

# To do ...

- **Happy Mid-Autumn festival**
- HW 11 ME due **Thurs**
- CATME mid-course survey due **Fri**
- HW 12 PL due **Tues**

# Chapter 6: Structural Analysis

## Main goals and learning objectives

- Determine the forces in members of a truss using the method of joints
- Determine zero-force members
- Determine the forces in members of a truss using the method of sections

# Simple trusses



Trusses are commonly used to support roofs.



A more challenging question is, that for a given load, how can we design the trusses' geometry to minimize cost?

# Scaffolding



An understanding of statics is critical for predicting and analyzing possible modes of failure.

Buckling of slender members in compression is always a consideration in structural analysis.



# Simple trusses

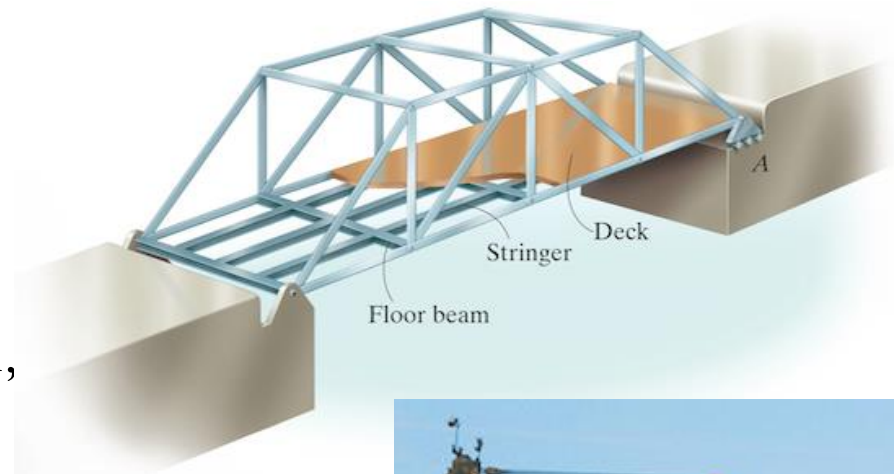
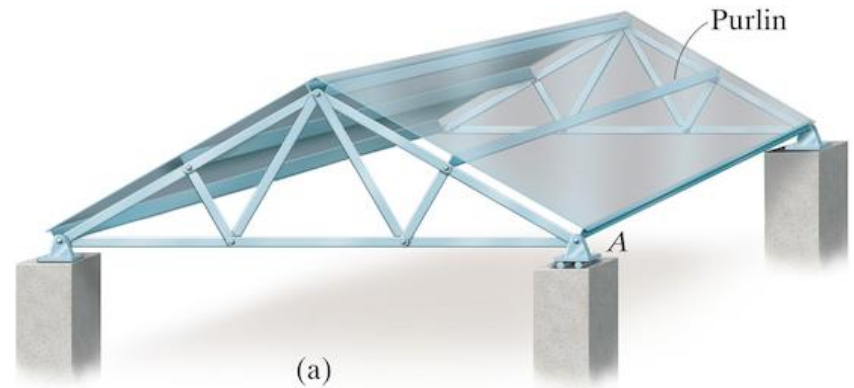
## Truss:

- Structure composed of slender members joined together at end points
- Transmit loads to supports

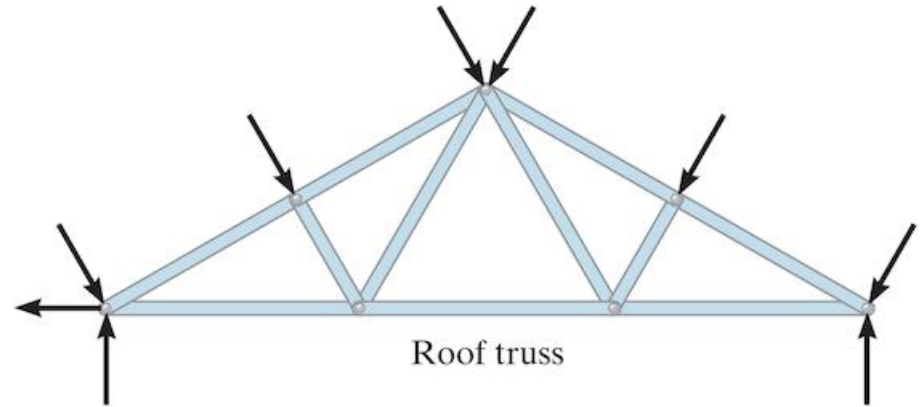
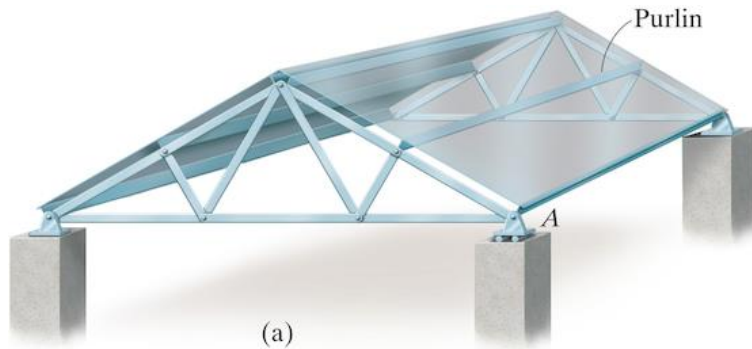
## Assumption of trusses

- Loading applied at joints, with negligible weight (If weight included, vertical and split at joints)
- Members joined by smooth pins

**Result: all truss members are two-force members,** and therefore the force acting at the end of each member will be directed along the axis of the member

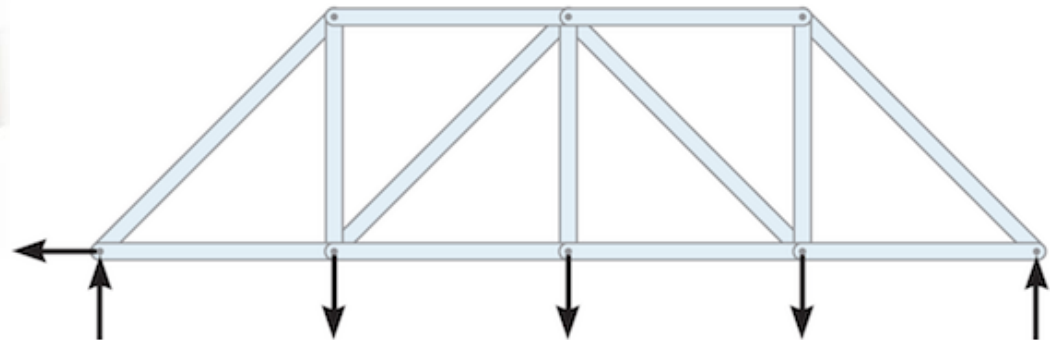
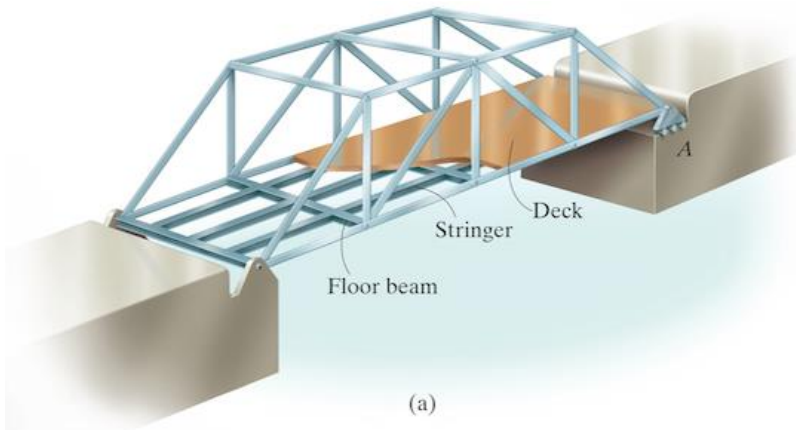


# Roof trusses



Load on roof transmitted to purlins, and from purlins to roof trusses at joints.

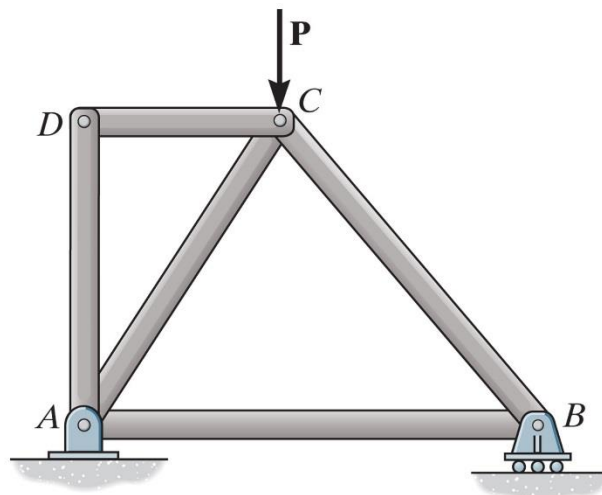
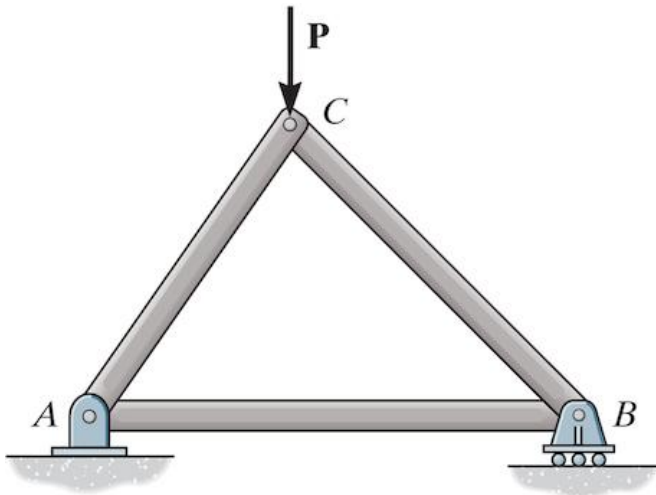
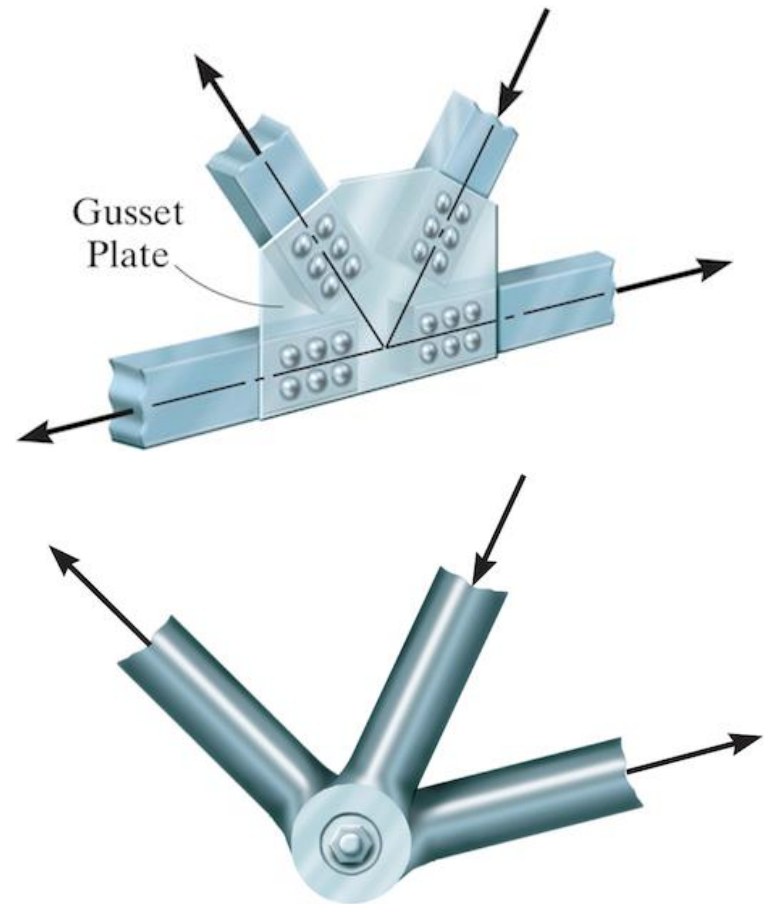
# Bridge trusses



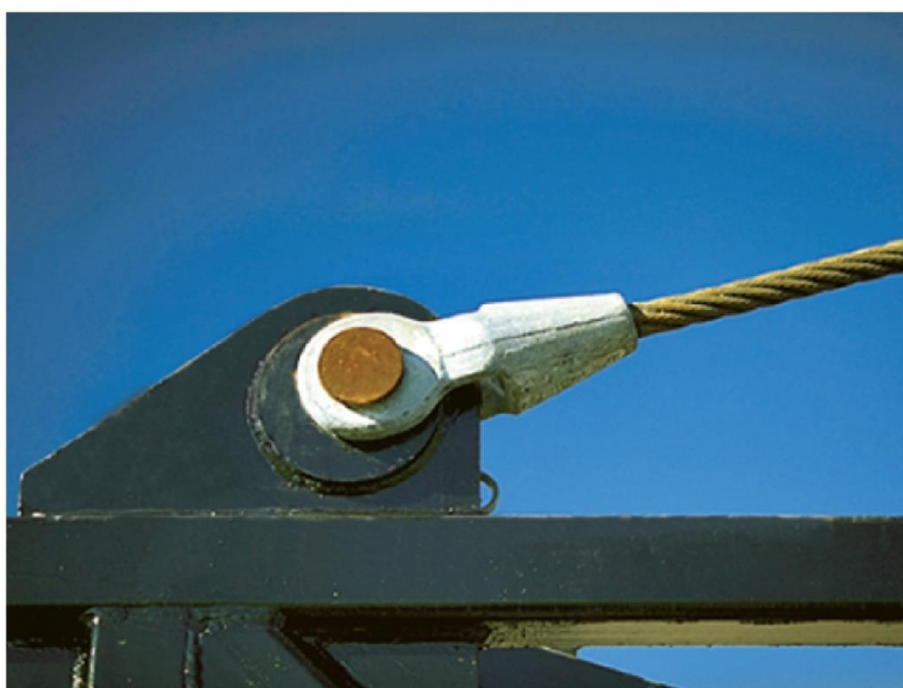
Load on deck transmitted to stringers, and from stringers to floor beams, and from floor beams to bridge trusses at joints.

# Truss joints

- Bolting or welding of the ends of the members to a gusset plates or passing a large bolt through each of the members
- Properly aligned gusset plates equivalent to pins (i.e., no moments) from coplanar, concurrent forces
- Simple trusses built from triangular members









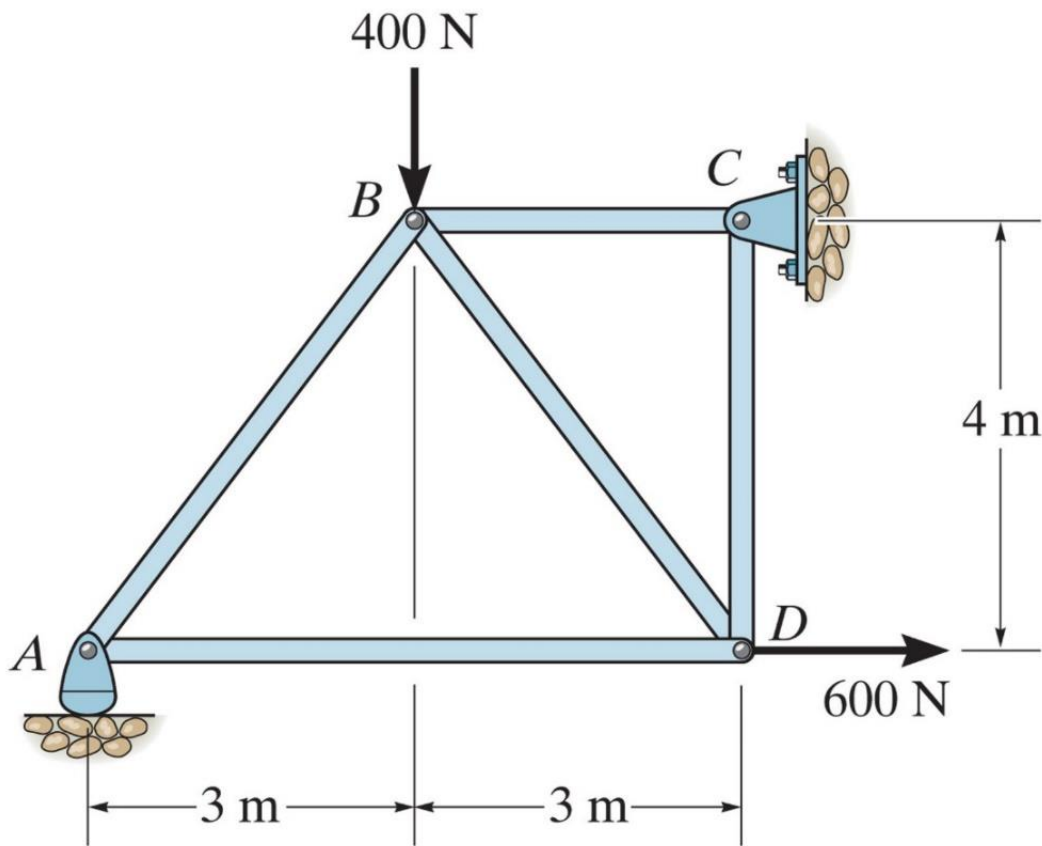


# Method of joints

- Truss is in equilibrium ONLY if ALL individual pieces are in equilibrium
- Truss members are two-force members: equilibrium satisfied by equal, opposite, collinear forces

**Procedure for analysis:**

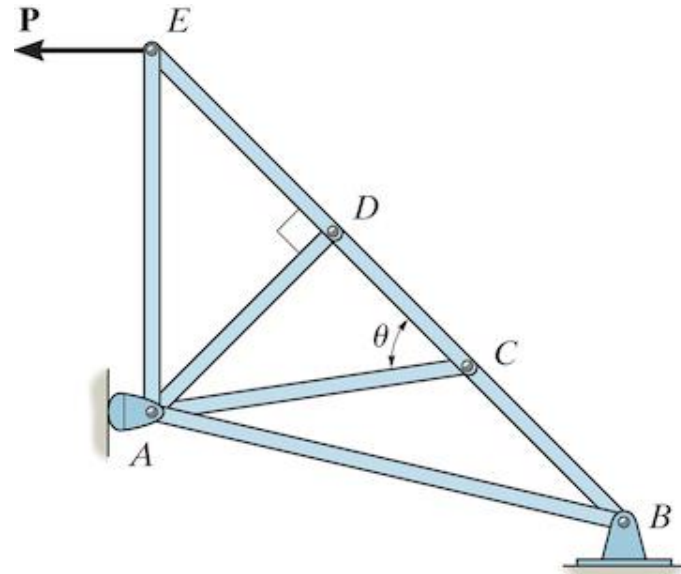
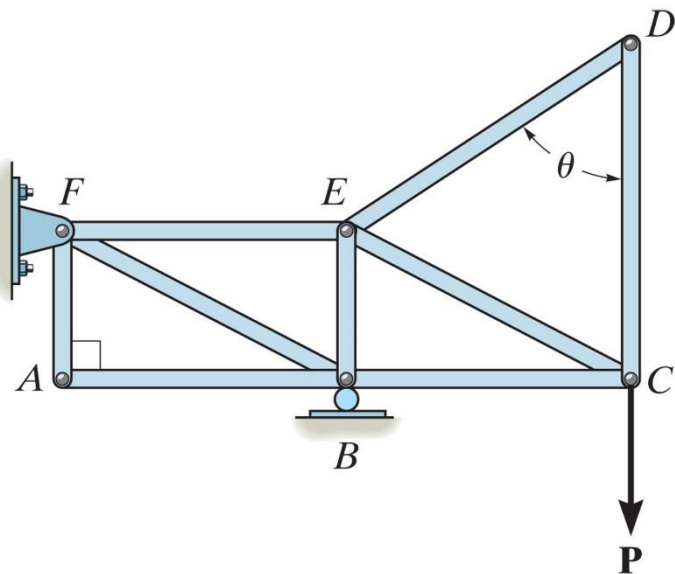




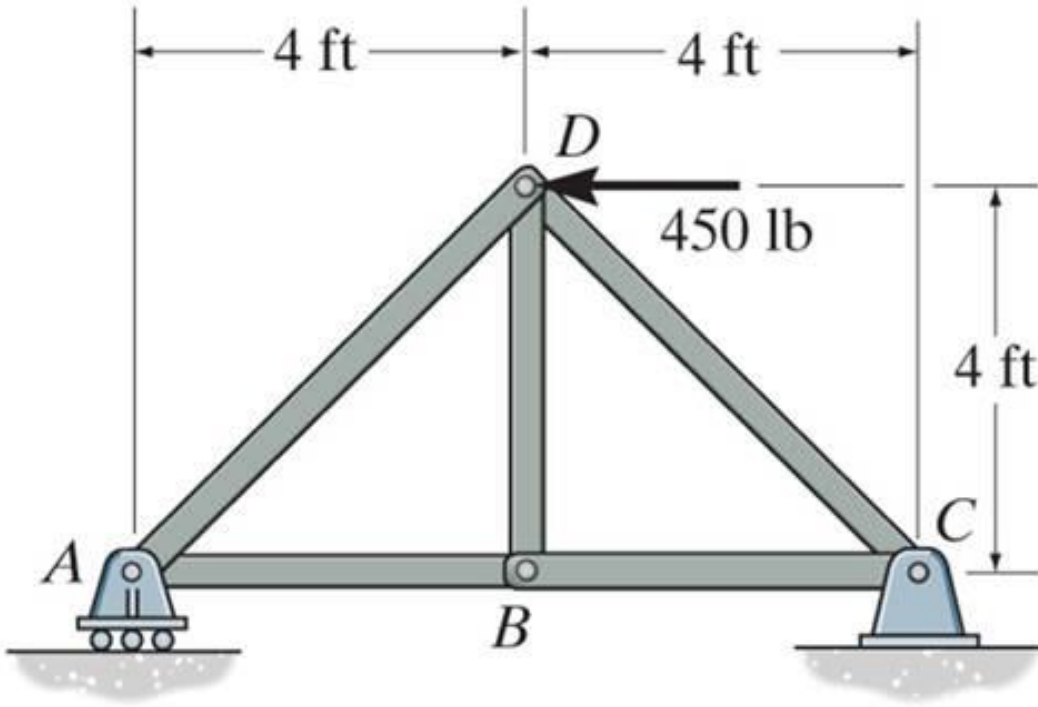
Find the forces in each member of the truss.  
Determine if members are in tension or compression.

# Zero-force members

- Particular members in a structure may experience no force for certain loads.
- Zero-force members are used to increase stability
- Identifying members with zero-force can expedite analysis.







Find the forces in each member of the truss.