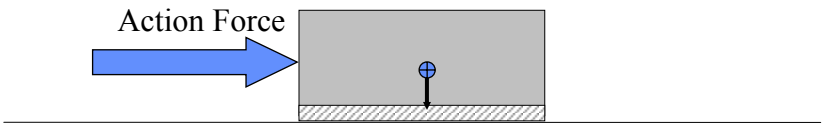
FRICTION

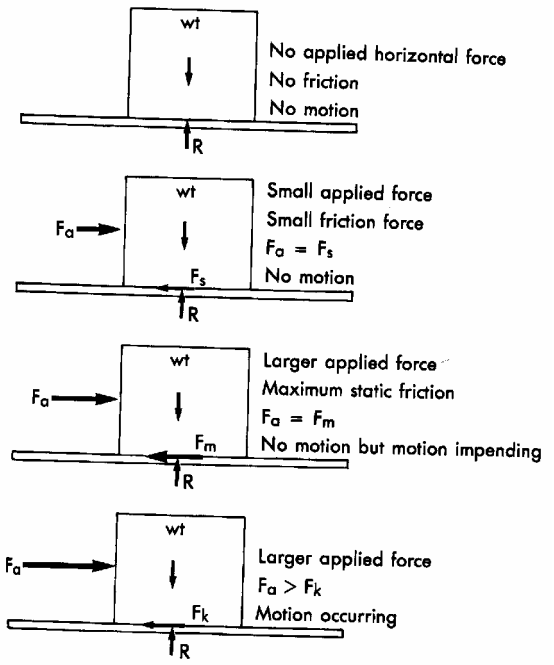


Friction

- **The friction force acts in a direction parallel to the area of contact, and opposes the motion or the tendency to move. The friction force depends on two things:**
  - The normal force (Rn)
  - The nature of the surfaces involved (μ)

$$\mathbf{F_{friction} = \mu \cdot R_n}$$

  - The friction force **<u>does not</u>** depend on the surface area (contact area).

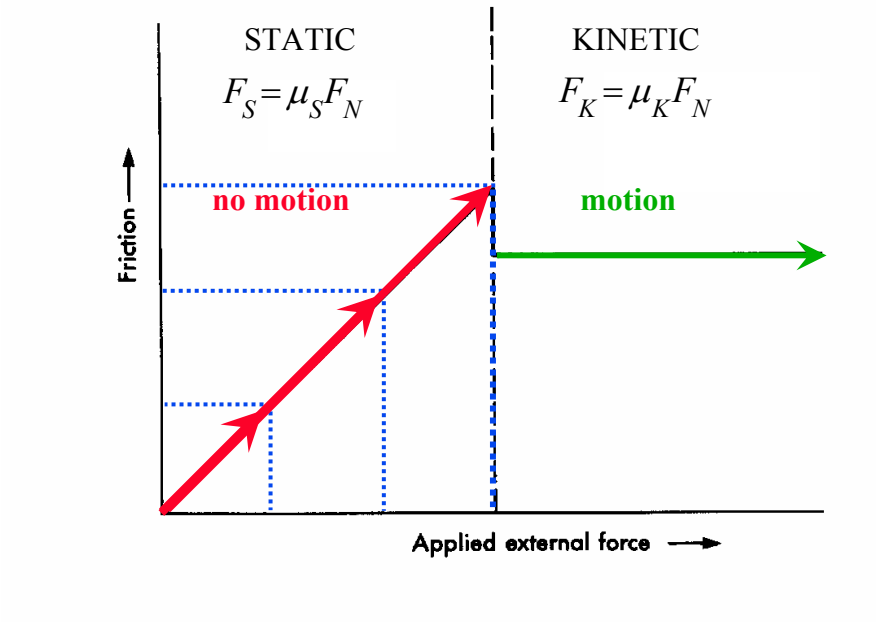


F_a = Action Force

R = Normal Reaction Force

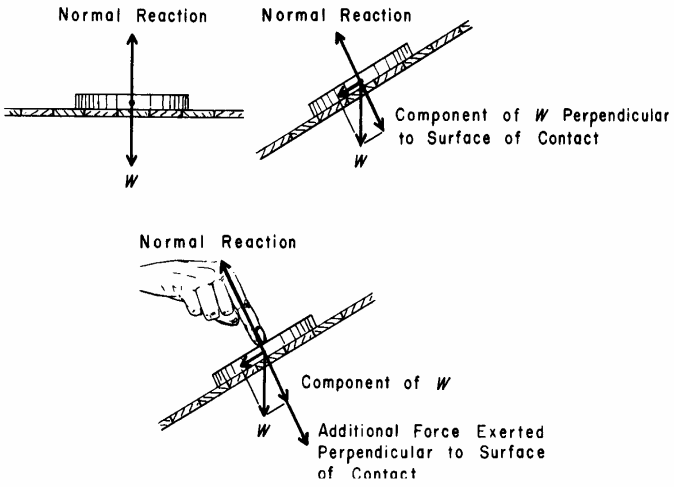
F_s = Static Friction Force

F_k = Kinetic Friction Force



Limiting Value of Static Friction

- As more force is applied, the friction force **increase**. The friction force will continue to **increase** until the instant immediately prior to the initiation of movement. At this moment:
  - **Motion** $\neq 0$
  - $F_{friction} = \mathbf{F_{lim}}$
  - $\mu = \mu_s$
- Therefore, at this moment, $\mu_s = \mathbf{F_{lim}} / \mathbf{R_n}$



Normal Force = force **perpendicular** to surface

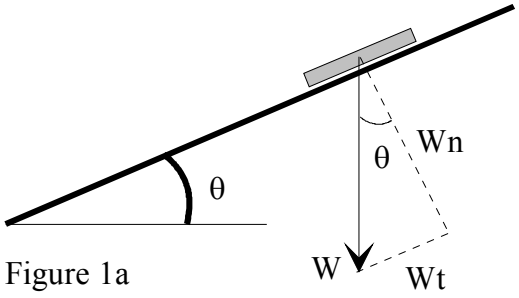


Figure 1a

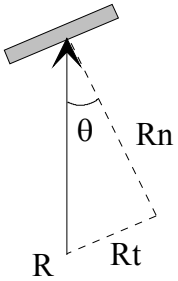
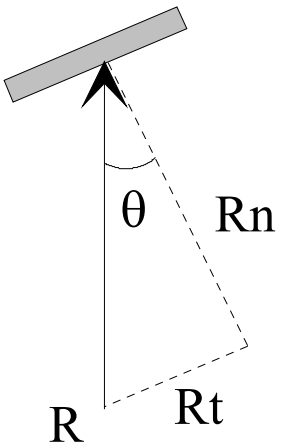
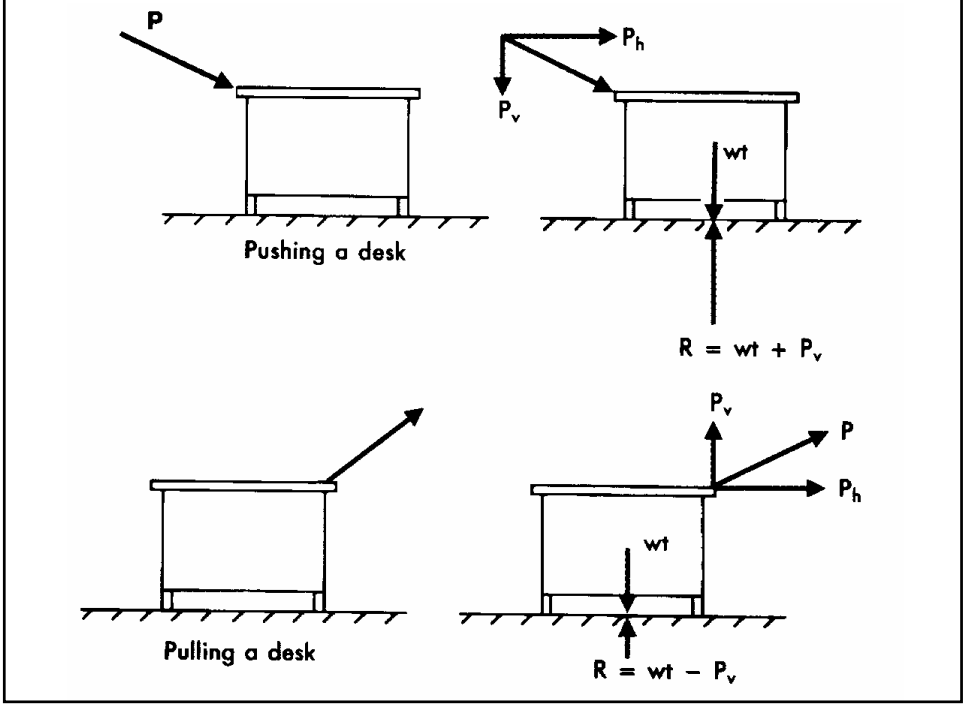


Figure 1b

A different way to find μ





Is it easier to pull a desk than push it?

- When you pull you usually have an **upward** component of force -- so…

- When you push you usually have a **downward** component of force -- so...

Things to consider

- What are some examples of manipulating the coefficient of friction and/or the force of friction in athletics? Everyday life?
- How does surface area affect coefficient of static friction?
- How does the normal force affect coefficient of static friction?
- Once an object has been set in motion (i.e., F_s has been overcome), what is the friction force? What would the net force look like? How would you describe the resulting acceleration?