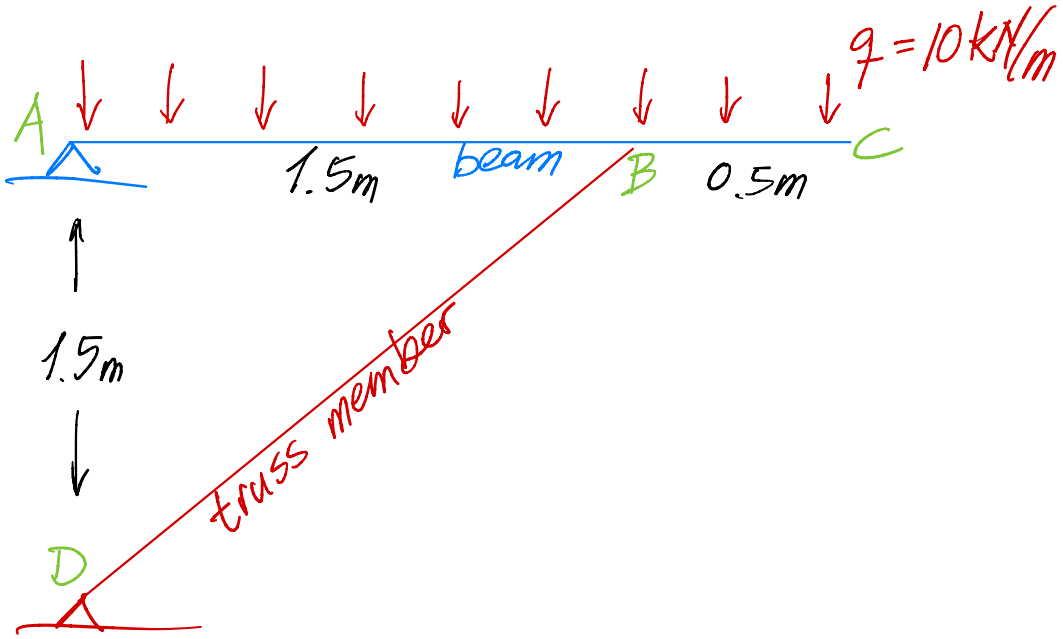
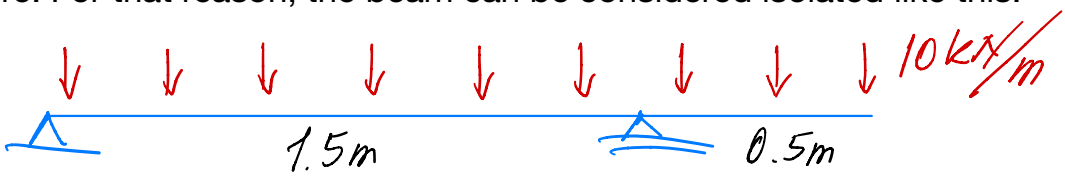
Example: Determinate mixed truss frame, meaning a beam supported by a truss member

Objective: Seeing how the beam can be analyzed first, followed by a truss analysis, i.e., joint equilibrium.

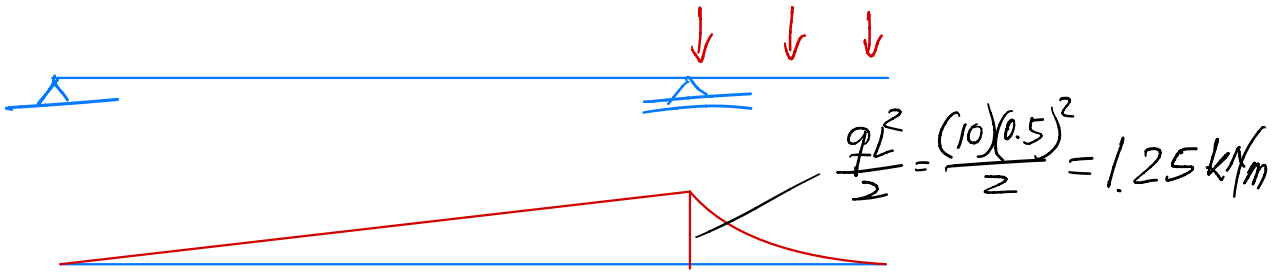


This structure is statically determinate. That means that any deformation at B will not affect the forces in the structure. For that reason, the beam can be considered isolated like this:

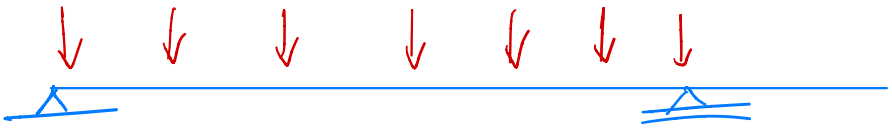


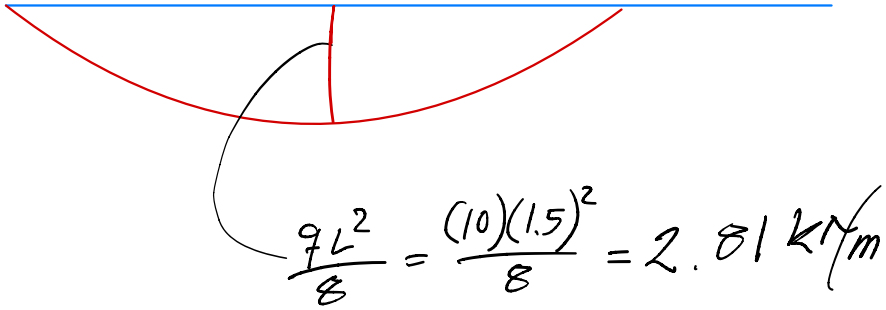
Here we can actually see the basic cases of a cantilevered beam and a simply supported beam, allowing us to simply use the known values, e.g., from the formula sheet, for those cases, instead of explicitly determining the reaction forces and determining moment values at select locations:

Case 1: (easy)

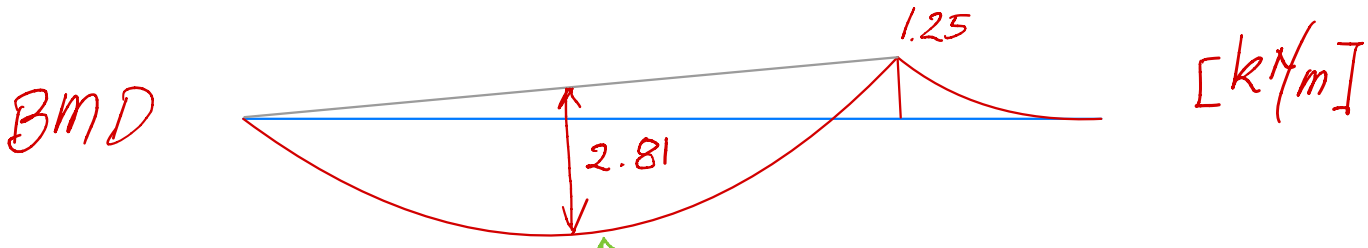


Case 2:
(easy)



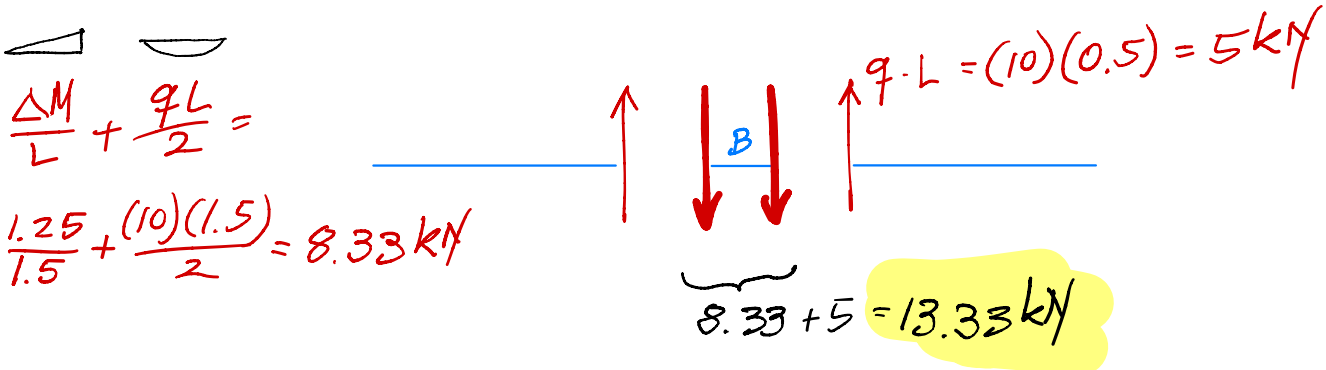


That gives the following combined bending moment diagram:

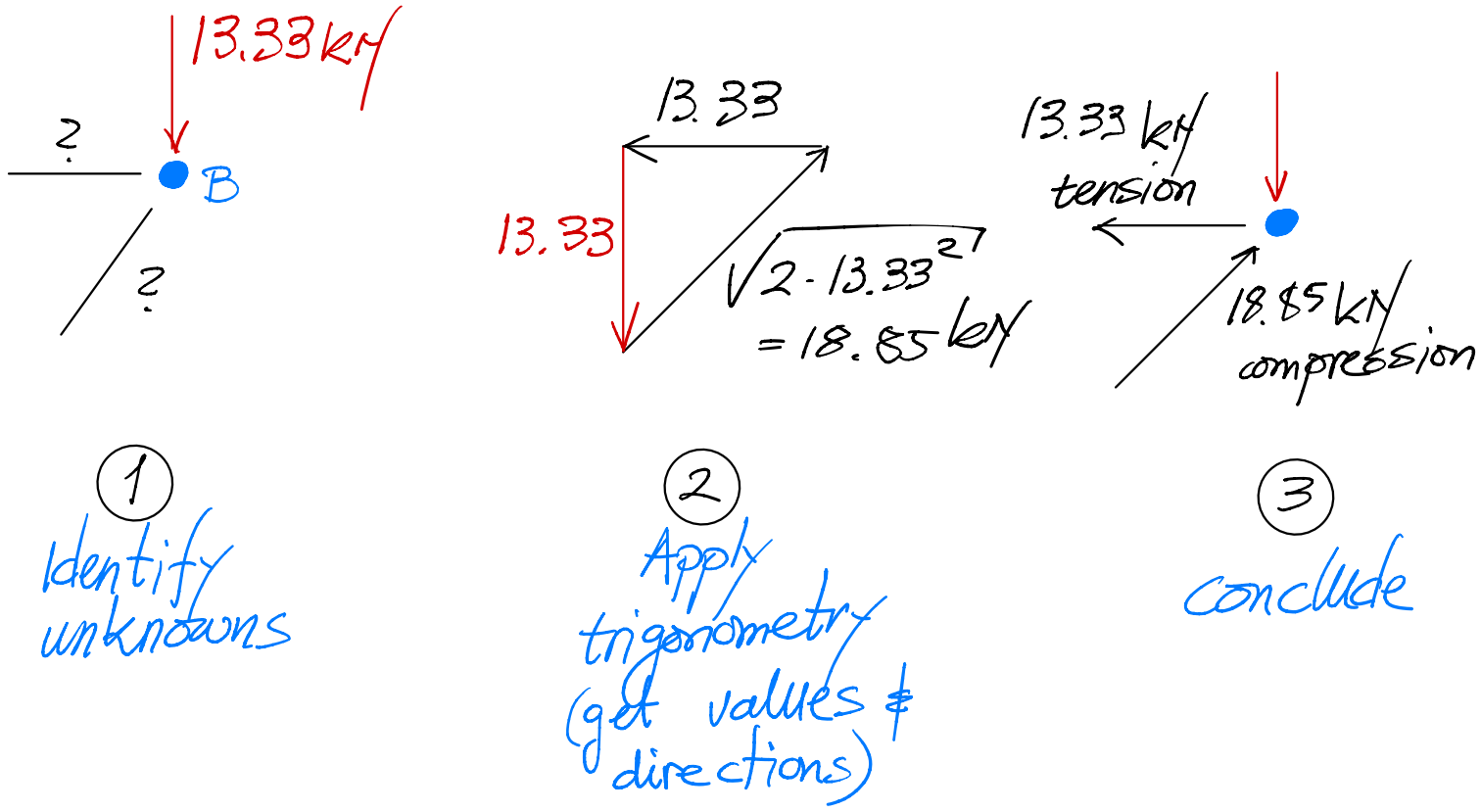


To find the location and value of the maximum moment you first establish the SFD and determine where the shear is zero.

For brevity, the SFD is not established here. However, the shear force at B is needed to determine the axial force in the truss member. The shear force at B is:



Joint equilibrium gives the axial force in the truss member:



That implies the following axial force diagram (AFD):