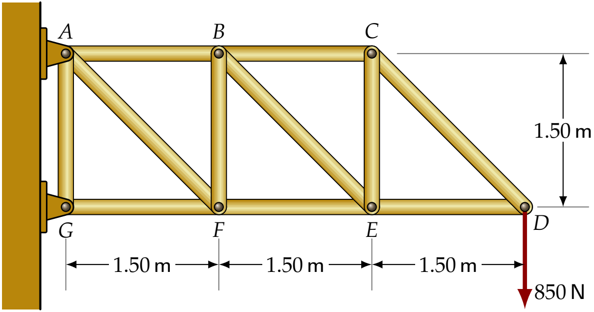
08 Method of Sections

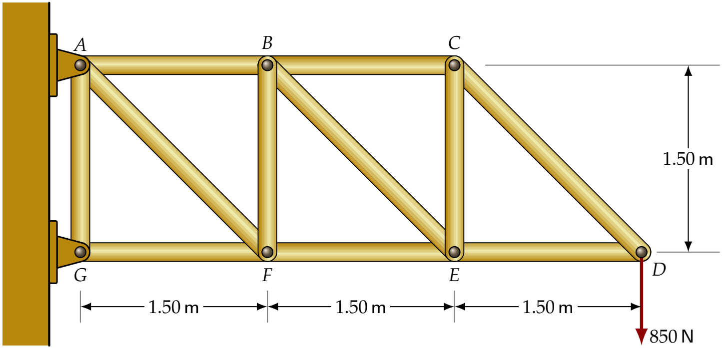
Engineering Statics

Updated on: October 20, 2025

Example 1

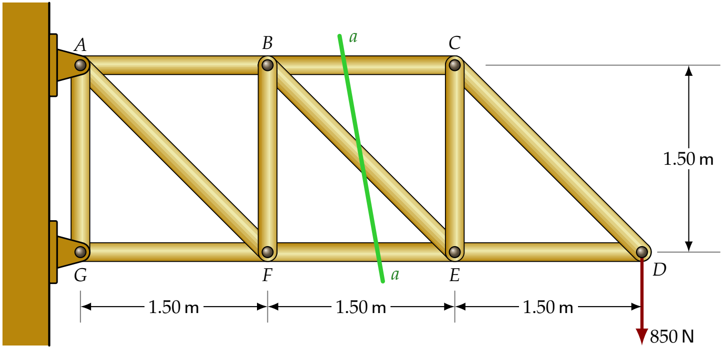


Use the method of sections to determine the internal forces in members BC, CH and GH.



The Method of Sections

- The method of sections technique is widely used in engineering.



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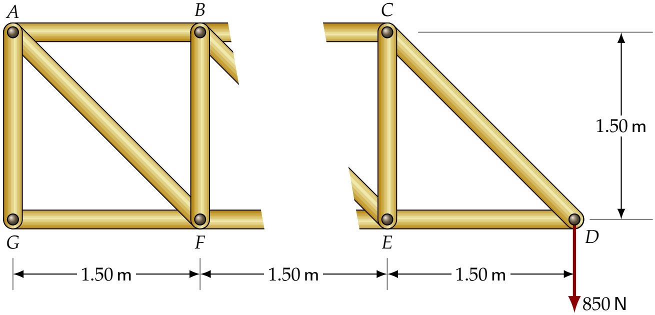
- It involves drawing a section $a-a$ through a structure or member.



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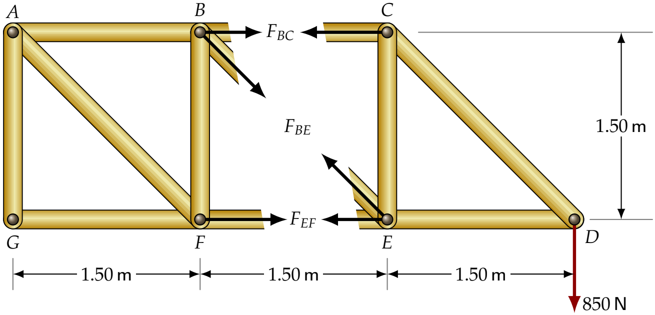
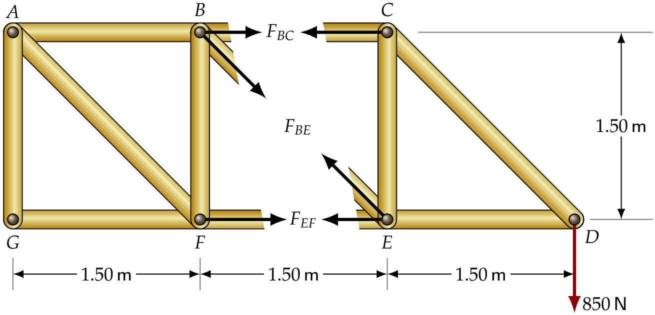
- Then the segments on each side of the section are also be in equilibrium.



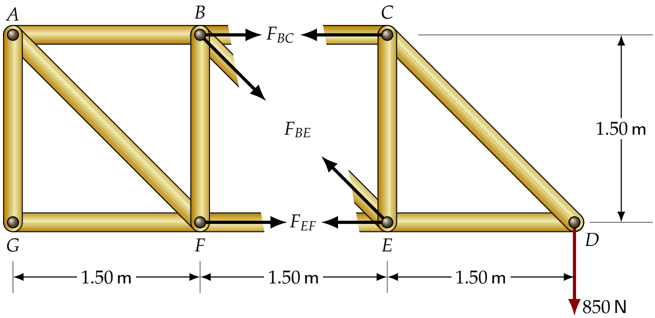
The Method of Sections

- The method of sections technique is widely used in engineering.
- It involves drawing a section $a{-}a$ through a structure or member.
- Then the segments on each side of the section are also be in equilibrium.
- The section 'exposes' the internal forces in cut members.



The Method of Sections

- We are free to place our section wherever is most convenient.



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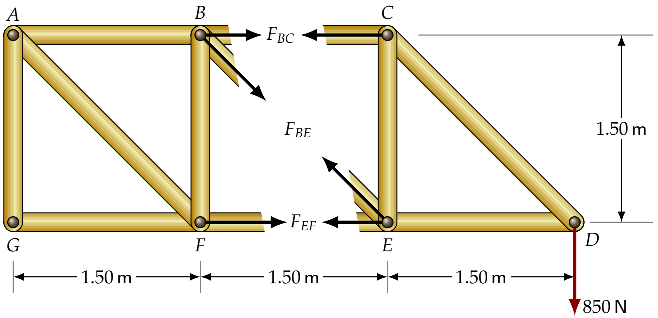
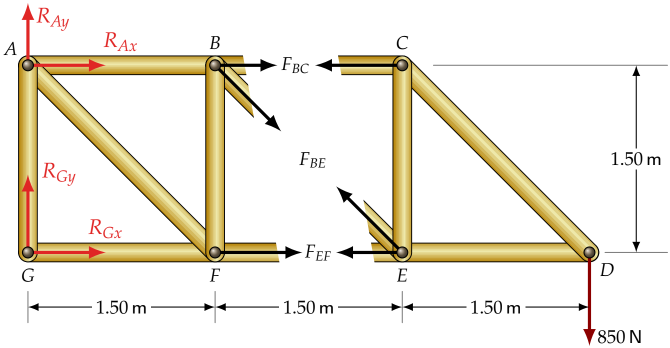
- We are free to place our section wherever is most convenient.
- We generally look for a section that 'cuts' the members we need.



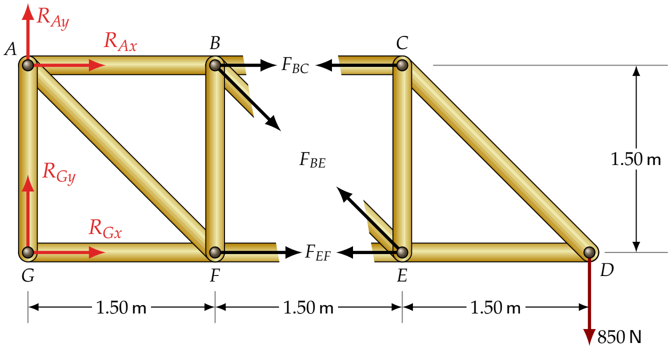
The Method of Sections

- We are free to place our section wherever is most convenient.
- We generally look for a section that 'cuts' the members we need.
- Then we choose whichever is the easier of the two segments to analyze.



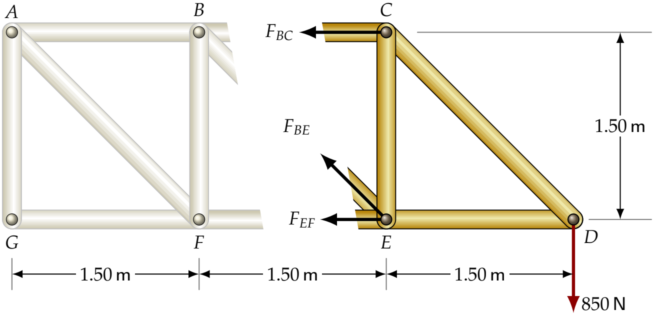
Example 1: Solution

- The right segment is the easiest to analyze since it only contains a single external force.



Example 1: Solution

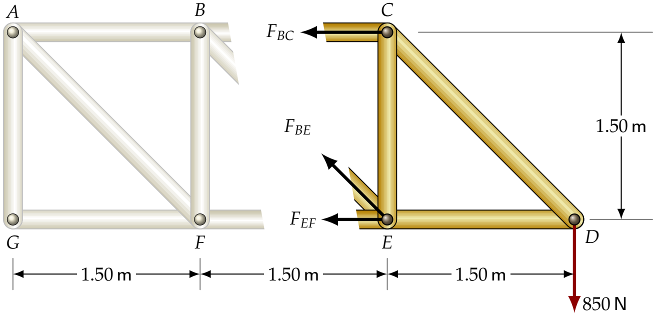
- The right segment is the easiest to analyze since it only contains a single external force.
- Note that in this case we only have the one choice since the reactions at A and G are '**statically indeterminate**.' (That is, we can't determine them using only the equilibrium equations. Why is this?)



Example 1: Solution

$$\Sigma M_E = F_{BC} \cdot (1.50\,\text{m}) - (850\,\text{N}) \cdot (1.50\,\text{m}) = 0$$

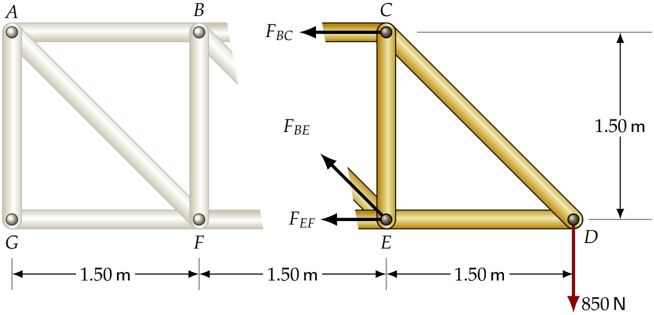
$$\Rightarrow F_{BC} = 850\,\text{N}$$



Example 1: Solution

$$\Sigma M_B = -F_{EF} \cdot (1.50\,\text{m}) - (850\,\text{N}) \cdot (3.00\,\text{m}) = 0$$

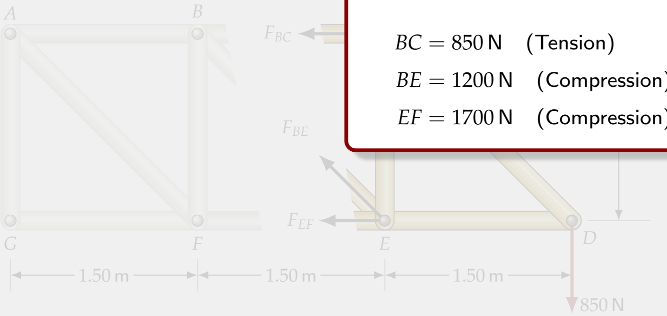
$$\Rightarrow F_{EF} = -1700\,\text{N}$$



Example 1: Solution

$$\Sigma F_y = -F_{BE} \cdot \sin 45^\circ - 850\,\text{N} = 0$$

$$\Rightarrow F_{BE} = -1202.1\,\text{N}$$



The Answers

$BC = 850\,\text{N}$ (Tension)

$BE = 1200\,\text{N}$ (Compression)

$EF = 1700\,\text{N}$ (Compression)

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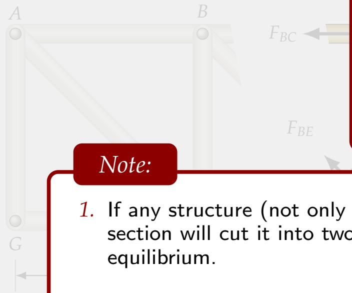

Example

The Answers

$$BC = 850\,\mathrm{N} \quad \text{(Tension)}$$
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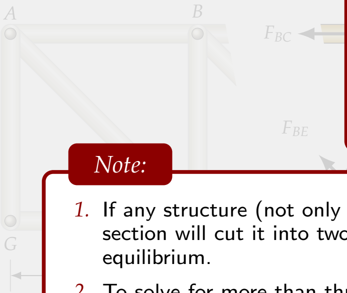
Note:

1. If any structure (not only a truss) is in equilibrium, then any section will cut it into two segments, each of which is itself in equilibrium.



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1. If any structure (not only a truss) is in equilibrium, then any section will cut it into two segments, each of which is itself in equilibrium.
2. To solve for more than three truss members, it is necessary to repeat the method of sections using a different section (one that cuts the additional members required by the problem).

Example

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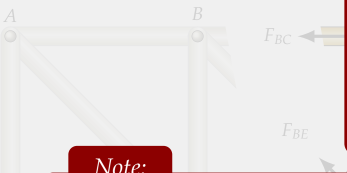
3. We can use all three equilibrium equations $\Sigma M = 0$, $\Sigma F_x = 0$ and $\Sigma F_y = 0$ but it is often less work to take moments about conveniently located joints.



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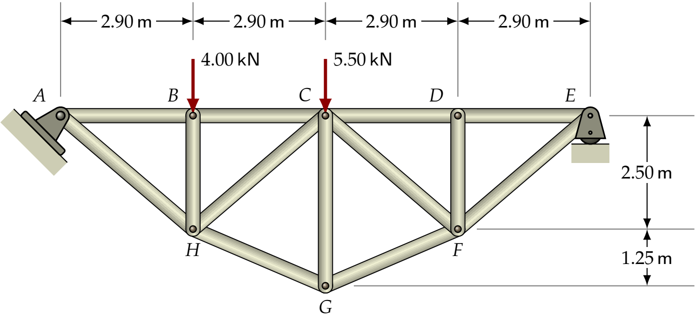
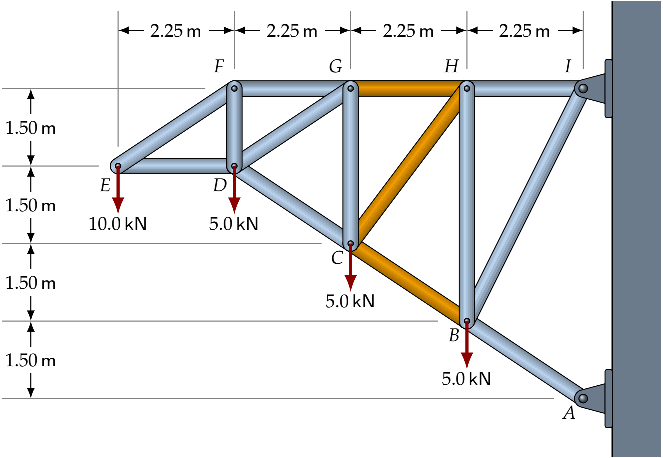
4. It is not necessary to take moments using joints in the 'active' segment. Moments can be taken about anywhere on the truss – or even anywhere on the plane in which the truss is situated. If a structure is in equilibrium, its moments about any point in the plane still sum to zero.

Example 2



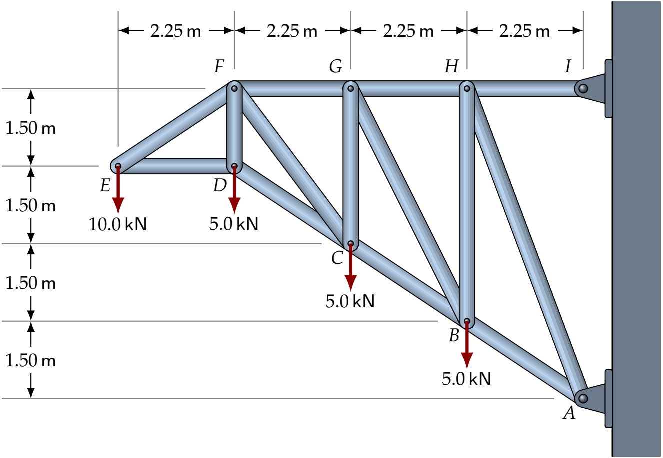
Use the method of sections to determine the internal forces in members BC, CH and GH.

Example 3



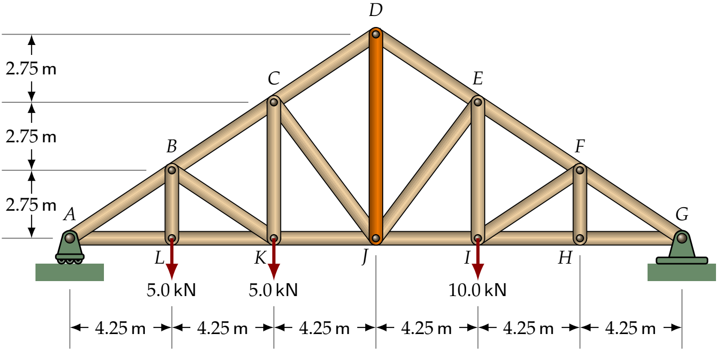
Use the method of sections to determine the internal forces in members BC, CH and GH.

Exercise 1



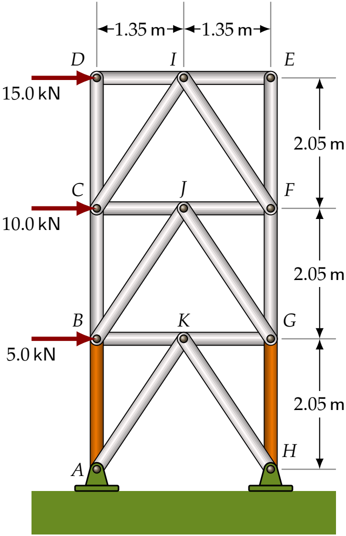
An alternative design is being considered for the previous example. Use the method of sections to determine the internal forces in members BC, BG and GH. How do they compare to the previous results?

Example 4



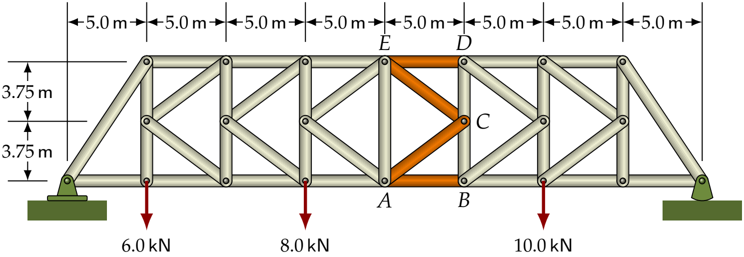
Determine the internal force in DJ.

Example 5



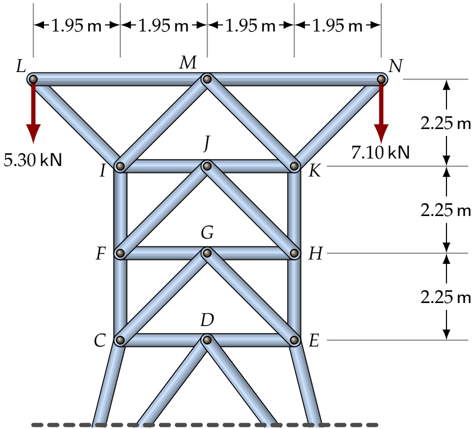
Determine the forces in members AB and GH.

Example 6



Use the method of sections to determine the internal forces in members AB, AC, CE and DE.

Exercise 2



Determine the forces in members CF, CG,EG and EH.