

# Announcements

- Happy Mid-Autumn Festival!
- Upcoming deadlines:
  - Thursday (10/5)
    - ME HW11
  - CATME Mid-course Survey (10/6)
  - Tuesday (10/10)
    - PL HW12



# Recap

- Rigid body equilibrium

- Two force member

# Chapter 6: Structural Analysis

# Goals and 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

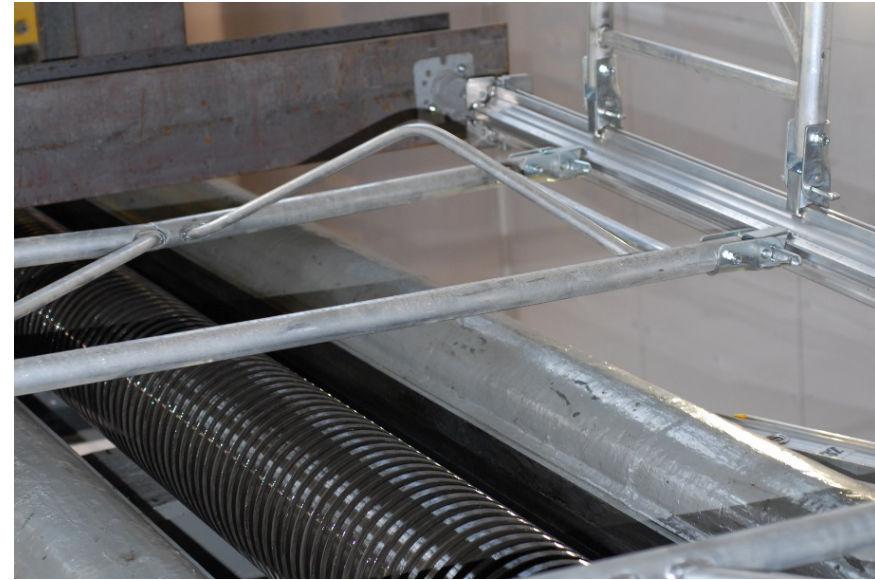


Trusses are commonly used to support roofs.



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:

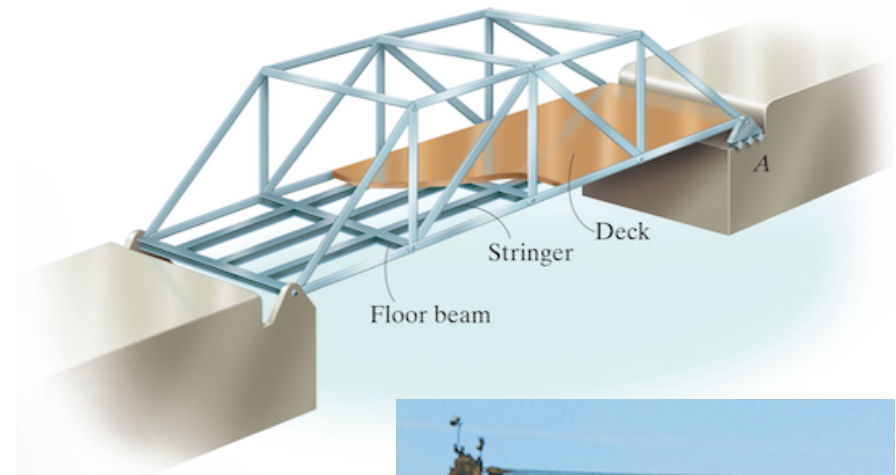
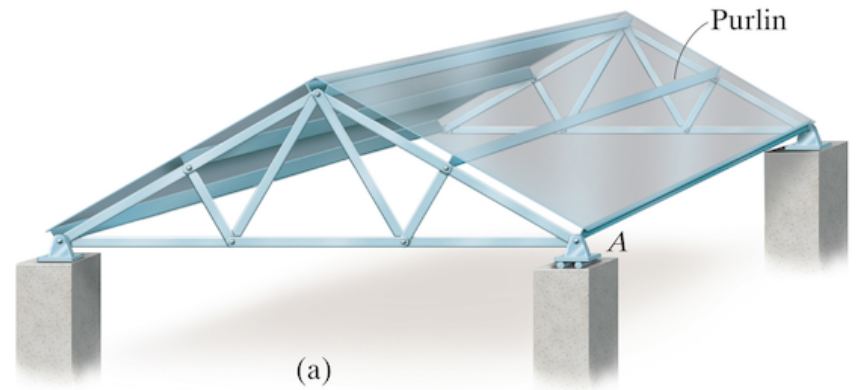
- Structure composed of slender members joined together at end points
- Transmit loads to supports

## Assumption of trusses

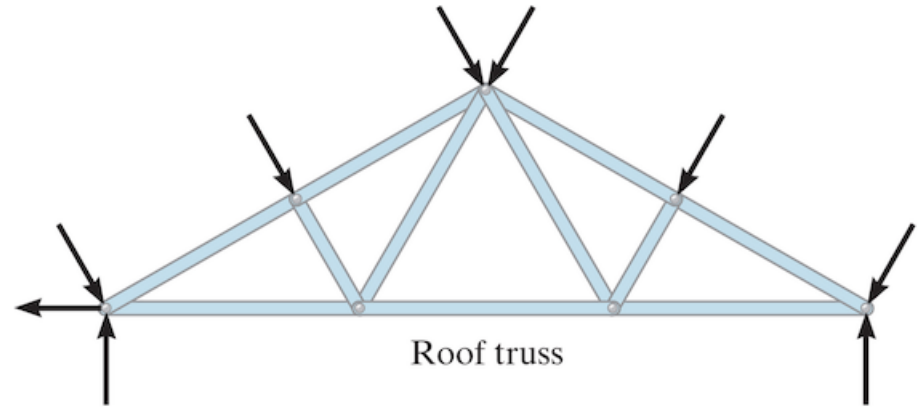
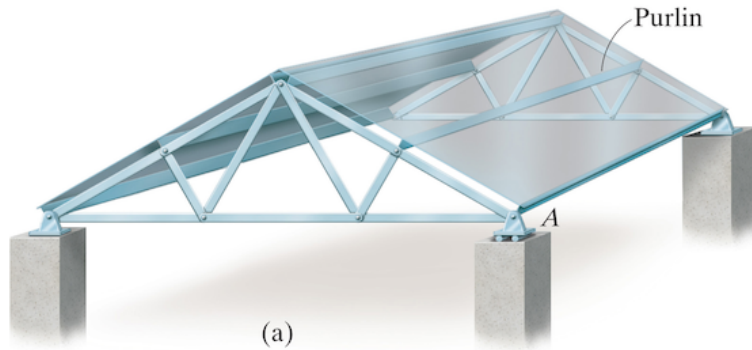
- Loading applied at joints, with negligible weight. Members joined by smooth pins

**Result:** all truss members are

and therefore the force acting at the end of each member will be directed along the axis of the member

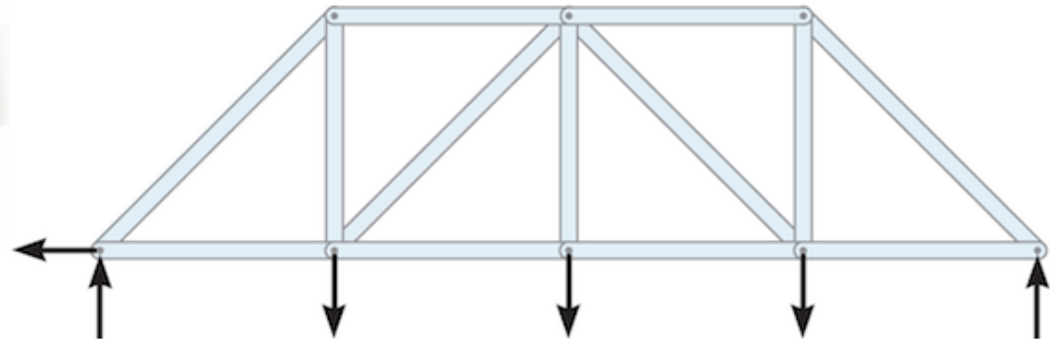
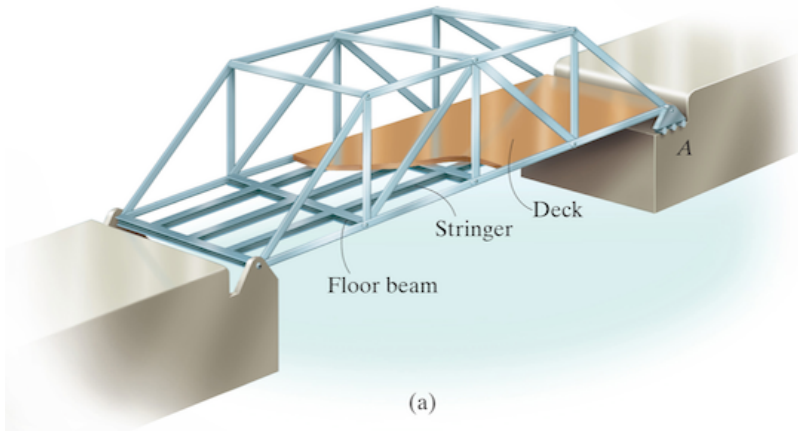


# Roof trusses



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

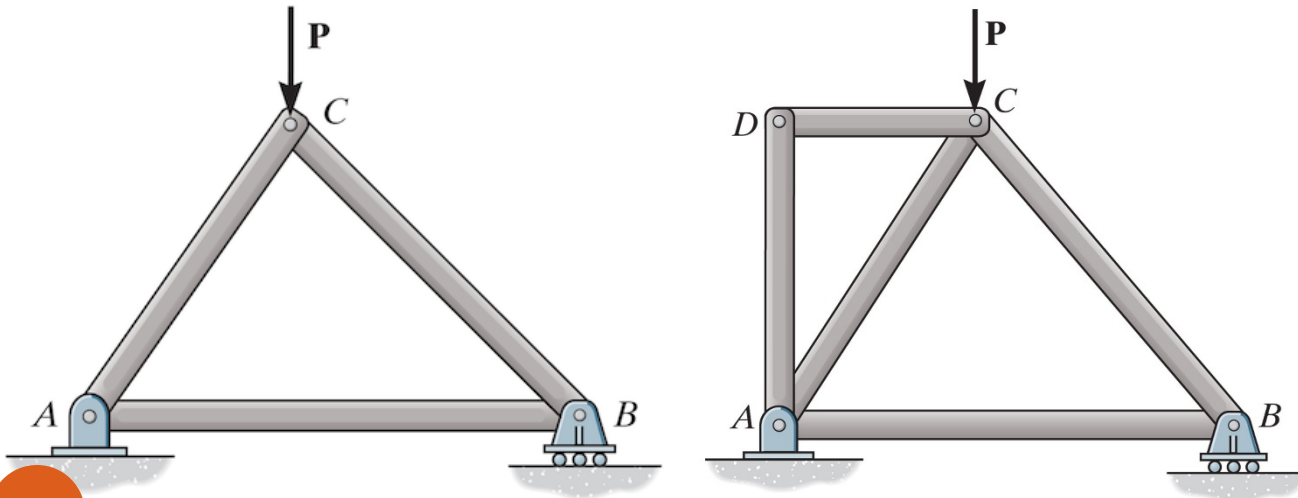
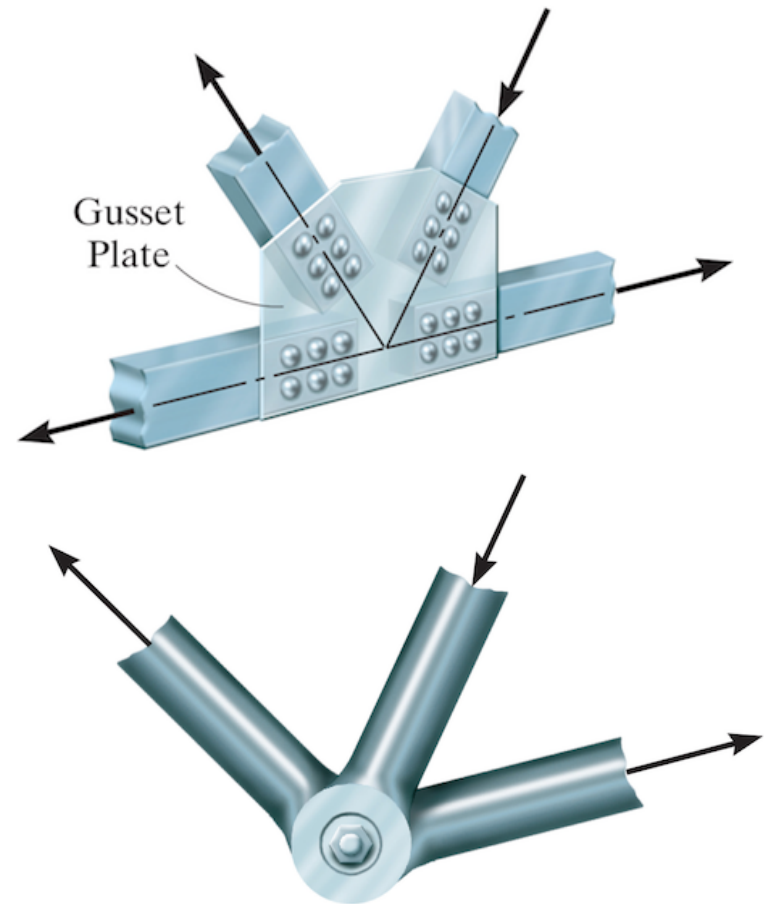
# Bridge trusses



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

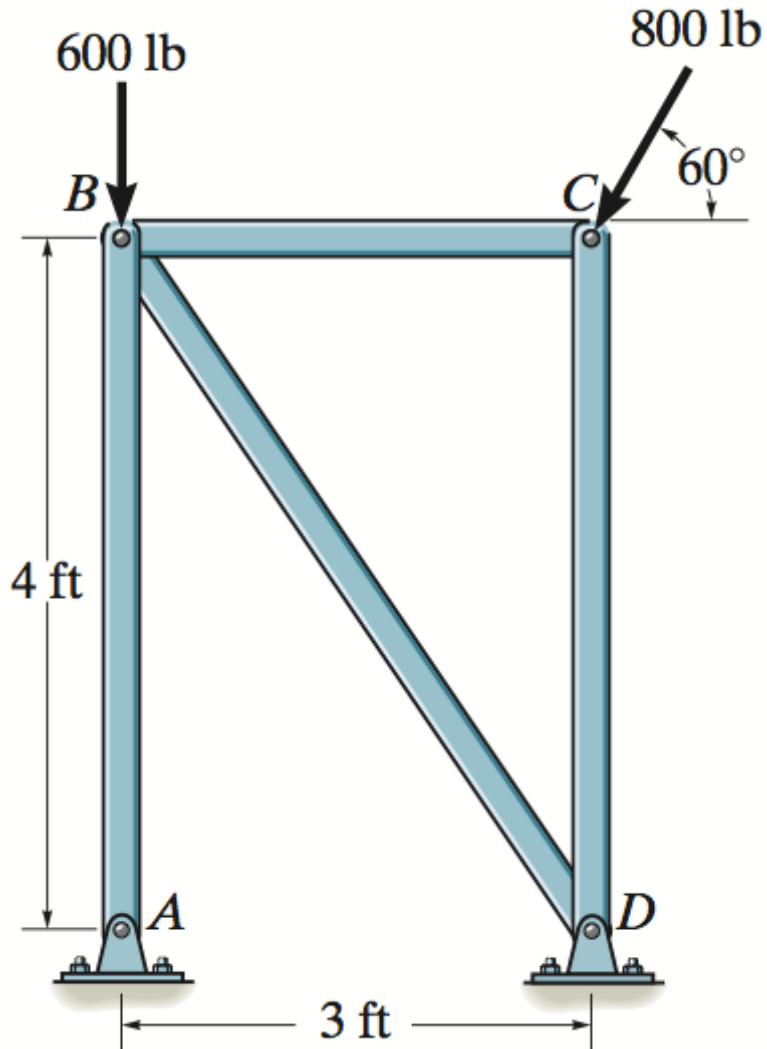


# Method of joints

- 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:**

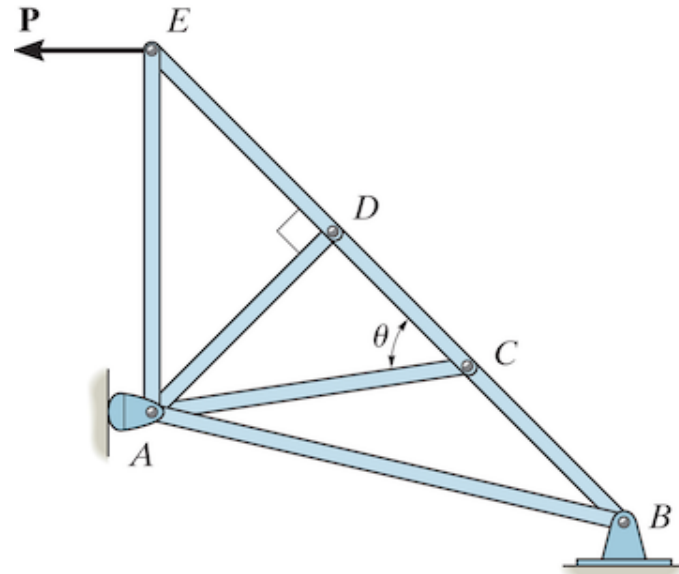
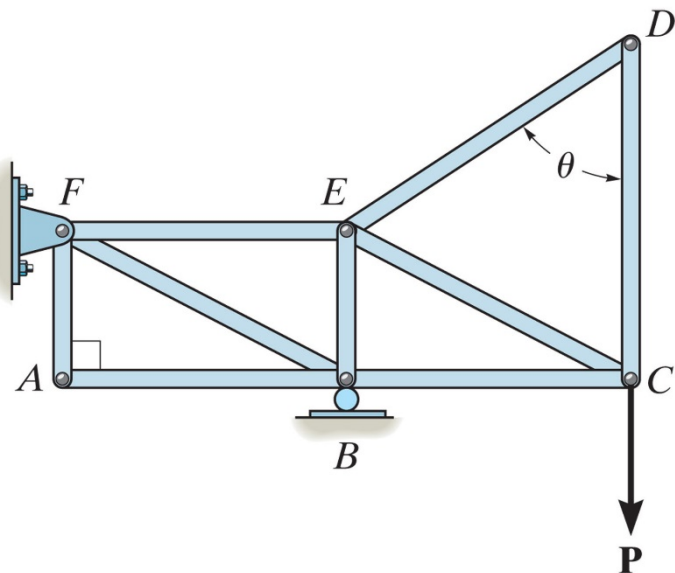




Find the forces in each member of the truss. Determine if members are in tension or compression.

# 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.



Identify all zero-force members in the truss.

