

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَالْحَمْدُ لِلَّهِ الْمَنَّانِ



IMAM KHOMEINI
INTERNATIONAL UNIVERSITY

دانشگاه بین المللی امام خمینی (ره)

دانشکده فنی و مهندسی

Title: **Friction** (Chapter 6)

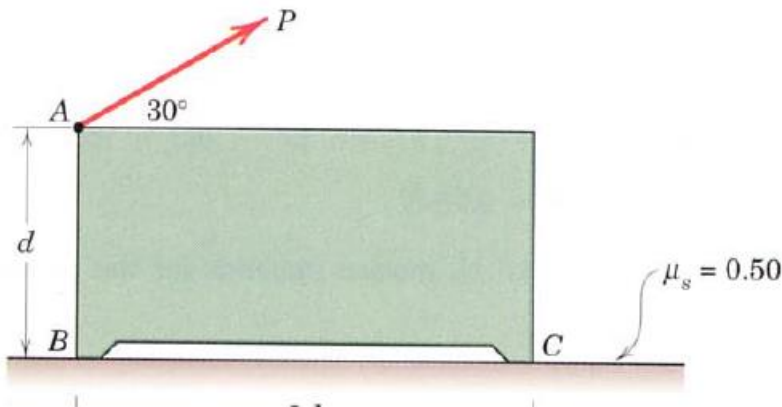
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March 17, 2019

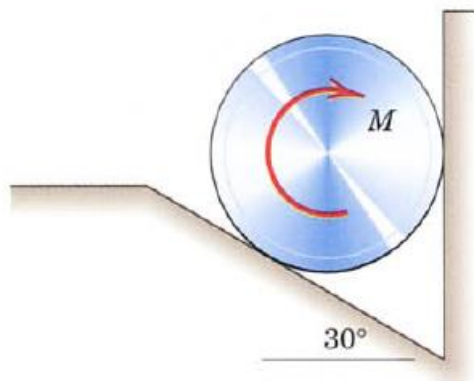
1-

6/6 The magnitude of force P is slowly increased. Does the homogeneous box of mass m slip or tip first? State the value of P which would cause each occurrence. Neglect any effect of the size of the small feet.



2-

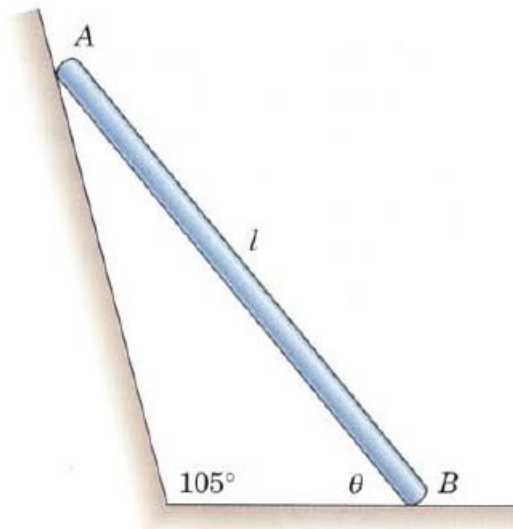
The 30-kg homogeneous cylinder of 400-mm diameter rests against the vertical and inclined surfaces as shown. If the coefficient of static friction between the cylinder and the surfaces is 0.30, calculate the applied clockwise couple M which would cause the cylinder to slip.



3-

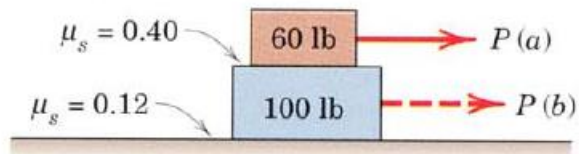
The uniform pole of length l and mass m is placed against the supporting surfaces shown. If the coefficient of static friction is $\mu_s = 0.25$ at both A and B , determine the maximum angle θ at which the pole can be placed before it begins to slip.

Ans. $\theta = 59.9^\circ$



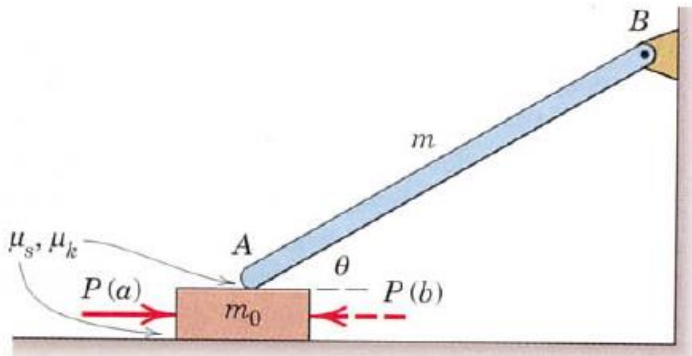
4-

The force P is applied to (a) the 60-lb block and (b) the 100-lb block. For each case, determine the magnitude of P required to initiate motion.



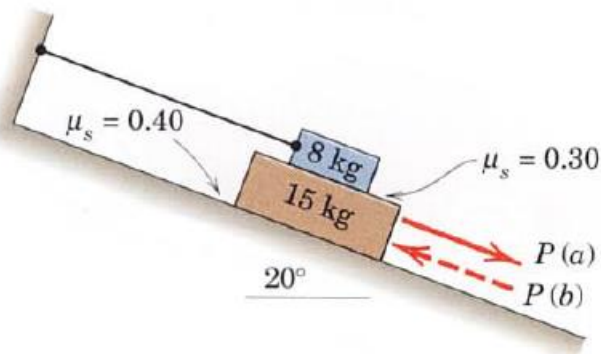
5-

- 26** Determine the magnitude P of the horizontal force required to initiate motion of the block of mass m_0 for the cases (a) P is applied to the right and (b) P is applied to the left. Complete a general solution in each case, and then evaluate your expression for the values $\theta = 30^\circ$, $m = m_0 = 3 \text{ kg}$, $\mu_s = 0.60$, and $\mu_k = 0.50$.



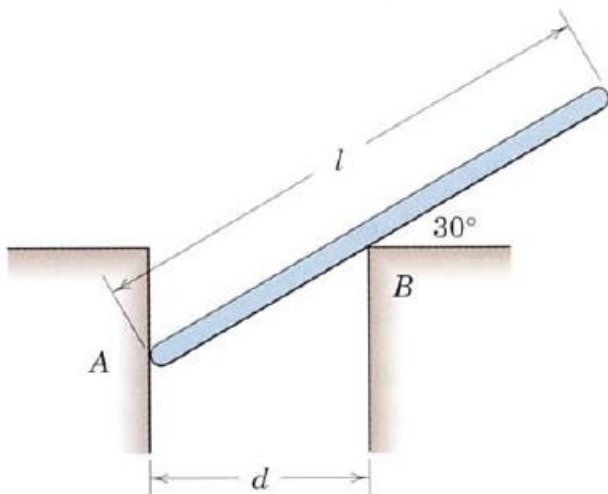
6-

- The two blocks are placed on the incline with the cable taut. (a) Determine the force P required to initiate motion of the 15-kg block if P is applied down the incline. (b) If P is applied up the incline and slowly increased from zero, determine the value of P which will cause motion and describe that motion.



7-

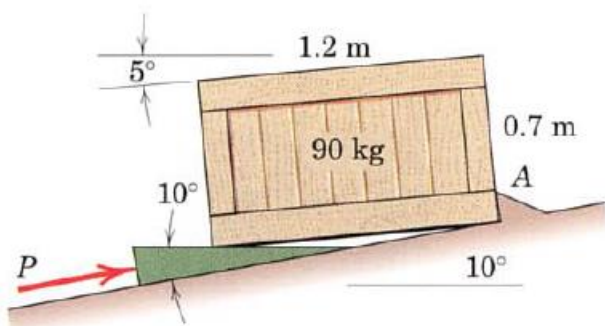
The uniform slender bar of length l is placed in the opening of width d at the 30° angle shown. For what range of l/d will the bar remain in static equilibrium? The coefficient of static friction at A and B is $\mu_s = 0.40$.



8-

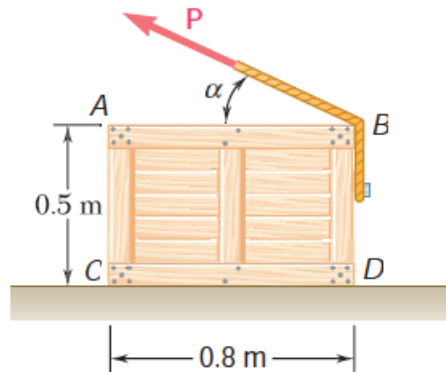
Determine the force P required to force the 10° wedge under the 90-kg uniform crate which rests against the small stop at A . The coefficient of friction for all surfaces is 0.40 .

Ans. $P = 449\text{ N}$



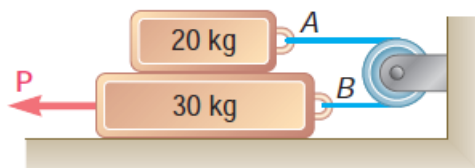
9-

A 40-kg packing crate must be moved to the left along the floor without tipping. Knowing that the coefficient of static friction between the crate and the floor is 0.35, determine (a) the largest allowable value of α , (b) the corresponding magnitude of the force \mathbf{P} .



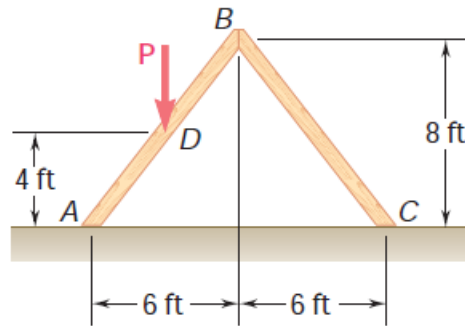
10-

8.13 and 8.14 The coefficients of friction are $\mu_s = 0.40$ and $\mu_k = 0.30$ between all surfaces of contact. Determine the smallest force \mathbf{P} required to start the 30-kg block moving if cable AB (a) is attached as shown, (b) is removed.



11-

- Two identical uniform boards, each of weight 40 lb, are temporarily leaned against each other as shown. Knowing that the coefficient of static friction between all surfaces is 0.40, determine (a) the largest magnitude of the force \mathbf{P} for which equilibrium will be maintained, (b) the surface at which motion will impend.



12-

- Block A supports a pipe column and rests as shown on wedge B. Knowing that the coefficient of static friction at all surfaces of contact is 0.25 and that $\mu = 45^\circ$, determine the smallest force \mathbf{P} required to raise block A.

