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THEORY OF STRUCTURES
CHAPTER 4 : TRUSSES (METHOD OF SECTION)
PART 2

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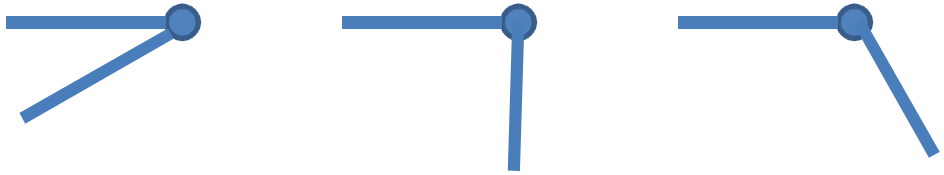
Chapter 4 : Part 2 – Method of Section

- Aims
  - Determine internal forces in truss member
- Expected Outcomes :
  - Able to analyse trusses using method of section
- References
  - Mechanics of Materials, R.C. Hibbeler, 7th Edition, Prentice Hall
  - Structural Analysis, Hibbeler, 7th Edition, Prentice Hall
  - Structural Analysis, SI Edition by Aslam Kassimali,Cengage Learning
  - Structural Analysis, Coates, Coatie and Kong
  - Structural Analysis - A Classical and Matrix Approach, Jack C. McCormac and James K. Nelson, Jr., 4th Edition, John Wiley

Zero force member

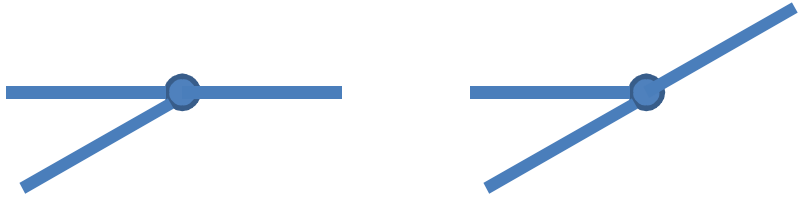
CASE 1

When two members meet at an unloaded joint



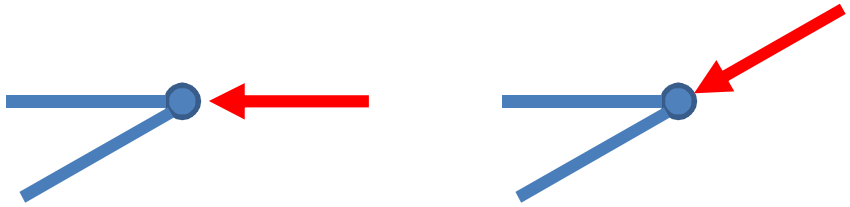
CASE 2

When three members meet at an unloaded joint, where two are in line

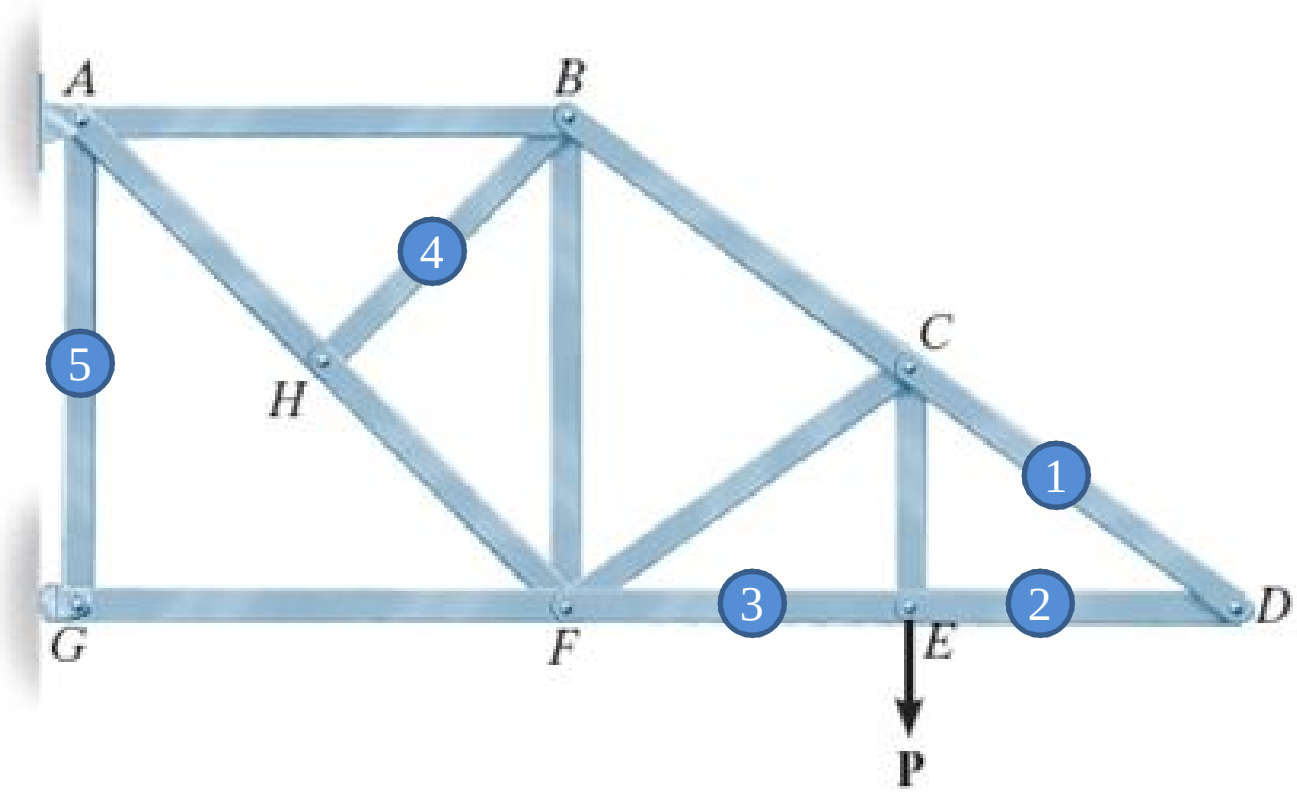


CASE 3

When two members meet at a loaded joint, where the loading is in line with one of the members

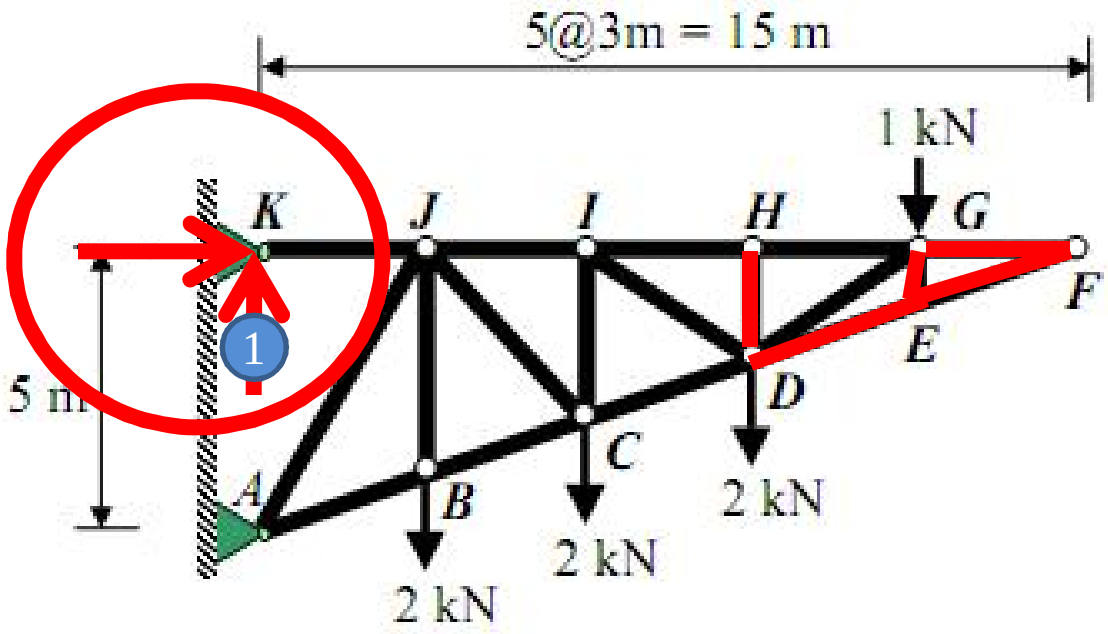


Find zero force member...



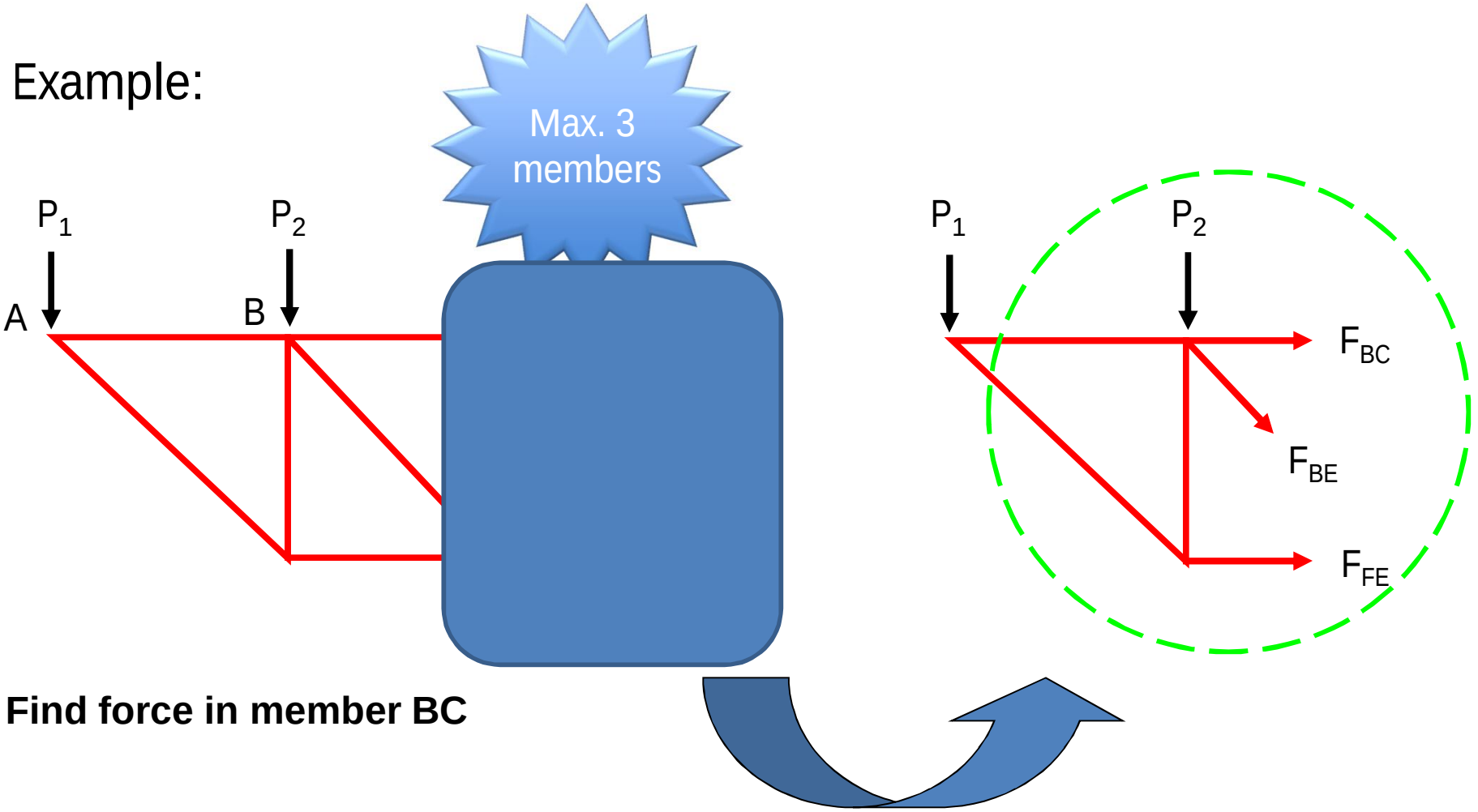
(a)

Find zero force member...



METHOD OF SECTIONS

- Example:

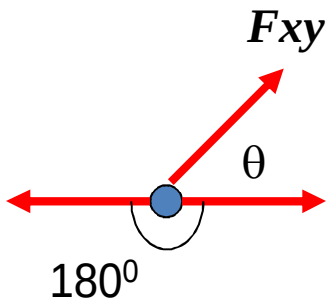


Find force in member BC

FBD

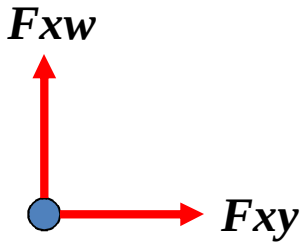
Fast Track Solutions

- 1st Condition



At any θ, NO external force acting at the joint then $Fxy = 0$

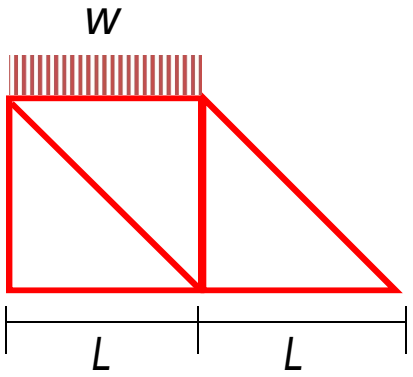
- 2nd Condition

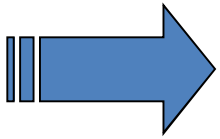


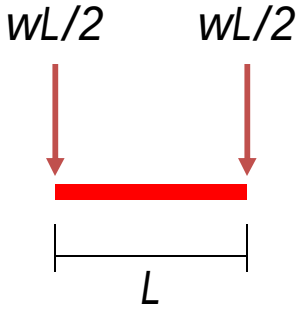
When 2 members perpendicular at 90^0, NO external force acting at joint the $Fxw = Fyz = 0$

Load Conditions

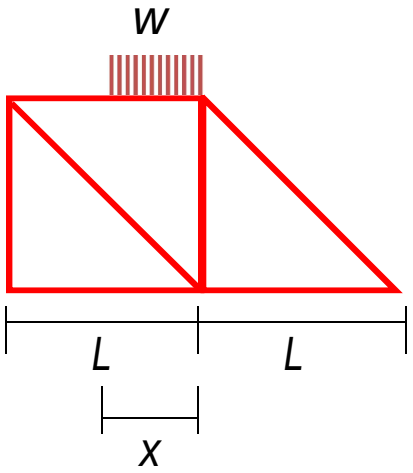
1

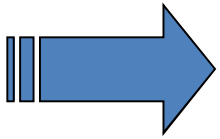


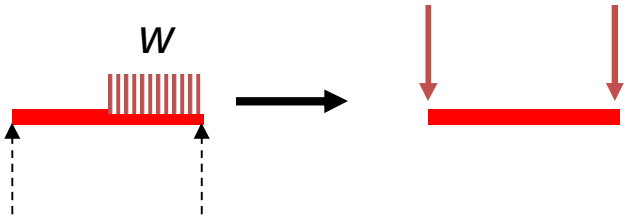




2

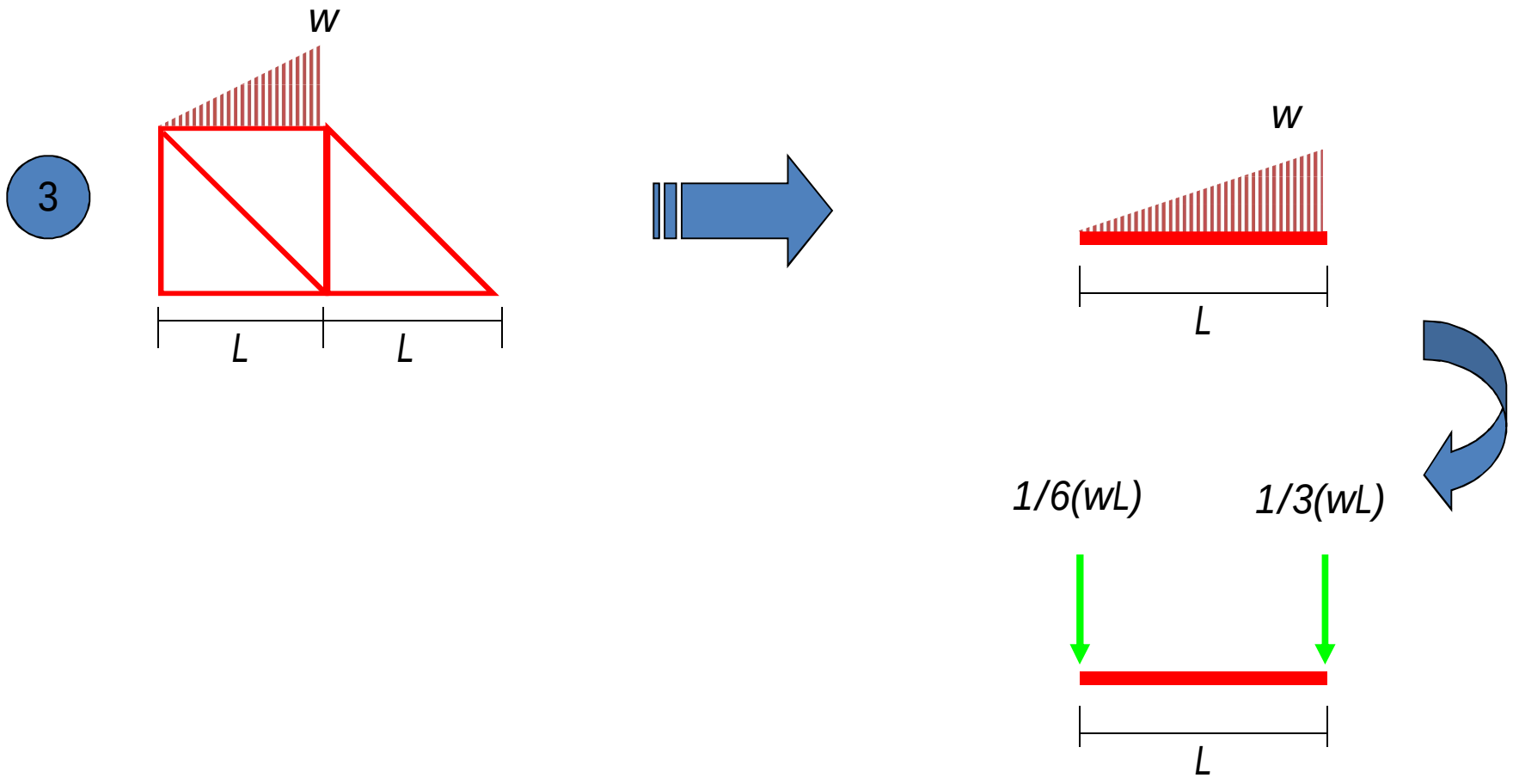






Used equation of equilibrium

Load Conditions



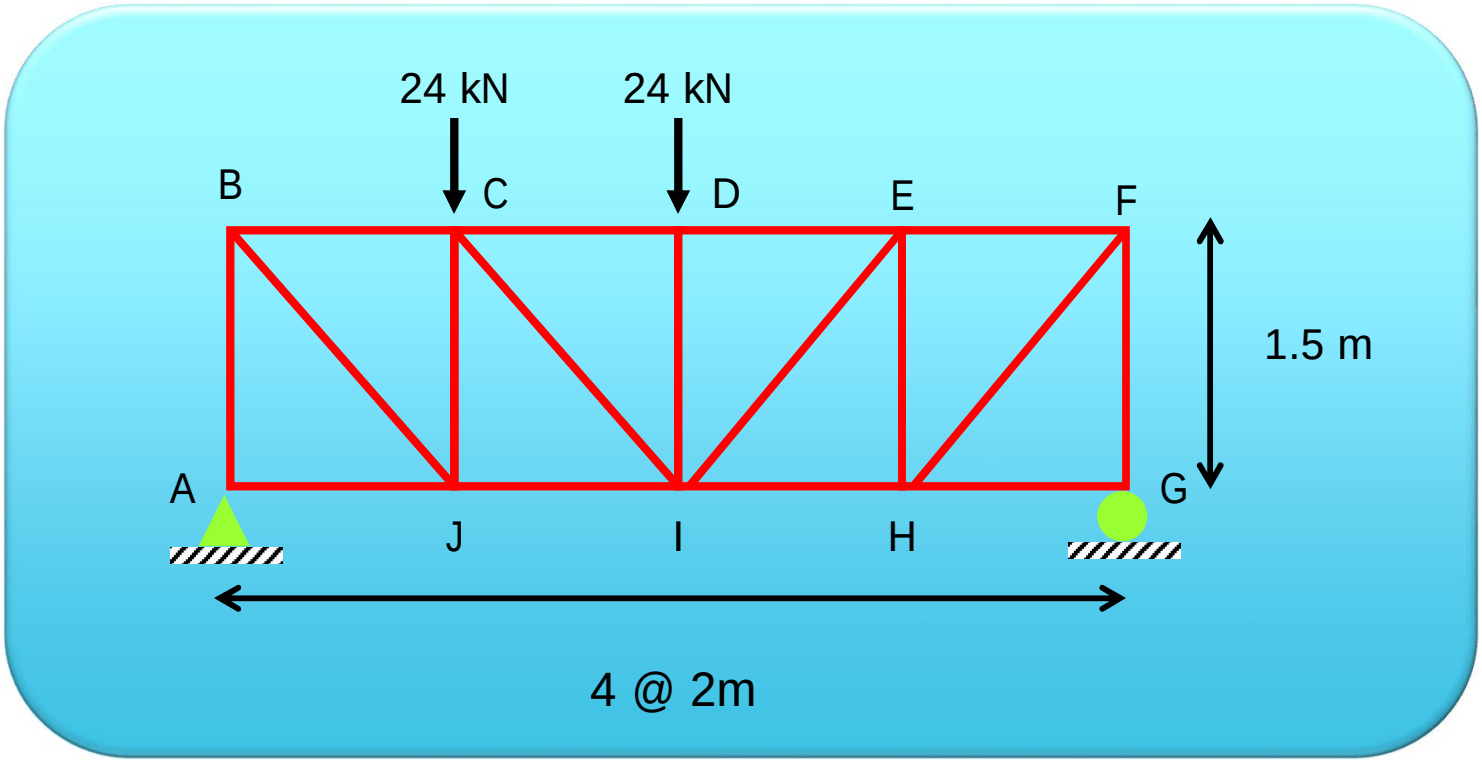
METHOD OF SECTIONS

Simple guidelines for analysis;

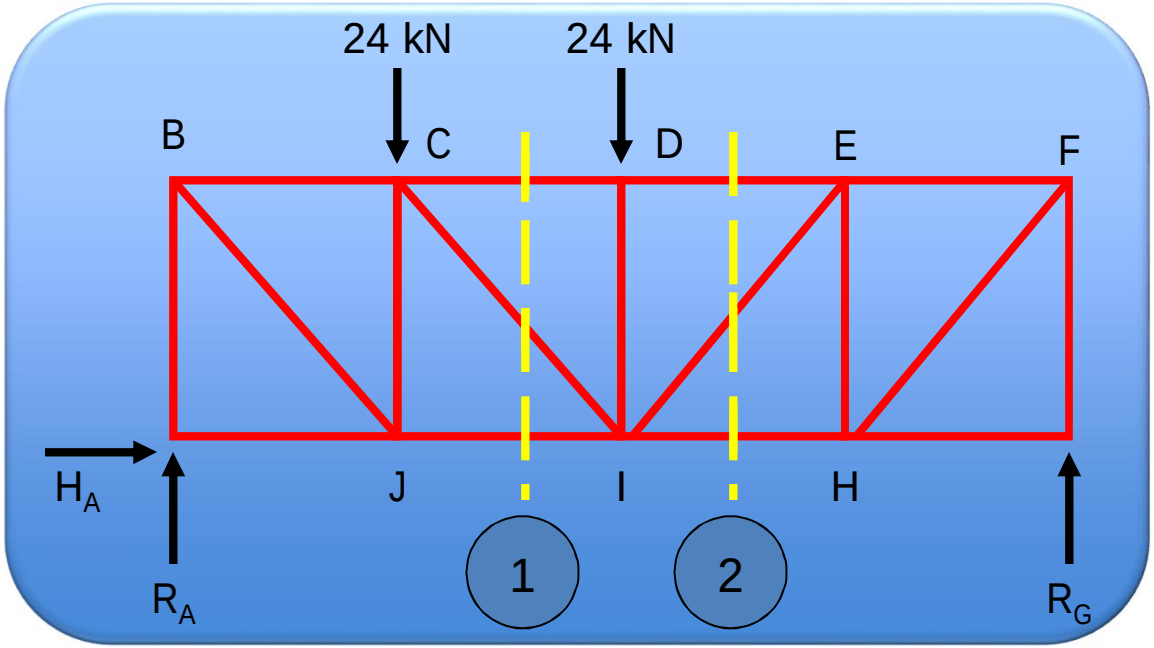
1. Pass a section through a maximum of three members, one of which is desired member (divide the truss into two completely separate parts)
2. For one part of the truss only, take moment about the point where the two members intersect
3. Solve for the member force
4. Solve the other two unknowns

EXAMPLE 1

Using method of sections, determine the force in members identified (CD, CI, EI and HI) for the trusses shown



Free Body Diagram (FBD)



Find Reactions:

$\sum M_A = 0$ (clockwise +ve)

$= 24(2) + 24(4) - R_G(8)$

$R_G =$ **18 kN**

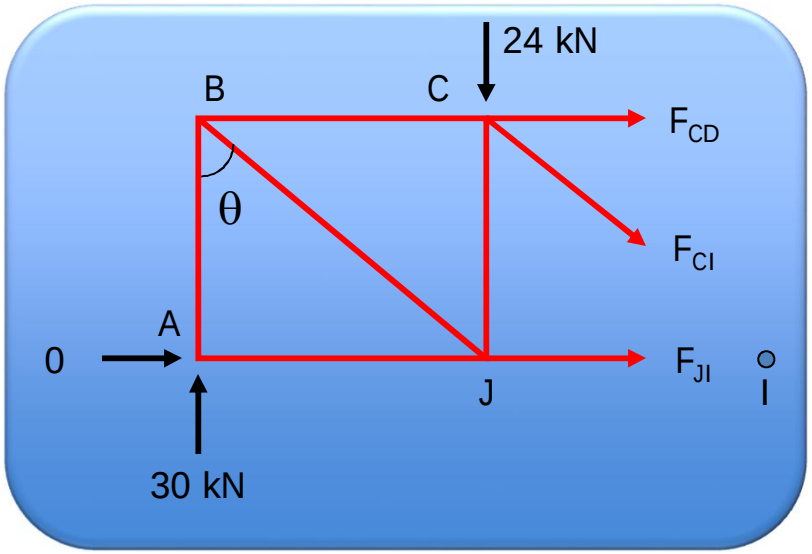
$\sum F_Y = 0$ (upward +ve)

$= R_A + R_G - 24 - 24$

$= R_A + 18 - 48$

$R_A =$ **30 kN**

$\sum F_X = 0 = H_A$



tan θ = 2 / 1.5
= 53.13⁰

$\sum M_I = 0$

$= F_{CD}(1.5) - 24(2) + 30(4)$

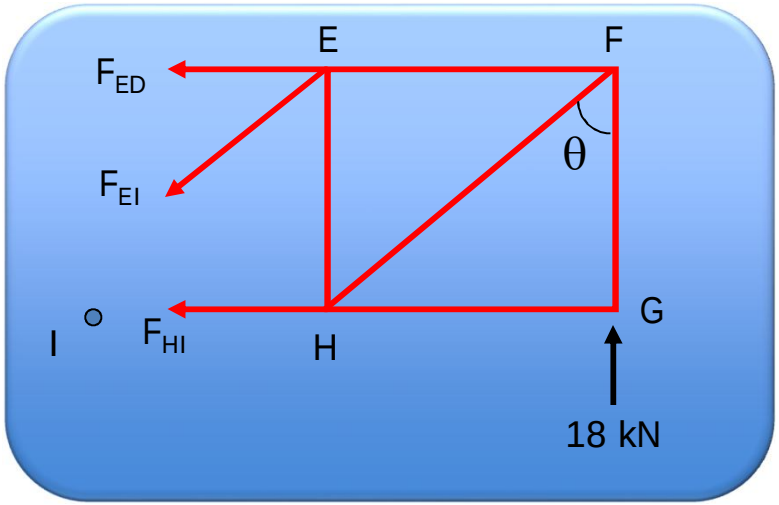
$F_{CD} =$ **-48 kN**

$\sum F_y = 0$

$= 30 - 24 - F_{CI} \cos 53.13$

$F_{CI} =$ **10 kN**

Consider RHS and FBD:



$\sum M_E = 0$

$= F_{HI}(1.5) - 24(2)$

$F_{HI} =$ **24 kN**

$\sum F_y = 0$

$= -F_{EI} \cos 53.13 + 18$

$F_{EI} =$ **30 kN**

Summary of results:

Member	Force (kN)
CD	-- 48
CI	+ 10
EI	+ 30
HI	24

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THANKS

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