Analysis of Structures
(*Initial Concept of Internal Force*)

Vector Mechanics-Chapter 6

Background

So far we have analysed *equilibrium of a single rigid body*. Forces were *external* to the rigid body.

Present focus:

Equilibrium of *structure* made of several connected parts (each is rigid);

We need to determine the *external* forces acting on the structure AND the forces that hold together different members of the structure.

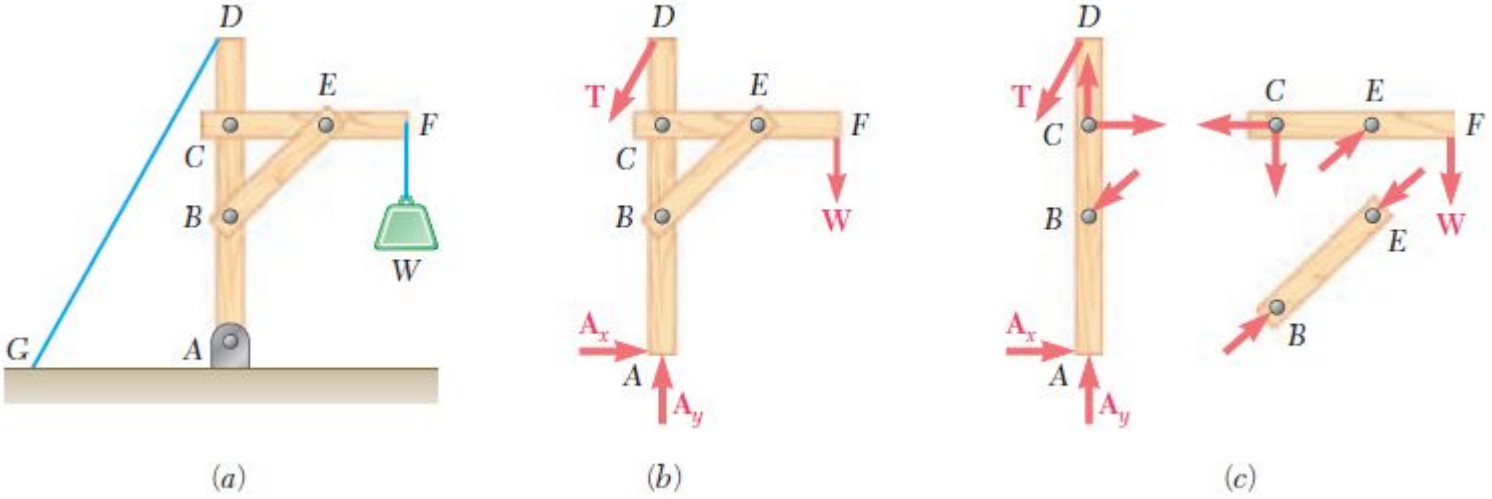
The forces that hold together the structure are the "*internal forces*" from the point of view of the structure as a whole.

External and internal forces

External force: Action of other bodies on the rigid body under study

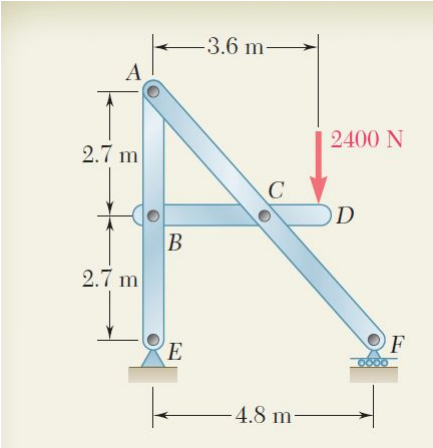
Internal force: The force that hold together particles forming the rigid body

Illustration through example

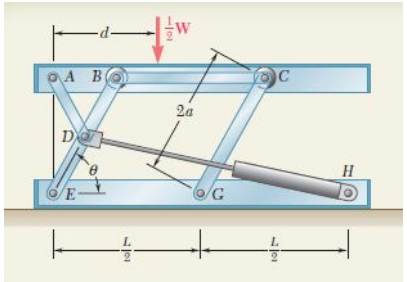


Types of structures

Trusses

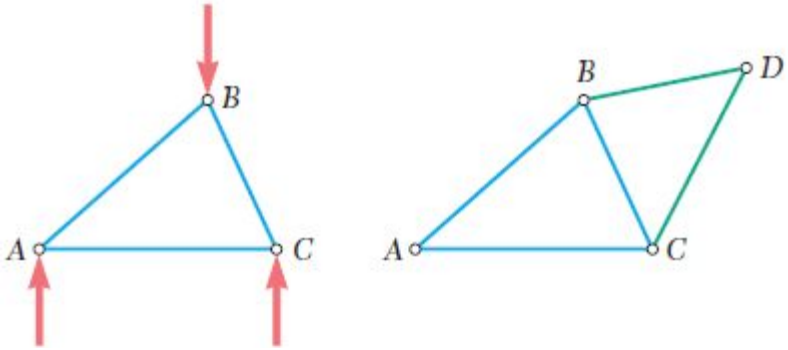


Frames



Machines

Trusses

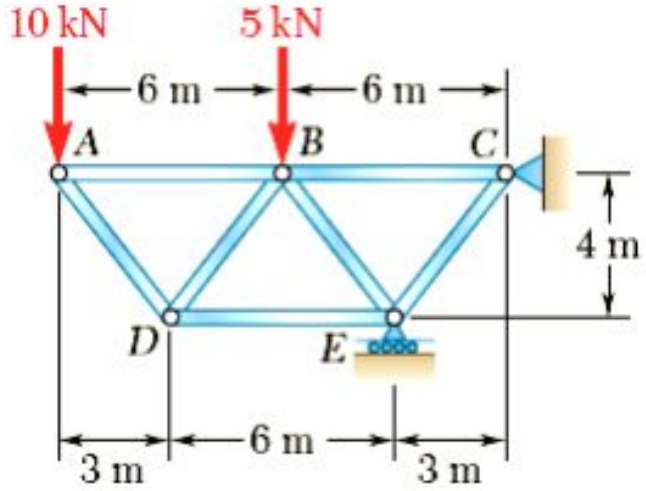


Straight members connected at joints located at the ends of each member

Two force members acted upon by two equal and opposite forces directed along the member

Structure ABC is an example of a rigid truss and ABDC is an example of a simple truss

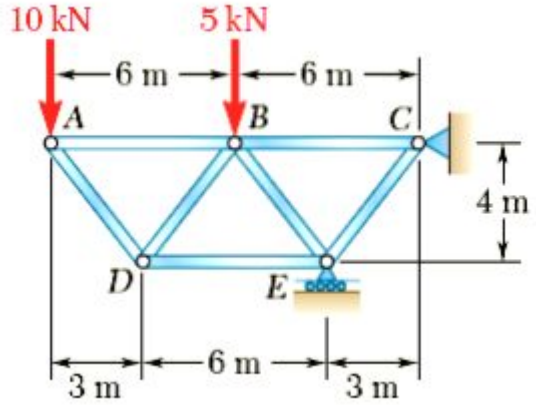
Analysis through example



Determine the forces in *each member*

Analysis through example

So far...



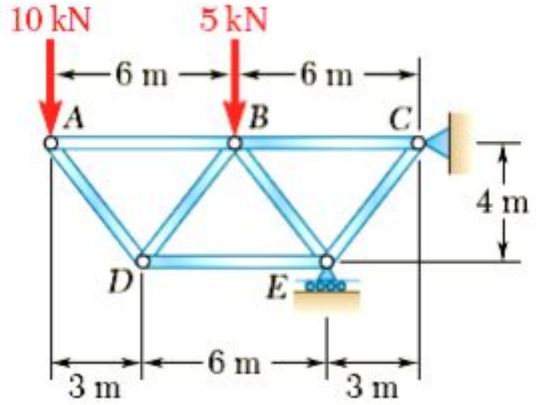
We have determined reactions at E and C

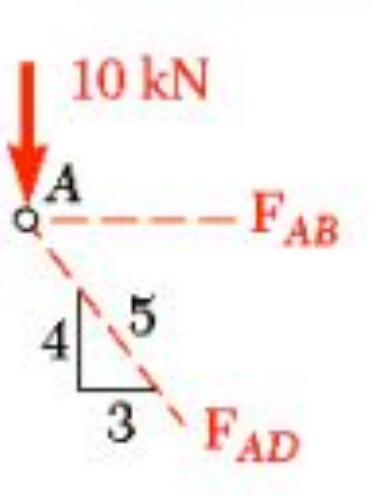
$$\Sigma \mathbf{F} = 0 \qquad \Sigma \mathbf{M_c} = 0$$

Analysis through example

At present...

We need to determine the forces at each member





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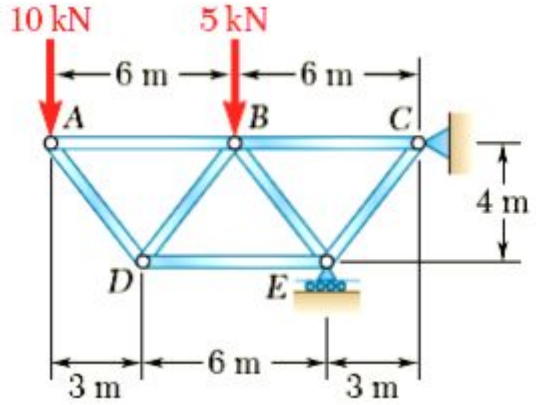

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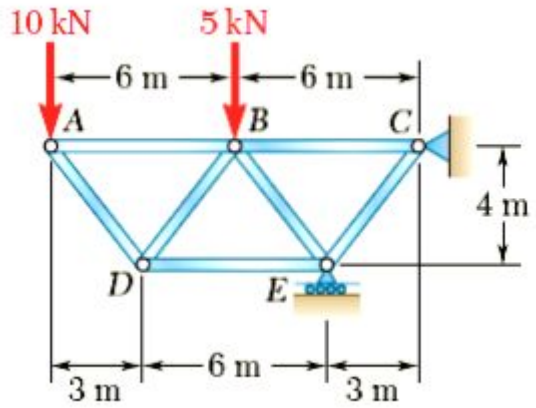

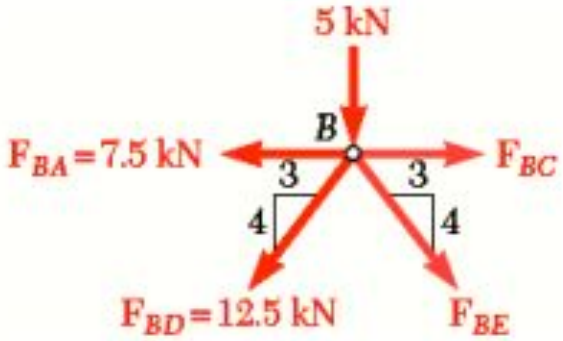

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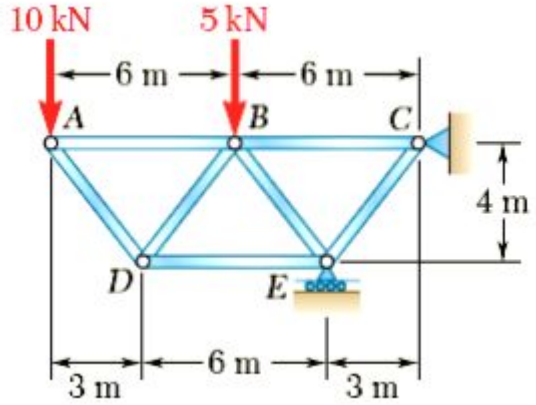
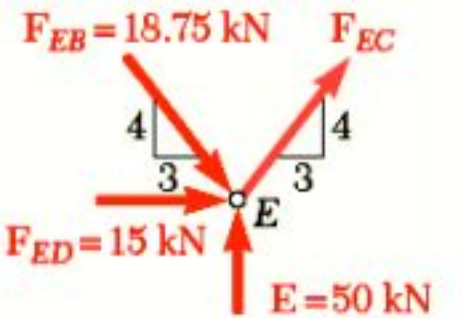
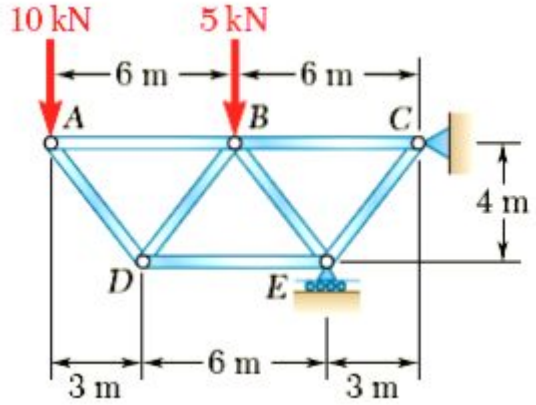
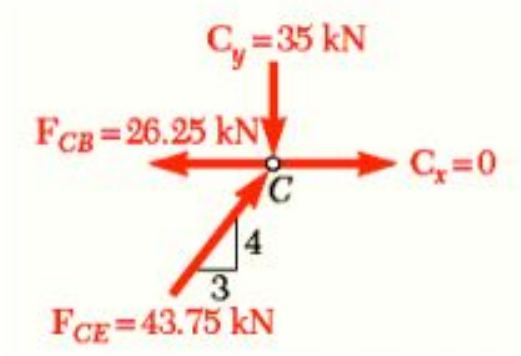




Analysis through example





Method of joints was explained through example