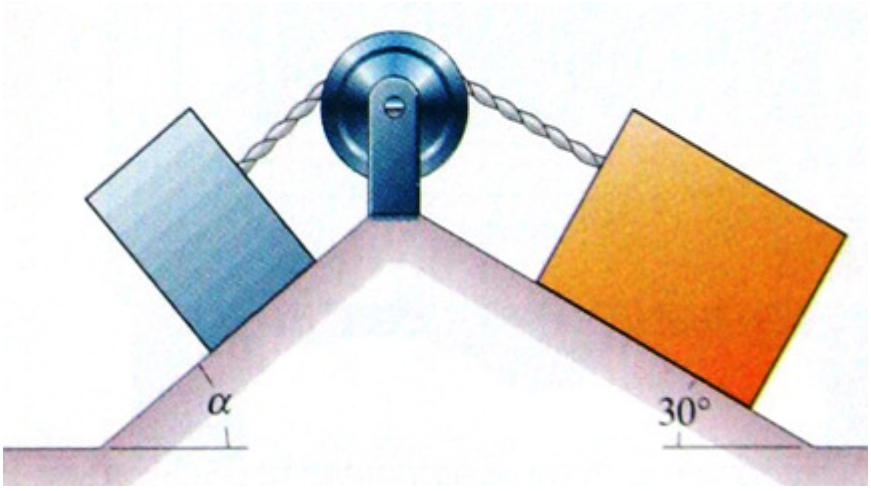
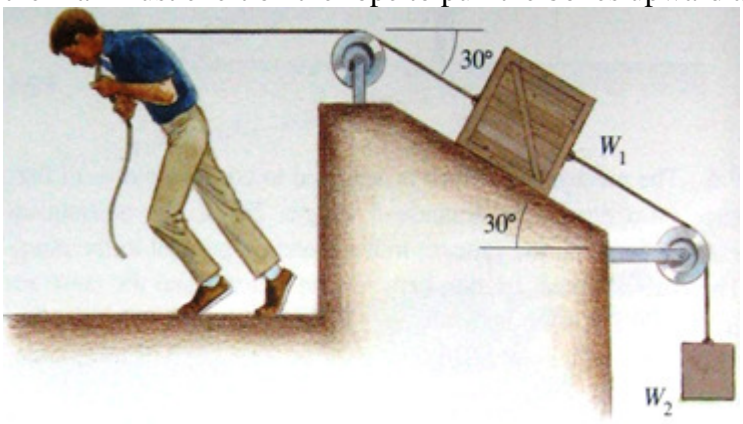
EGBE260: Week 6 Homework (Friction)

9.12. The mass of the box on the left is 30 kg, and the mass of the box on the right is 40 kg. The coefficient of static friction between each box and the inclined surface is $\mu s=0.20$. Determine the minimum angle α for which the boxes will remain stationary.



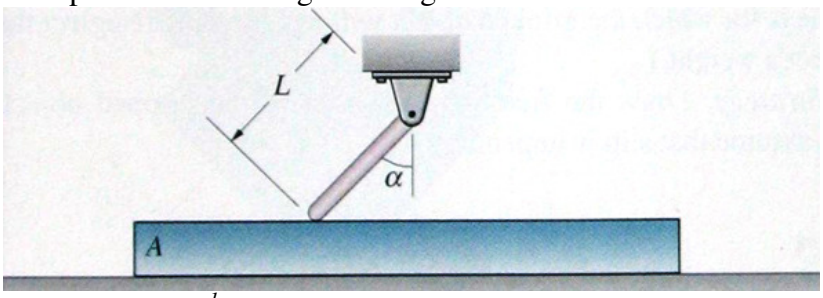
Answer: $\alpha=14°$

9.18. The weight of the two boxes are $W_1 = 100$ lb and $W_2 = 50$ lb. The coefficients of friction between the left box and the inclined surface is $\mu_k=0.10$. Determine the tension the man must exert on the rope to pull the boxes upward at a constant rate.



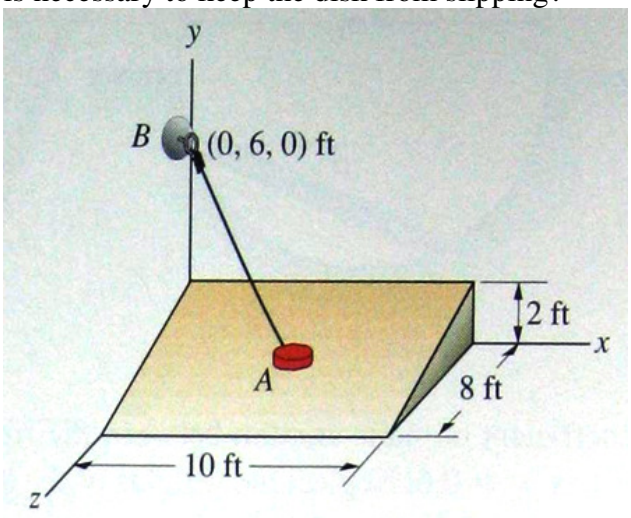
Answer: T = 109 lb.

9.24. Suppose that you want bar of length L to act as a simple brake that will allow the workpiece A to slide to the left but will not allow it to slide to the right no matter how large a horizontal force is applied to it. The weight of the bar is W, and the coefficient of static friction is μ_s. What is the largest angle α for which the bar will prevent the workpiece from moving to the right?



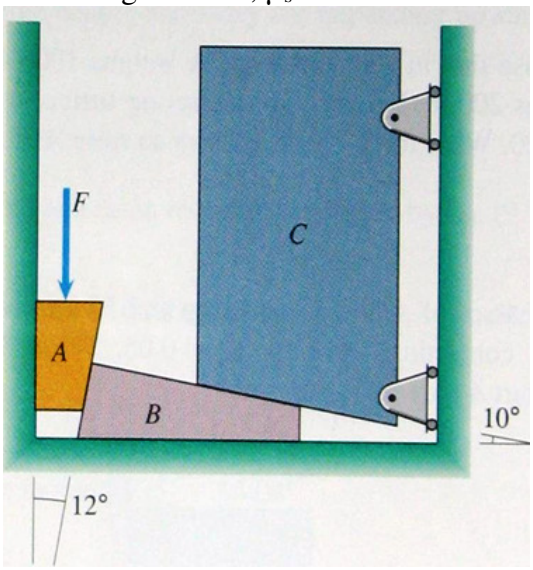
Answer: $\alpha=\tan^{-1}(\mu_s)$

9.62. The 10-lb metal disk is at the center of the inclined surface. The tension in string AB is 5 lb. What minimum coefficient of static friction between the disk and the surface is necessary to keep the disk from slipping?



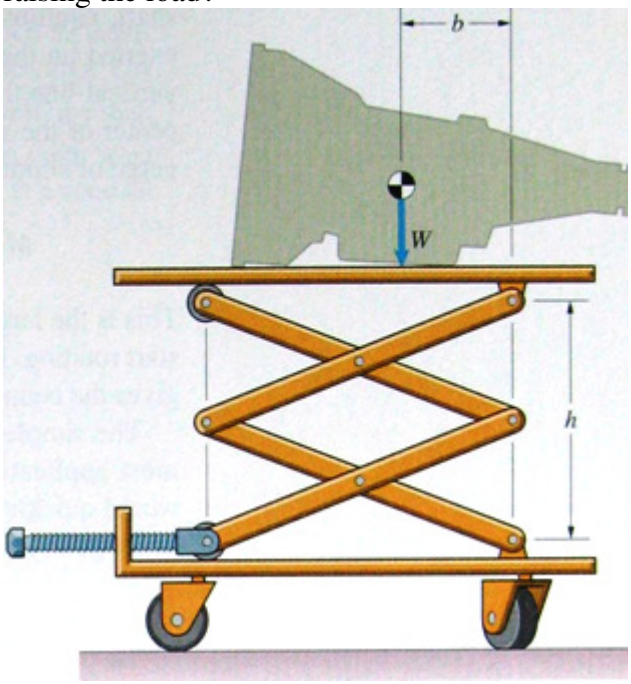
Answer: $\mu_s=0.432$.

9.78. The masses of A, B, and C are 8 kg, 12 kg, and 80 kg, respectively. Between all contacting surfaces, μ_s=0.4. What force F is required to start C moving upward?



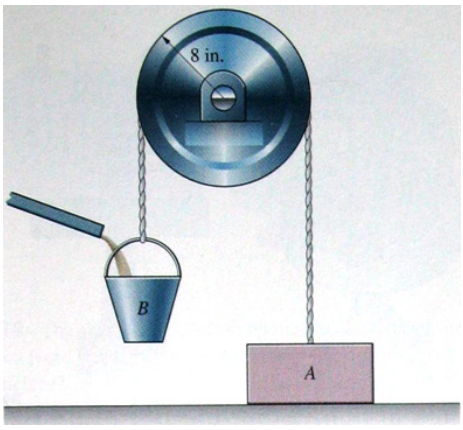
Answer: F = 1160 N.

9.96. W=800 N. b = 75 mm, h = 200 mm. The pined bars are each 300 mm. The lead of the threaded shaft is 5mm, and the radius is 15 mm. μ_k=0.2. When the system is in the position shown, what couple must be exerted to turn the threaded shaft at a constant rate, raising the load?



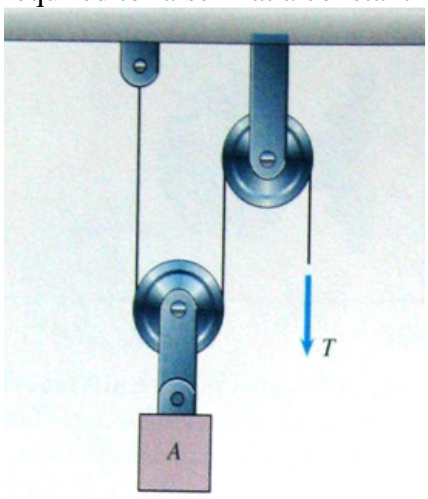
Answer: 17.4 Nm

9.102. The pulley of 8-in radius is mounted on a shaft of 1-in radius. The coefficient of static friction between the bearings and the shaft is μ_s=0.15. The 50-lb block A rests on the floor. If sand is slowly added to the bucket B, what do the bucket and sand weigh when the shaft slips in the bearings?



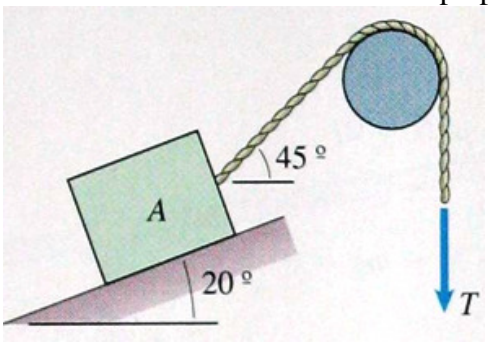
Answer: 51.9 lb.

9.110. Each pulley has a radius of 100 mm and a mass of 2 kg. Both are mounted on shafts of 5-mm radius supported by journal bearings. The coefficient of kinetic friction between the shafts and the bearings is μ_k=0.18. The mass of A is 14 kg. What force T is required to raise A at a constant rate?



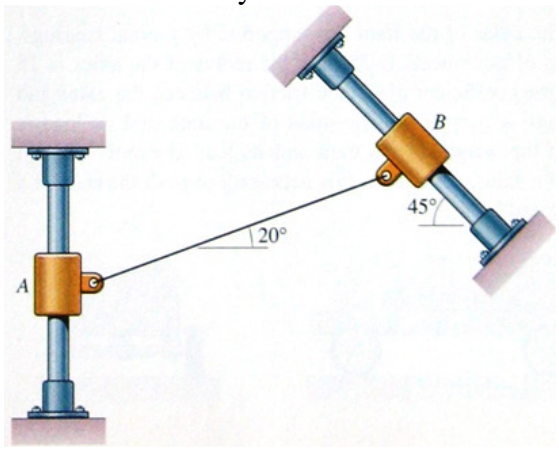
Answer: T = 80.7 N.

9.132. The 20 kg box A is held in equilibrium on the inclined surface by force T. The coefficient of static friction between the box and inclined surface is 0.1. The coefficient of static friction between the rope and the cylinder is 0.05. Determine the largest value of T that will not cause the box to slip up the inclined surface.



Answer: T = 50.1 N.

9.168. The collars A and B each have a mass of 2 kg. If friction between colar B and the bar can be neglected, what minimum coefficient of static friction between collar A and the bar is necessary for the collars to remain in equilibrium in the position shown?



Answer: μ_s=0.272.