown. With μ_s=0.22, determine (a) the largest value of θ for which the rod will not fall into the tube, (b) the smallest value of θ for which the rod will not fall out of the tube.