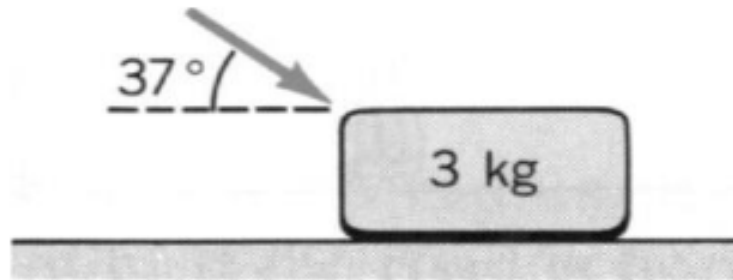# Homework #6

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October 2, 2024

Problem 1

A 3.15-kg block is acted on by a 24.0-N force that acts at 37.0° below the horizontal, as shown in the figure. Take $\mu_k = 0.200$ and $\mu_s = 0.500$. (a) Does the block move if it is initially at rest? (b) If it is initially moving to the right, what is the blocks acceleration?

Solution

Problem 2

A block is released at the top of a 25° incline. Determine the coefficient of kinetic friction given that it slides 2.30 m in 3.15 s.

Solution

Problem 3

A circular off ramp has a radius of 57.0 m and a posted speed limit of 50.0 km/h. If the road is horizontal, what is the minimum coefficient of friction required?

Solution

Problem 4

A car travels at speed v around a frictionless curve of radius r that is banked at an angle θ to the horizontal. Show that the proper angle of banking is given by $tan(\theta) = \frac{v^2}{rg}$. (Hint, this is easier if you don't rotate the coordinate system like most other incline problems, and treat the x-axis as the horizontal direction, and the y-axis as the vertical direction. This is because the centripetal force is horizontal.)

Solution

Problem 5

A button is at the rim of a turntable of radius 15.0 cm rotating at 45.0 rpm. What is the minimum coefficient of friction needed for it to stay on?
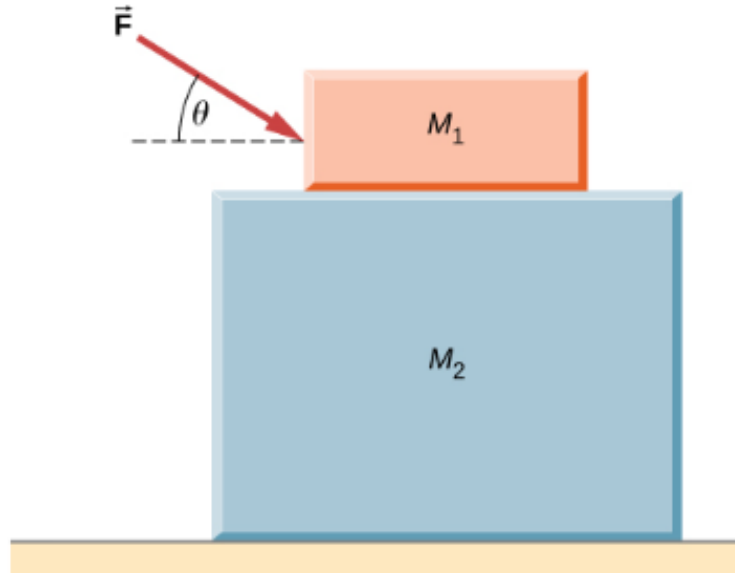
Solution

Problem 6

A box is dropped onto a conveyor belt moving at 3.40 m/s. If the coefficient of friction between the box and the belt is 0.270, how long will it take before the box moves without slipping?

Solution

Problem 7

Two blocks are stacked as shown below, and rest on a frictionless surface. There is friction between the two blocks with a coefficient of friction μ_s. An external force is applied to the top block at an angle θ with the horizontal. What is the maximum force F that can be applied for the two blocks to move together?

Solution