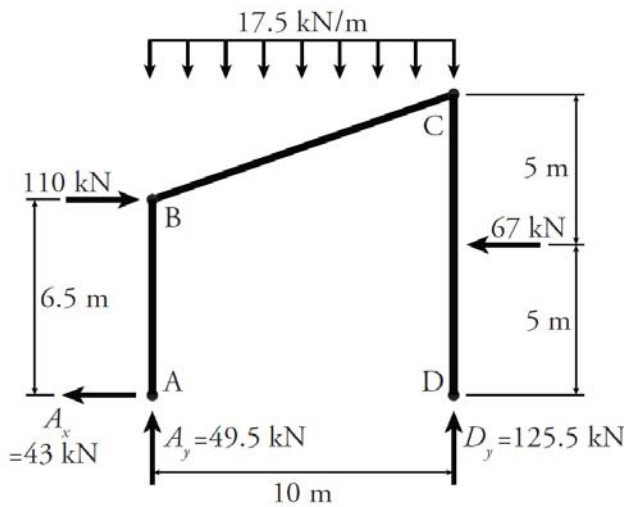


Carleton University Department of Civil and Environmental Engineering
CIVE 3203: INTRODUCTION TO STRUCTURAL ANALYSIS
 In-Class Assignment #5

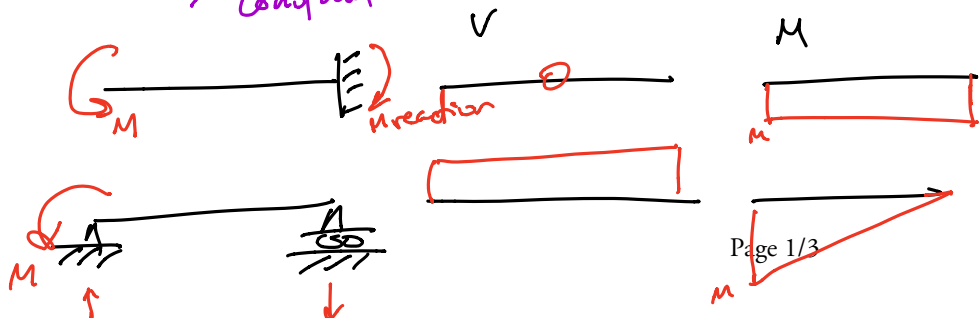
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In this assignment, we will be working on developing the shear and moment diagrams for the determinate frame shown below.



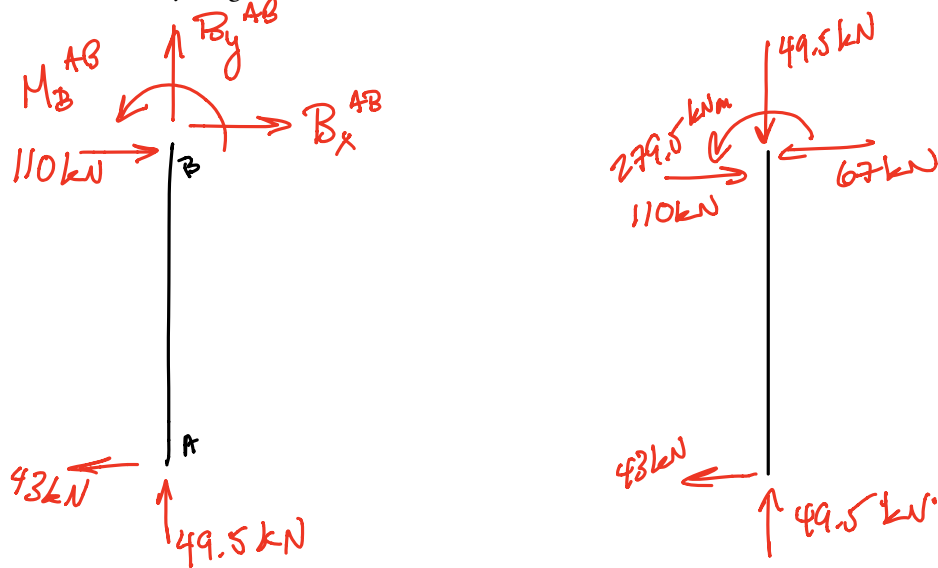
1. What are the resulting shapes of the shear and moment diagrams for the following loading distributions:

Loading Type	Shear Diagram Shape	Moment Diagram Shape
Point Load	Constant	Linear
Uniformly-Distributed Load <i>constant</i>	<i>Linear</i>	<i>Parabolic</i>
Triangular-Distributed Load <i>linear</i>	<i>Parabolic</i>	<i>Cubic</i>
Trapezoidally-Distributed Load	<i>Parabolic</i>	<i>Cubic</i>
Point Moment	<i>Zero / Constant</i>	<i>Constant / Linear</i>



2. In this structure, the 17.5 kN/m load is distributed along the horizontal projection, what could this loading represent? (PHONE POLL In-Class 5A)

3. Draw a free body diagram of member AB, show the unknown forces at the cut and include the 110 kN point load on this free body diagram.

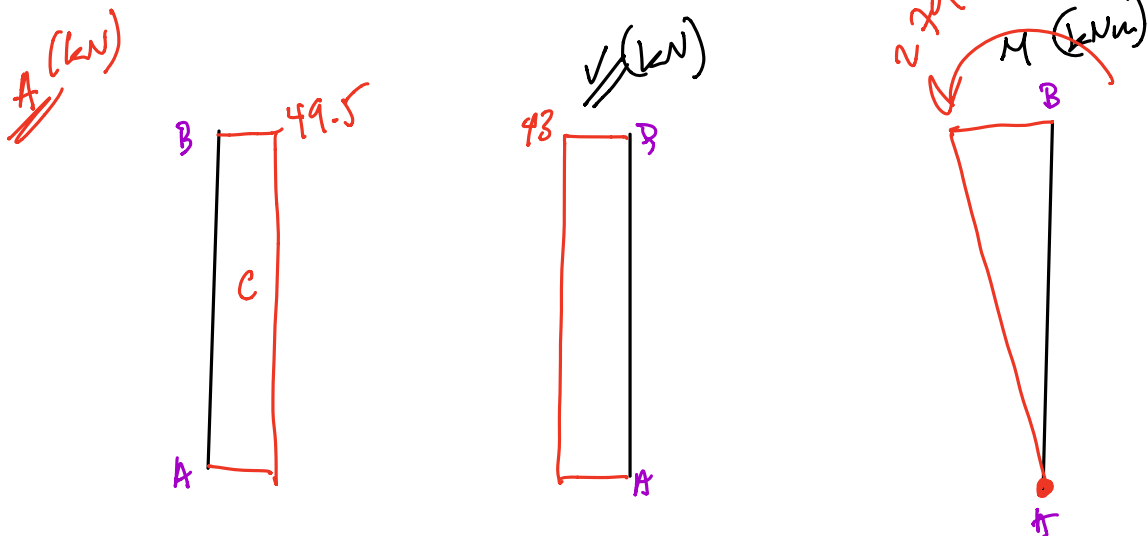


4. Solve for the unknown forces on this free body diagram and draw the axial, shear, and moment diagrams

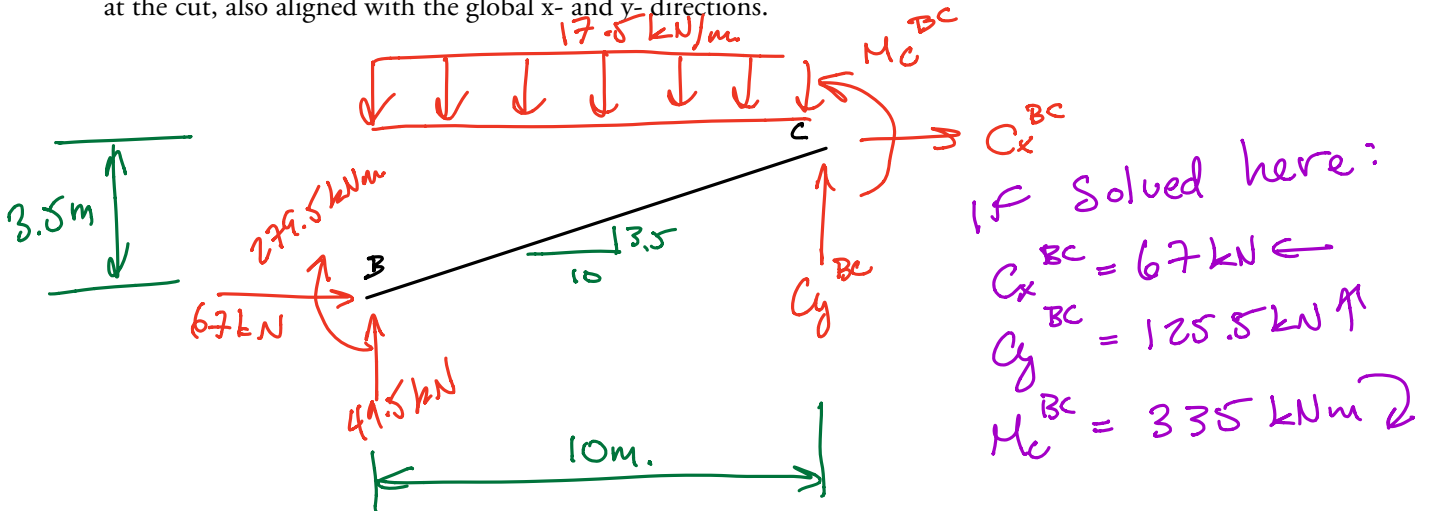
$$B_x^{AB} = 67 \text{ kN} \leftarrow$$

$$B_y^{AB} = 49.5 \text{ kN} \downarrow$$

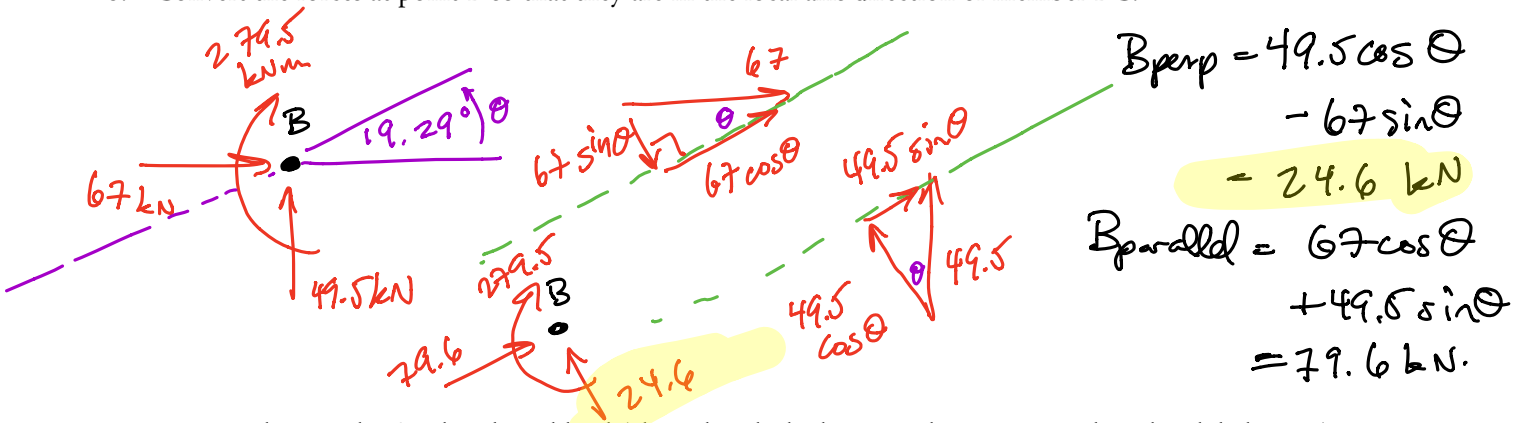
$$M_B^{AB} = 279.5 \text{ kNm} \curvearrowright$$



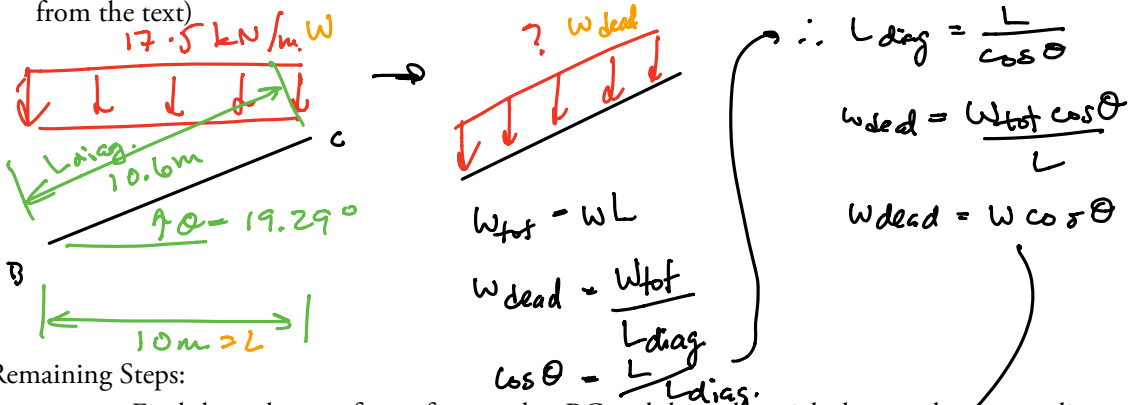
5. Now draw the free body diagram of member BC. Make sure that you consider which external loads are appropriate for this free body diagram. Show the known forces at point B (make sure to consider the direction). You can leave this force aligned with the global x- and y- directions. Show the unknown forces at the cut, also aligned with the global x- and y- directions.



6. Convert the forces at point B so that they are in the local axis direction of member BC.

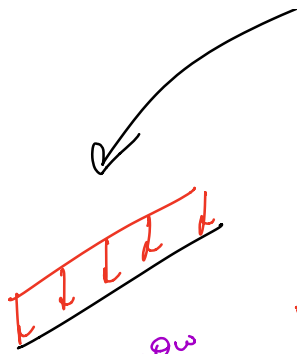


7. Convert the 17.5 kN/m distributed load (aligned with the horizontal projection, a.k.a. the global x-axis) so that it is represented instead by a distributed load that is perpendicular to member BC and a distributed traction that is parallel to member BC (you can use the inclined member geometry figure from the text)

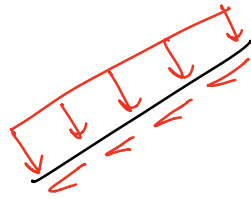


Remaining Steps:

- Find the unknown forces for member BC and draw the axial, shear and moment diagrams
- Repeat to find all unknown forces on member CD and draw the axial, shear and moment diagrams



$$w_{\text{dead}} = \cos \theta w$$
$$\begin{array}{l} \downarrow w_{\text{dead}} \cos \theta \\ \rightarrow w_{\text{dead}} \sin \theta \end{array}$$



$$\Rightarrow \begin{array}{l} w_{\text{perp}} = w \cos^2 \theta \\ w_{\text{parallel}} = w \cos \theta \sin \theta \end{array}$$