To do ...

- Quiz 5 starts **TUES**
- HW 18 PL due **WED**
- HW 19 ME due **THURS**
- Last TAM 210 class **FRI**
- WA 10 due **SUN**

- TAM 210 office hours
  - OCT 30, 31: 5-7 pm 112 Transportation bldg

- TAM 210 **FINAL** (Nov 1 – Nov 5)
Relations Among Load, Shear and Bending Moments
Wherever there is an external concentrated force, or a concentrated moment, there will be a change (jump) in shear or moment respectively.
Draw the shear and moment diagrams for the beam.
Draw the shear and moment diagrams for the beam.
Draw the shear and moment diagrams for the beam.
Draw the shear and moment diagrams for the cantilever beam.
Draw the shear and moment diagrams for the overhang beam.
The smooth pin is supported by two leaves A and B and subject to a compressive load caused by bar C. Draw the shear and moment diagrams for the pin.
Friction

Friction is a force that resists the movement of two contacting surfaces that slide relative to one another. This force acts tangent to the surface at the points of contact and is directed so as to oppose the possible or existing motion between the surfaces.

Dry Friction (or Coulomb friction) occurs between the contacting surfaces of bodies when there is no lubricating fluid.
Dry friction

In designing a brake system for a bicycle, car, or any other vehicle, it is important to understand the frictional forces involved.
Dry friction

- Consider the effects of pulling horizontally (force $\mathbf{P}$) a block of weight $W$ which is resting on a **rough** surface.

- The floor exerts an uneven distribution of normal forces $\Delta N_n$ and frictional forces $\Delta F_n$ along the contacting surface.

- These distributed loads can be represented by their equivalent resultant normal forces $\mathbf{N}$ and frictional forces $\mathbf{F}$.
Dry friction

![Graph showing dry friction forces](image)

**Table 8–1 Typical Values for $\mu_s$**

<table>
<thead>
<tr>
<th>Contact Materials</th>
<th>Coefficient of Static Friction ($\mu_s$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal on ice</td>
<td>0.03–0.05</td>
</tr>
<tr>
<td>Wood on wood</td>
<td>0.30–0.70</td>
</tr>
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<td>Leather on wood</td>
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<tr>
<td>Leather on metal</td>
<td>0.30–0.60</td>
</tr>
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<td>Aluminum on aluminum</td>
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Dry friction

![Diagram of dry friction with force vs. motion](image)

### Table 8-1: Typical Values for $\mu_s$

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Find the maximum force $P$ that can be applied without causing movement of the crate.