Introduction

Friction may be defined as a force of resistance acting on a body which prevents or retards slipping of the body relative to a second body or surface with which it is in contact.

The frictional force always acts tangent to the surface of contact between two bodies. This force opposes sliding motion between the bodies.

People could not walk or drive automobiles without the beneficial effects of friction to make attractive force possible. Belt drives and brakes all require frictional forces in order to function.

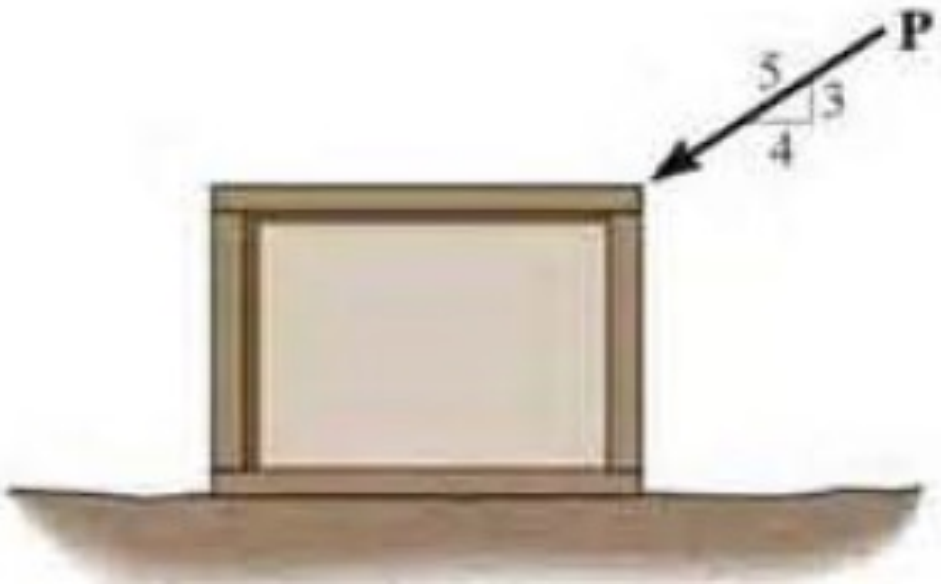
Types of friction

In general, two types of friction can occur between surfaces.

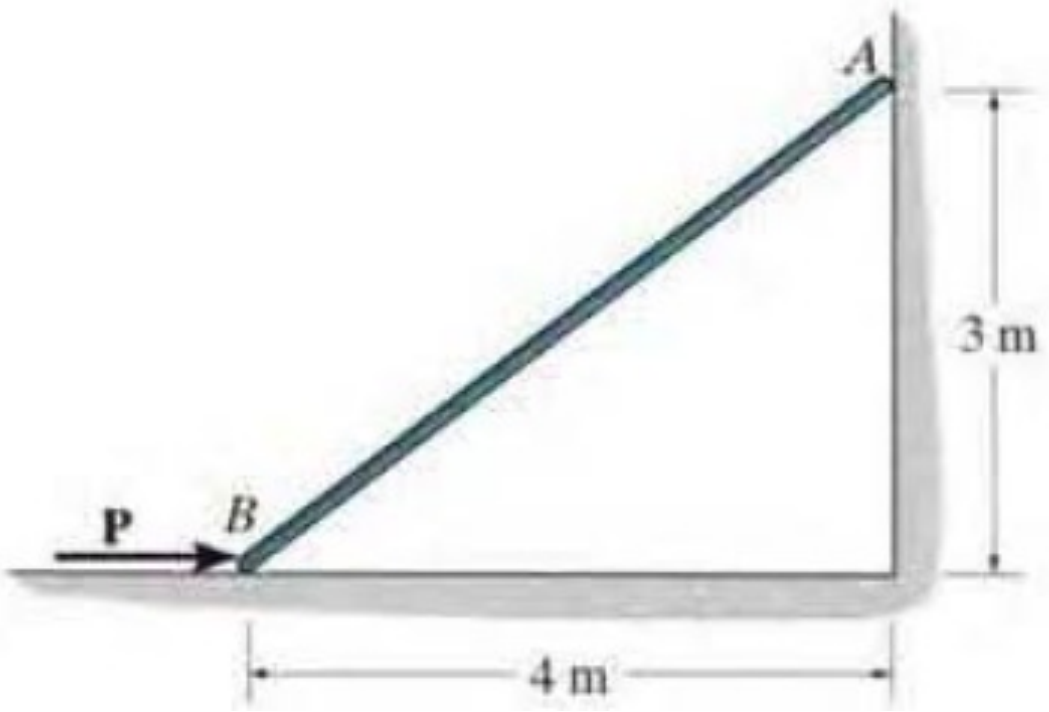
a) Dry Friction: Dry friction occurs when the unlubricated surfaces of two solids are in contact under a condition of sliding or a tendency to slide.

b) Fluid Friction: Fluid friction occurs when the contacting surfaces are separated by a film of fluid (gas or liquid).The nature of fluid friction is studied in fluid mechanics.

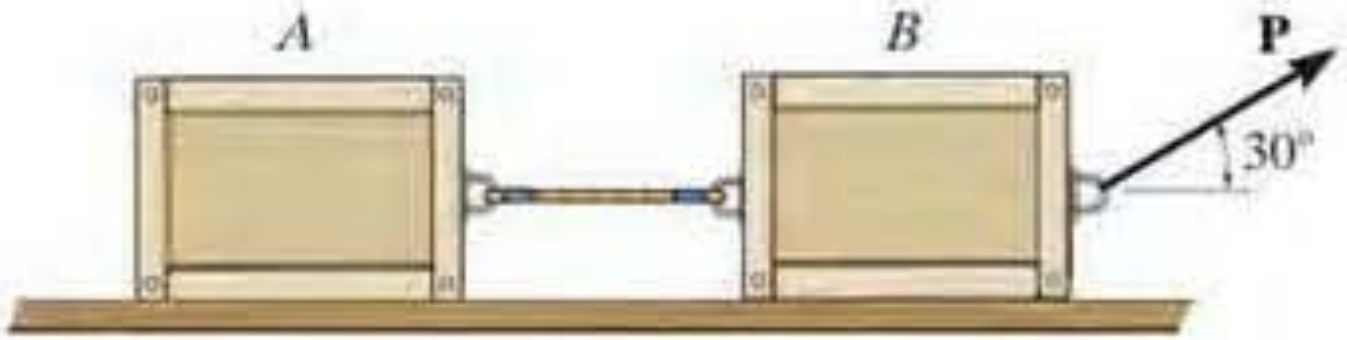
F8–1. If $P = 200\,\text{N}$, determine the friction developed between the 50-kg crate and the ground. The coefficient of static friction between the crate and the ground is $\mu_s = 0.3$.



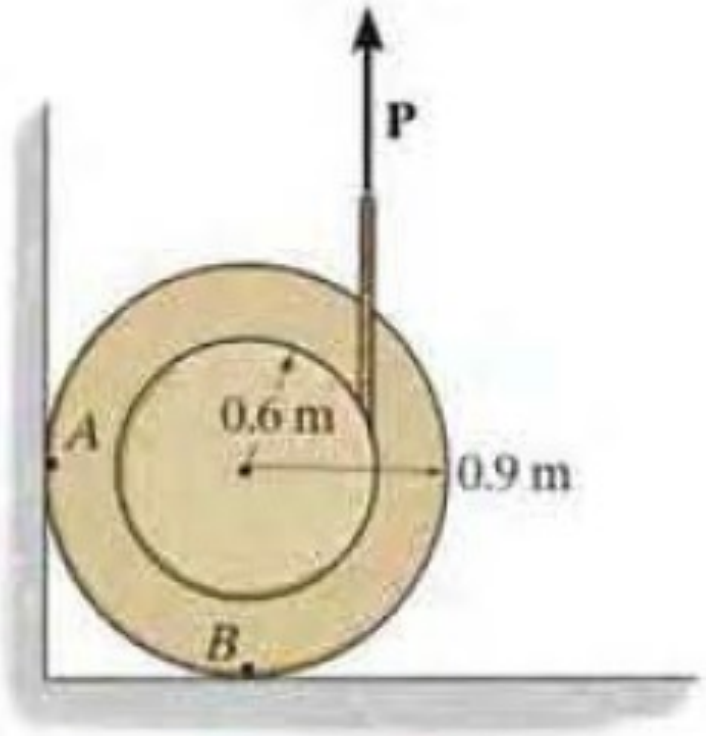
F8–2. Determine the minimum force P to prevent the 30-kg rod AB from sliding. The contact surface at B is smooth, whereas the coefficient of static friction between the rod and the wall at A is $\mu_s = 0.2$.



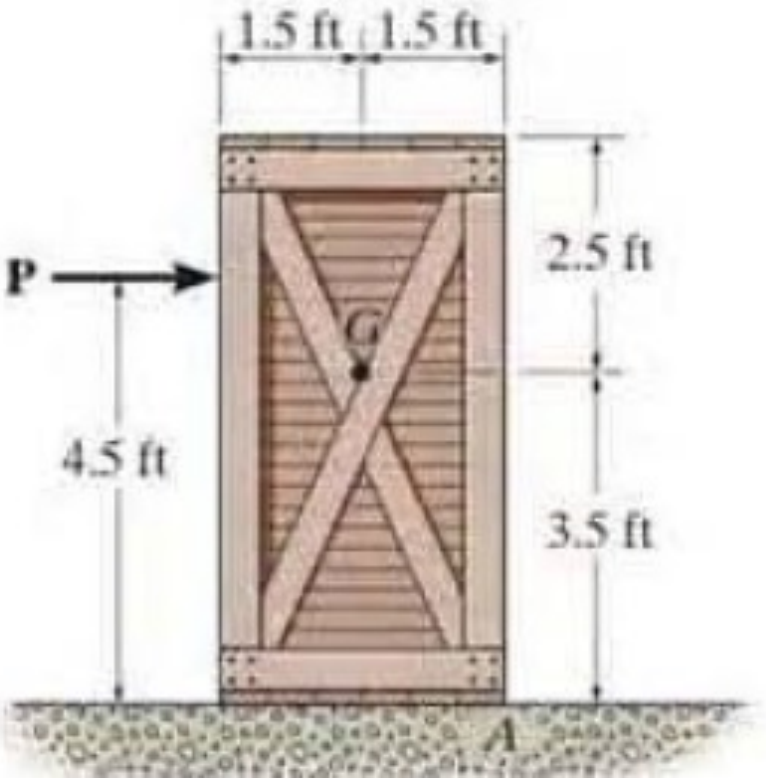
F8–3. Determine the maximum force P that can be applied without causing the two 50-kg crates to move. The coefficient of static friction between each crate and the ground is $\mu_s = 0.25$.



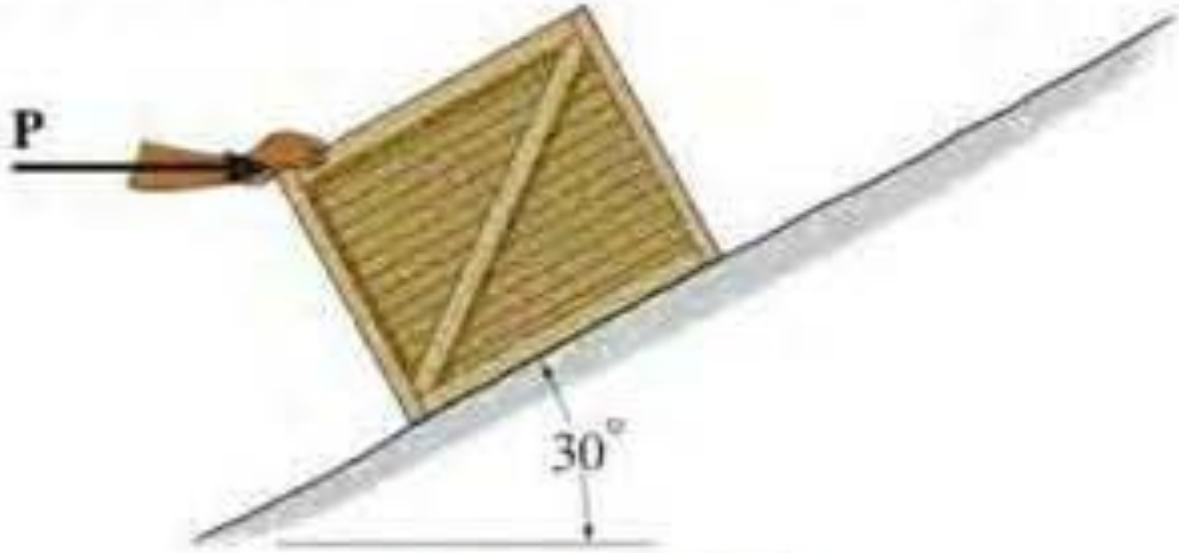
F8–4. If the coefficient of static friction at contact points A and B is $\mu_s = 0.3$, determine the maximum force P that can be applied without causing the 100-kg spool to move.



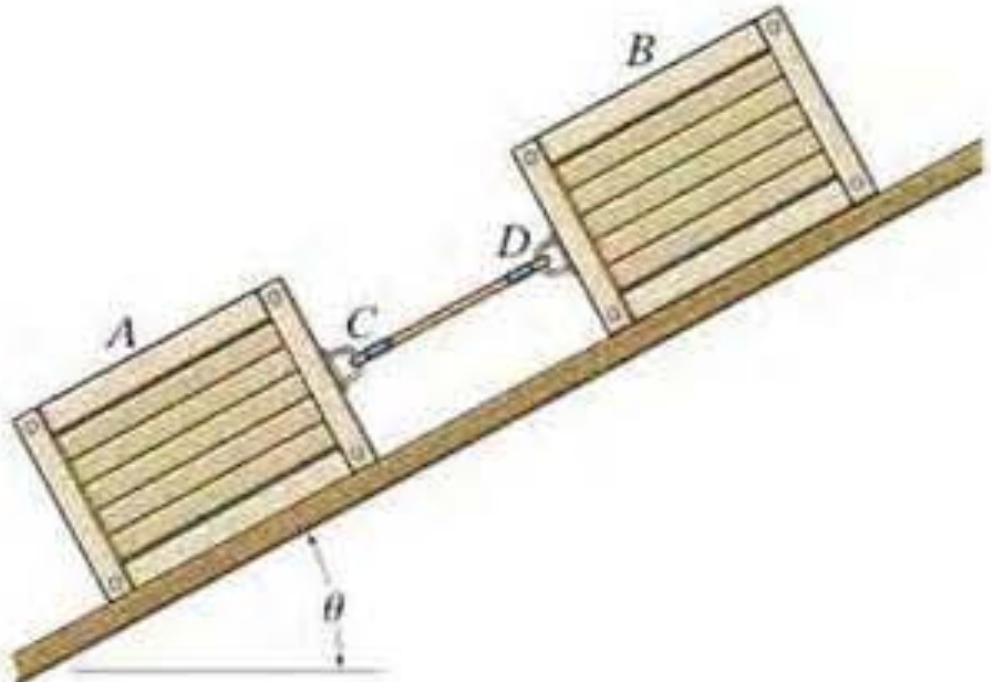
F8–5. Determine the minimum force P that can be applied without causing movement of the 250-lb crate which has a center of gravity at G. The coefficient of static friction at the floor is $\mu_s = 0.4$.



8–3. A horizontal force of $P = 100\ \text{N}$ is just sufficient to hold the crate from sliding down the plane, and a horizontal force of $P = 350\ \text{N}$ is required to just push the crate up the plane. Determine the coefficient of static friction between the plane and the crate, and find the mass of the crate.



•8–21. Crates A and B weigh 200 lb and 150 lb, respectively. They are connected together with a cable and placed on the inclined plane. If the angle θ is gradually increased, determine θ when the crates begin to slide. The coefficients of static friction between the crates and the plane are $\mu_A = 0.25$ and $\mu_B = 0.35$.



8–22. A man attempts to support a stack of books horizontally by applying a compressive force of $F = 120\ \text{N}$ to the ends of the stack with his hands. If each book has a mass of 0.95 kg, determine the greatest number of books that can be supported in the stack. The coefficient of static friction between the man's hands and a book is $(\mu_s)_h = 0.6$ and between any two books $(\mu_s)_b = 0.4$.