introduction to trusses
Truss Structures

- ancient (?) wood
  - Romans 500 B.C.
- Renaissance revival
- 1800’s analysis
- efficient
Truss Structures

• comprised of straight members
• geometry with triangles is stable
• loads applied only at pin joints
Truss Structures

- 2 force members
  - compression
  - tension

- 3 members connected by 3 joints

- 2 more members need 1 more joint

\[ b = 2n - 3 \]
Truss Structures

- statically determinate
- indeterminate
- unstable

(a) Determinate.

\[ b = 21 \]
\[ n = 12 \]
\[ 2(n) - 3 = 2(12) - 3 = 21 \]

(b) Indeterminate.

\[ b = 18 \]
\[ n = 10 \]
\[ b = 18 > 2(10) - 3 = 17 \] (Too many members)

(c) Unstable.

\[ b = 16 \]
\[ n = 10 \]
\[ b = 16 < 2(10) - 3 = 17 \] (Too few members—square panel is unstable)
Truss Analysis

- visualize compression and tension from deformed shape
Truss Analysis

- Method of Joints
- Graphical Methods
- Method of Sections

• all rely on equilibrium
  – of bodies
  – internal equilibrium
Method of Joints

- isolate each joint
- enforce equilibrium in $F_x$ and $F_y$
- can find all forces

- long
- easy to mess up
Joint Cases

- two bodies connected
Joint Cases

- three bodies with two in line
Joint Cases

- crossed