

Announcements

- Quiz 3 pick-up during office hours (Grainger 429)
 - Wednesday 4-9 pm (10/18)
 - Thursday 4-9 pm (10/19)

□ Upcoming deadlines:

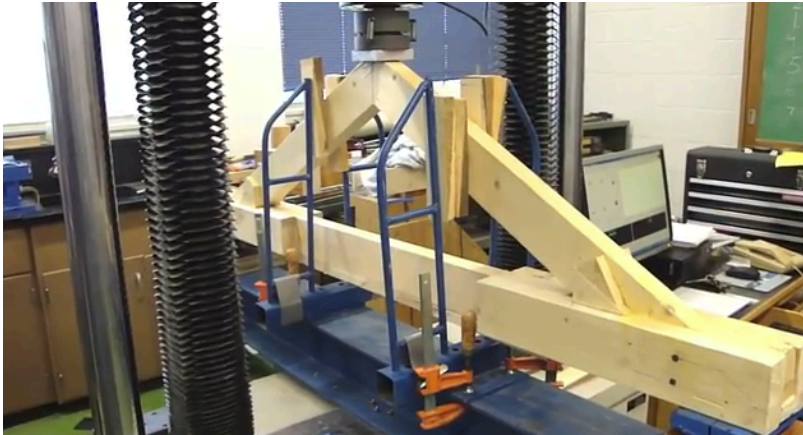
- Wednesday (10/18) – Today!
 - PL HW14
- Thursday (10/19)
 - ME HW15



imgur.com/bsFJm

Recap: Internal Loadings

Structural Design: need to know the loading acting within the member in order to be sure the material can resist this loading



Objective

- Determine the internal loadings in members using the method of sections

Internal Forces and Moment

Normal force (**N**):

Shear force (**V**):

Bending moment (**M**):

Sign conventions

Positive normal force

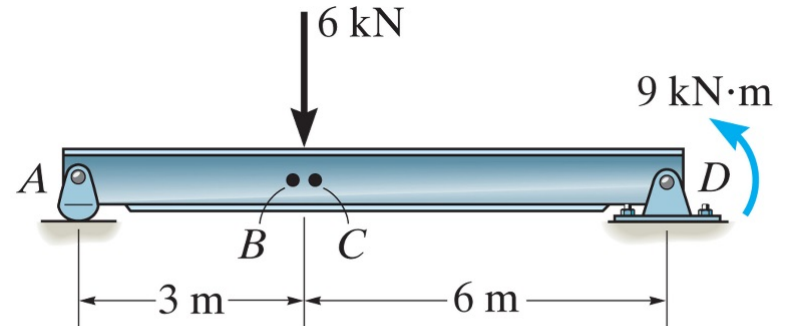
Positive shear force

Positive moment

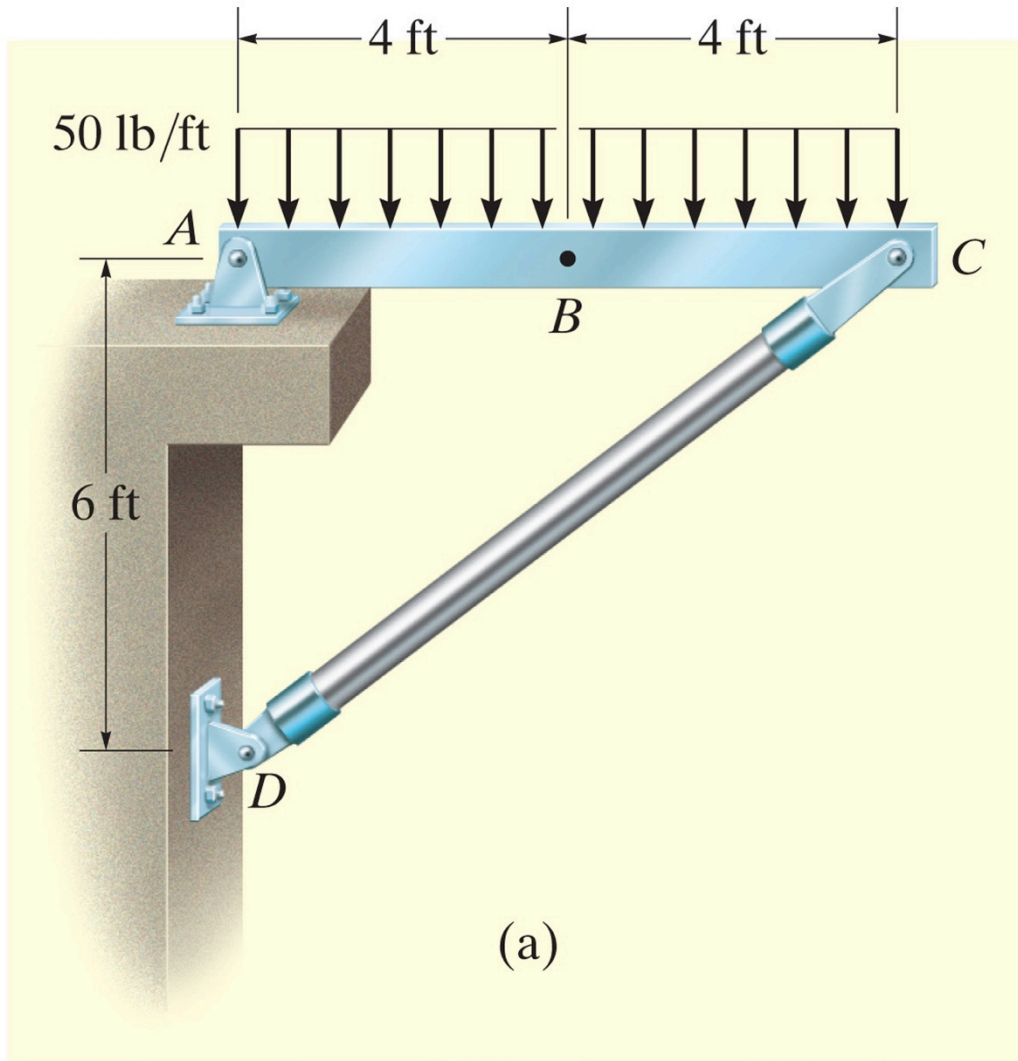
Procedure for analysis

1. Find support reactions (free-body diagram of entire structure)
2. Pass an imaginary section through the member
3. Draw a free-body diagram of the segment that has the least number of loads on it
4. Apply the equations of equilibrium

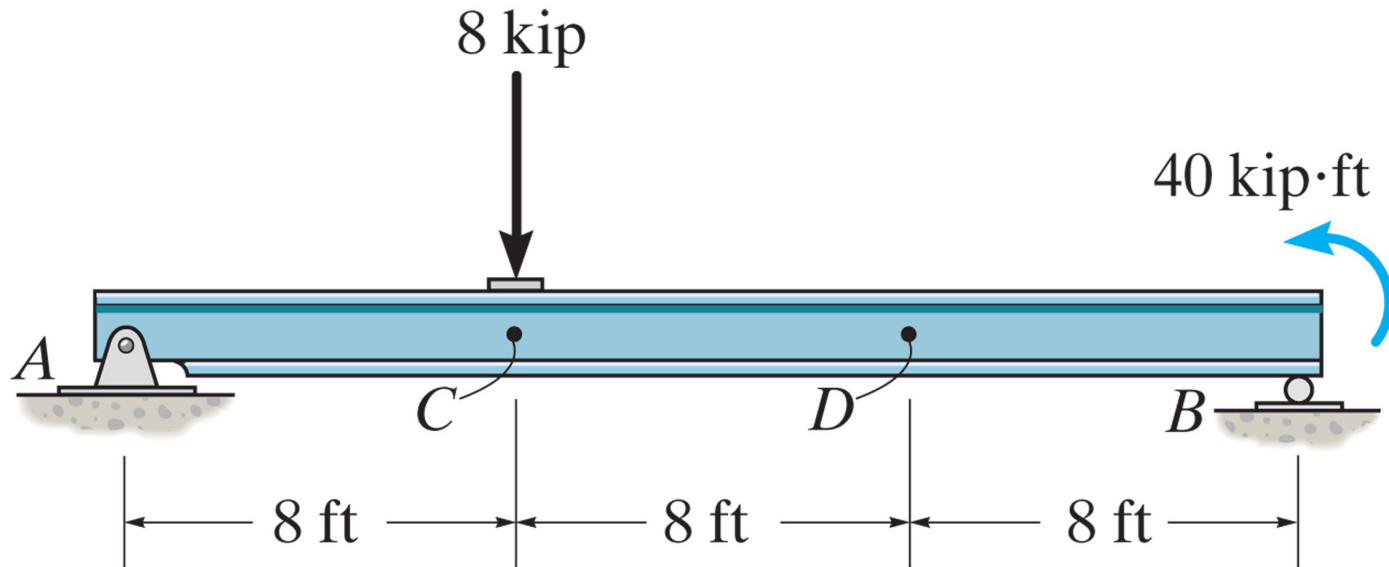
Example: Find the internal forces and moments at B (just to the left of P) and at C (just to the right of P)

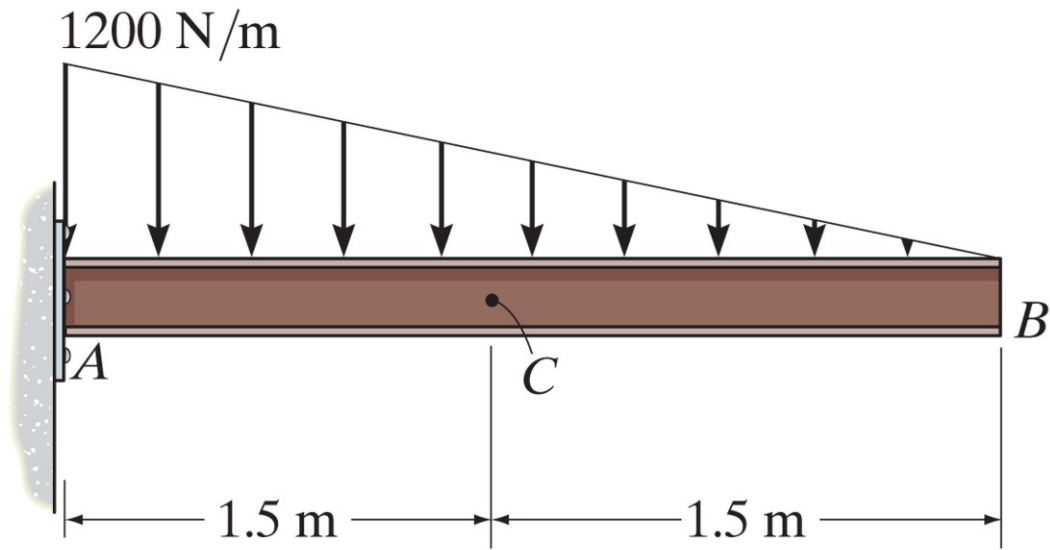


Determine the normal force, shear force, and bending moment at B .



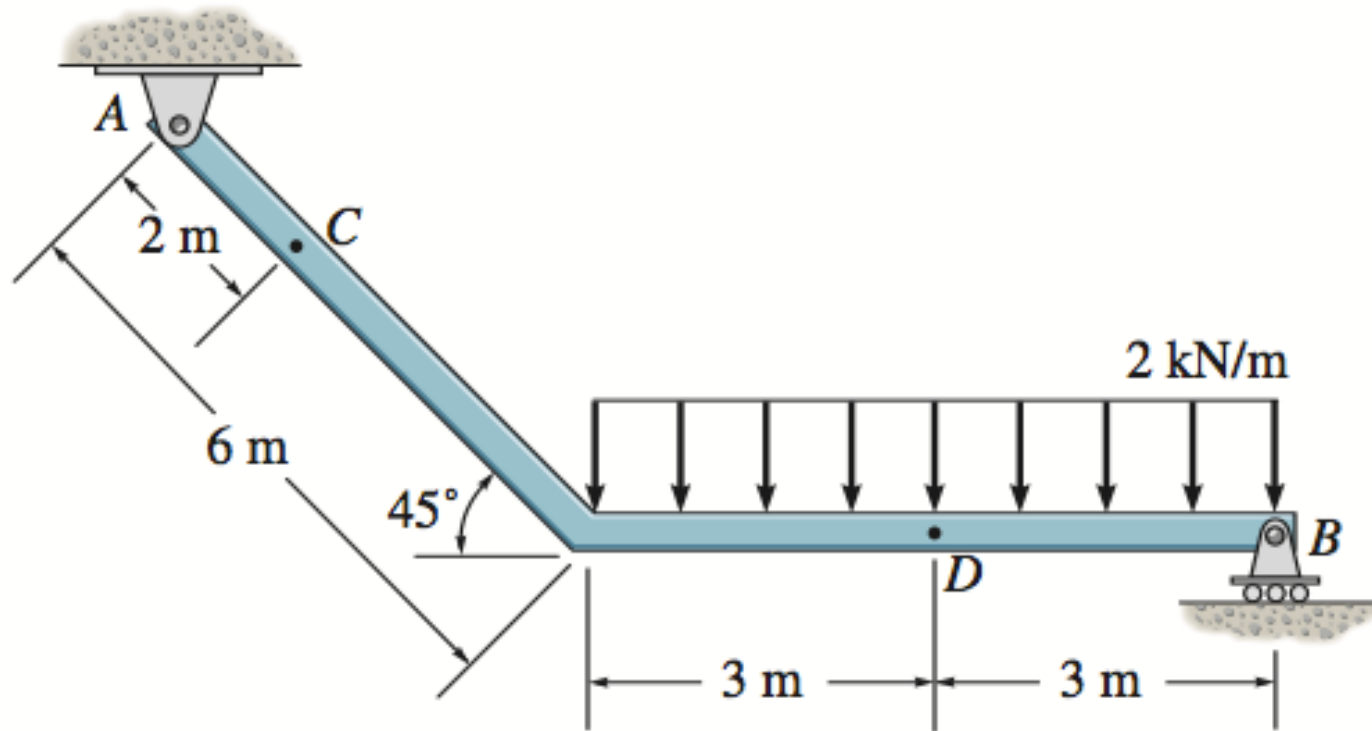
Determine the normal force, shear force, and bending moment at D .





Determine the normal force, shear force, and bending moment at C of the beam.

Determine the normal force, shear force, and bending moment at C .



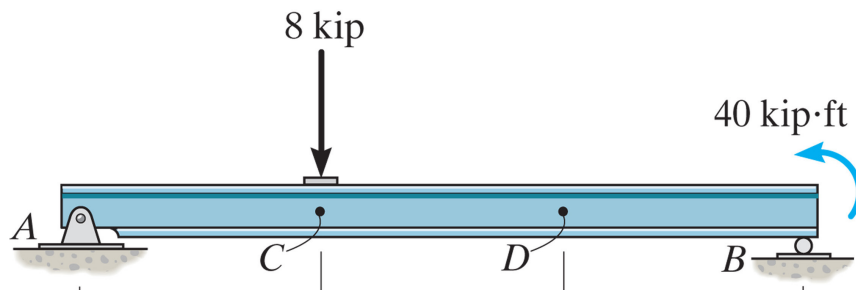
Shear and Moment Diagram

Beams: structural members designed to support loadings applied perpendicular to their axes.

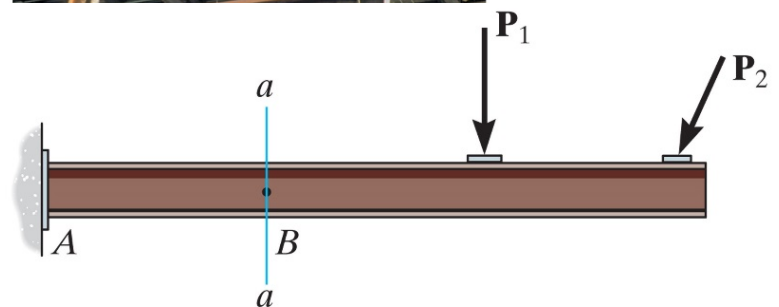
Simply supported beam



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Cantilever beam



Shear and Moment Diagram

Goal: provide detailed knowledge of the variations of internal loadings (V and M) throughout the beam

Procedure

1. Find support reactions (free-body diagram of entire structure)
2. Specify coordinates x
3. Divide the beam into regions
4. Draw FBD of a segment
5. Apply equations of equilibrium to derive V and M as functions of x

