Muller-Breslau Principle

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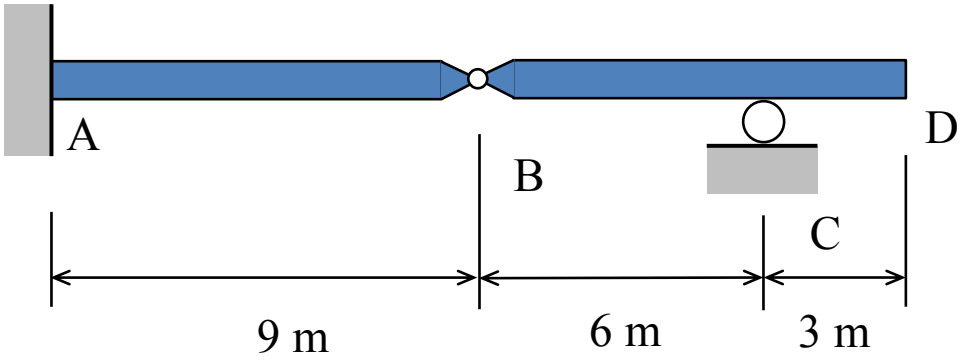
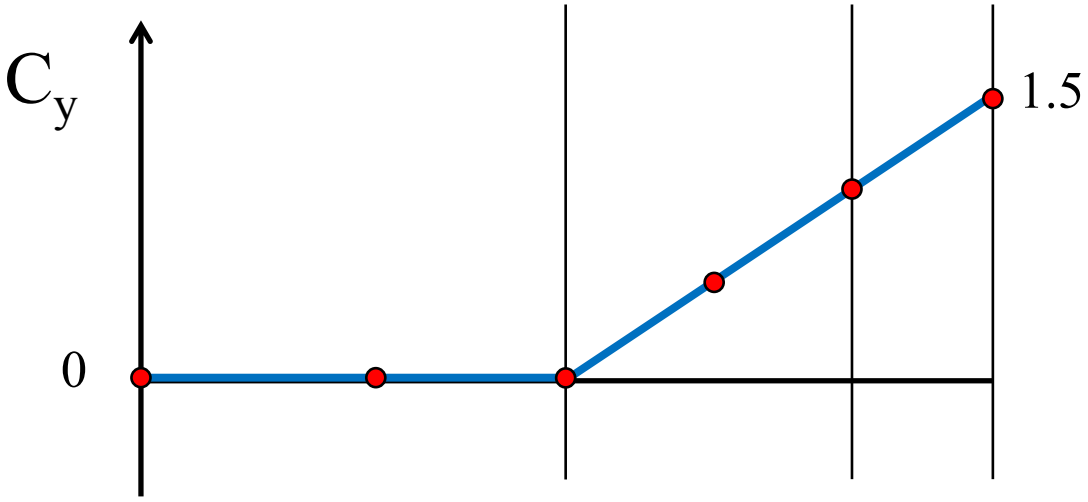
San Jose State University

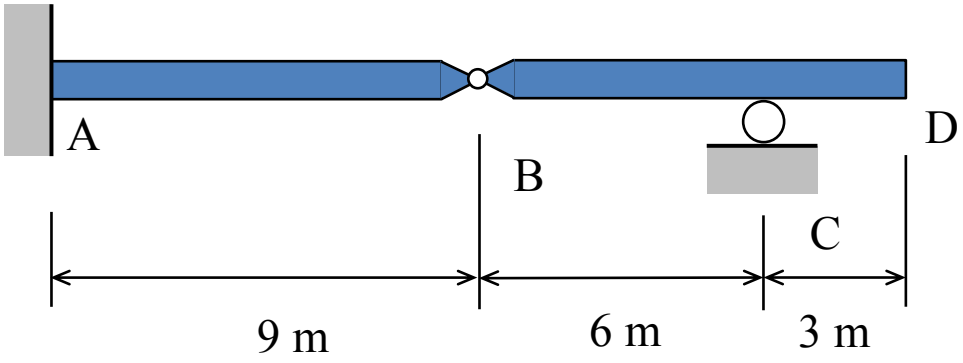
Influence Lines for Our Model Problem



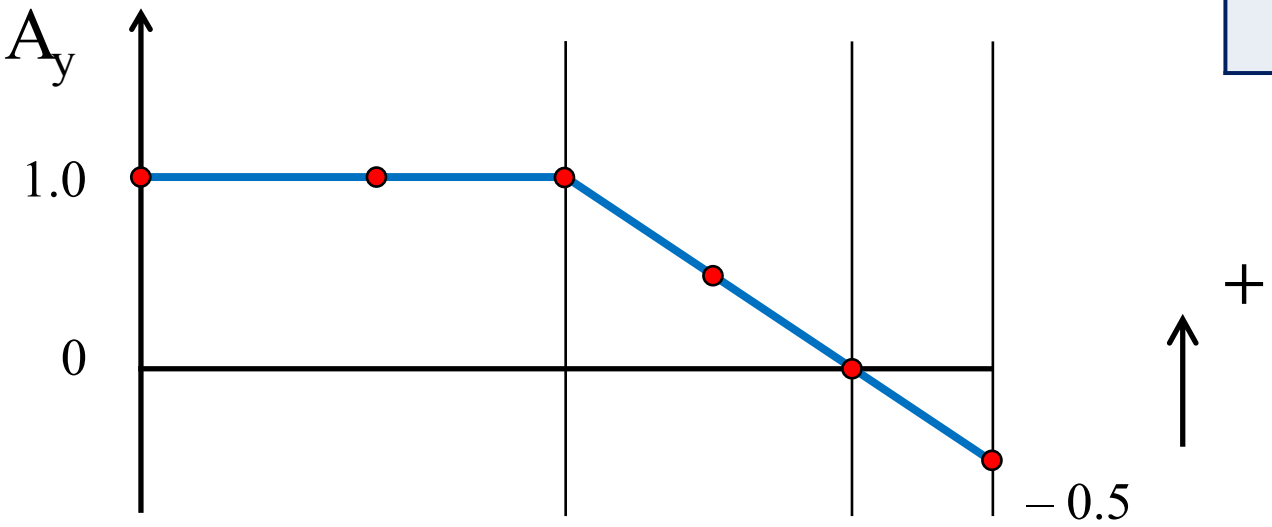
x =	C_y
0	0
5 m	0
9 $^-$ m	0
12 m	0.5
15 m	1.0
18 m	1.5



Influence Lines for Our Model Problem



x =	A_y
0	1
5 m	1
9 – m	1
12 m	0.5
15 m	0
18 m	– 0.5



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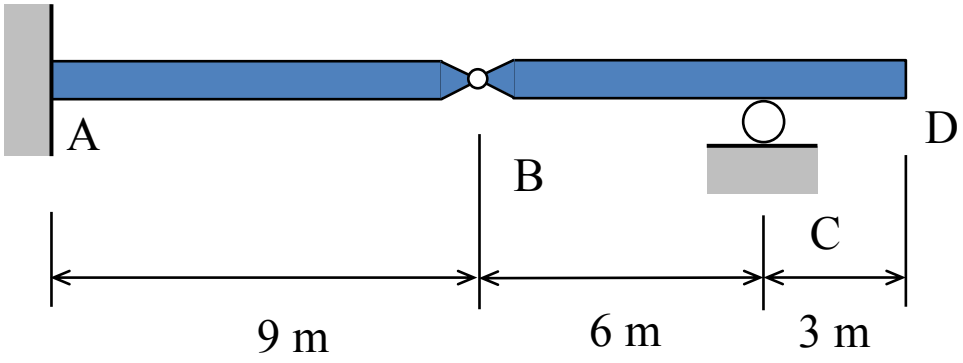
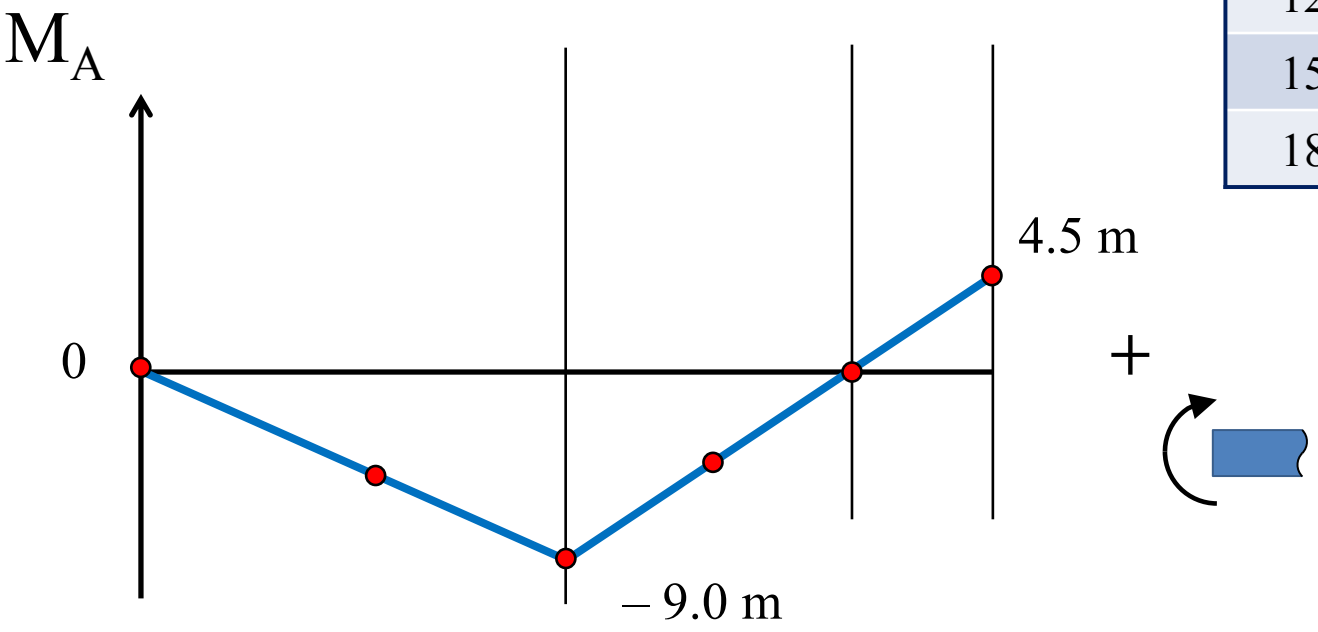
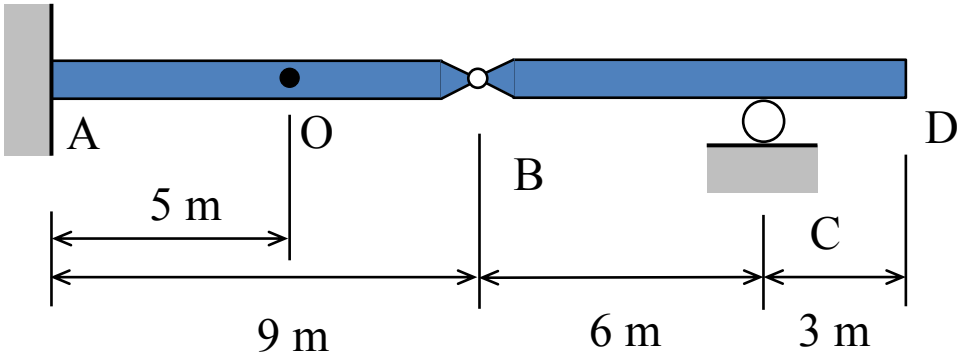
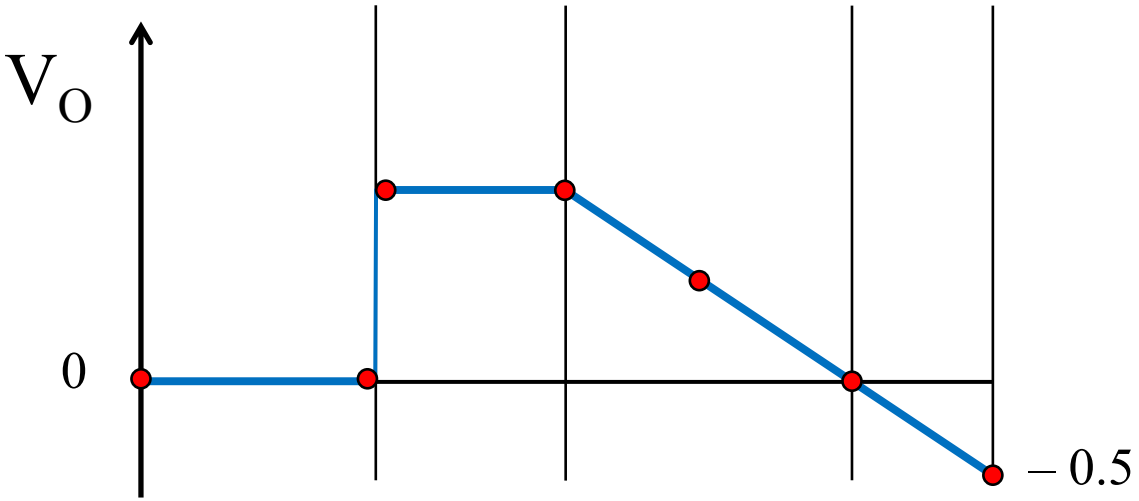


x =	M_A
0	0
5 m	– 5 m
9 – m	– 9 m
12 m	– 4.5 m
15 m	0
18 m	4.5 m

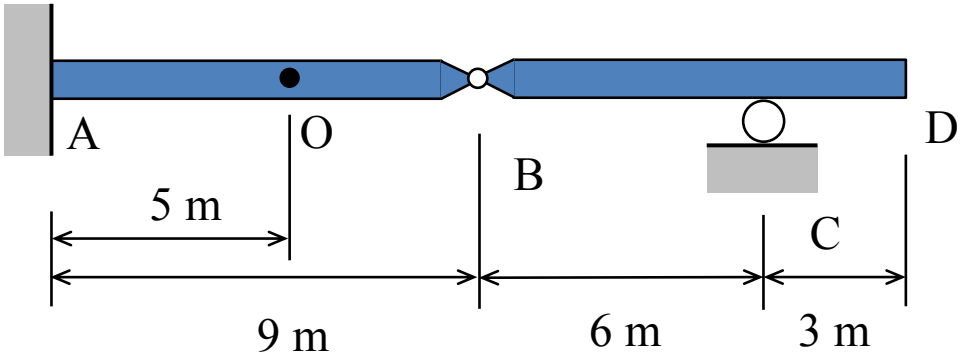


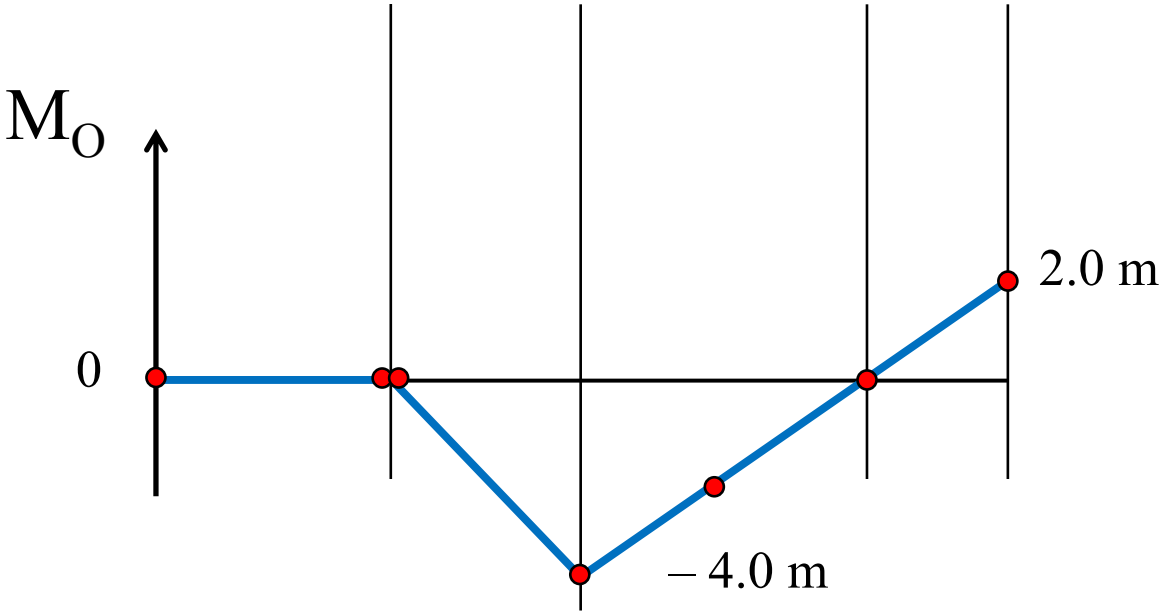
Influence Lines for Our Model Problem





Influence Lines for Our Model Problem



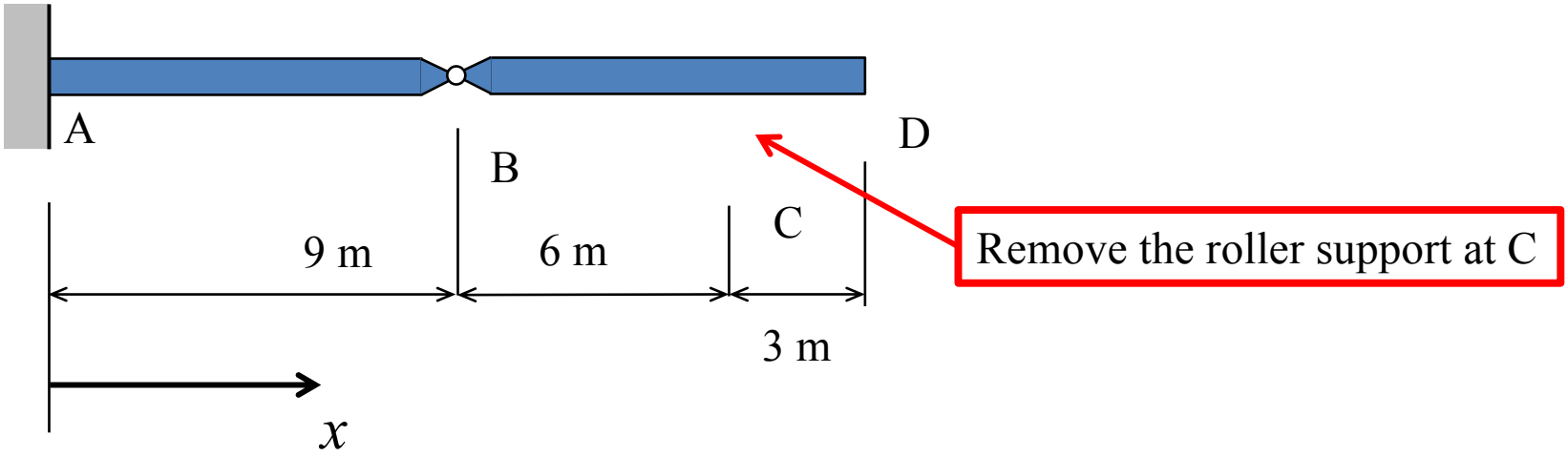


General procedure for the applying the Muller-Breslau principle to find the shape of influence lines

1. Remove the ability for the structure to resist the response quantity (e.g. reaction, internal shear, internal bending moment at a particular point). For a determinate structure this will result in an unstable structure.
2. Apply the response quantity to the modified unstable structure from Step 1.
3. The **rigid body** motion of the modified unstable structure is the shape of the influence line for the response quantity.

Shape of C_y Influence Line

Use the Muller-Breslau Principle to find the shape of the influence line for the support reaction at C for our model problem:



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Shape of C_y Influence Line

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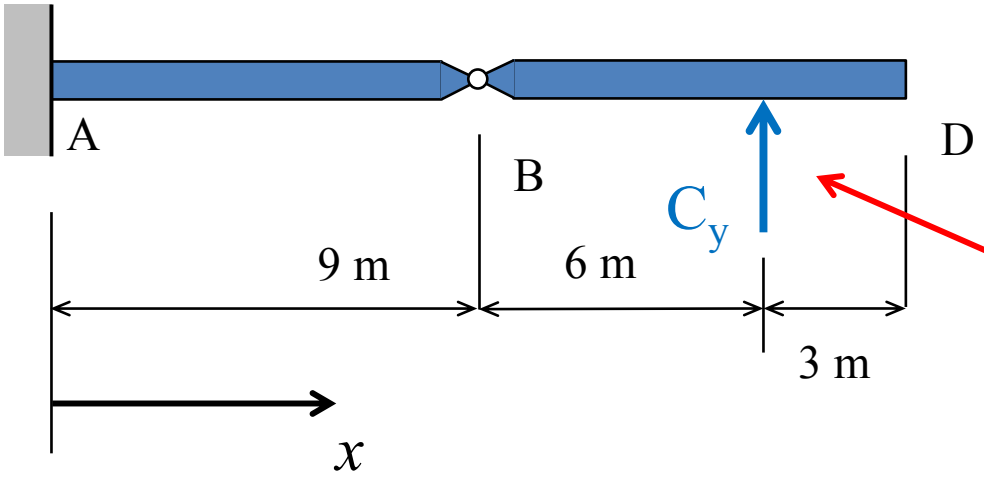
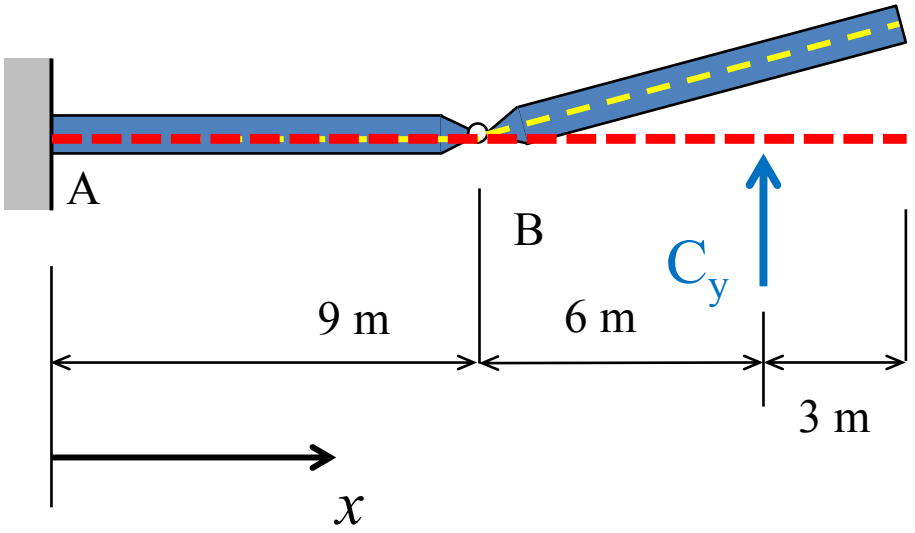


Apply C_y consistent with positive sign convention

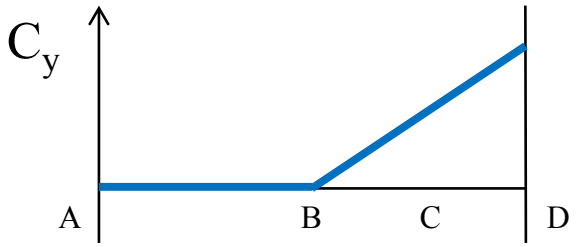
2. Apply the response quantity to the modified unstable structure from Step 1.

Shape of C_y Influence Line

Use the Muller-Breslau Principle to find the shape of the influence line for the support reaction at C for our model problem:



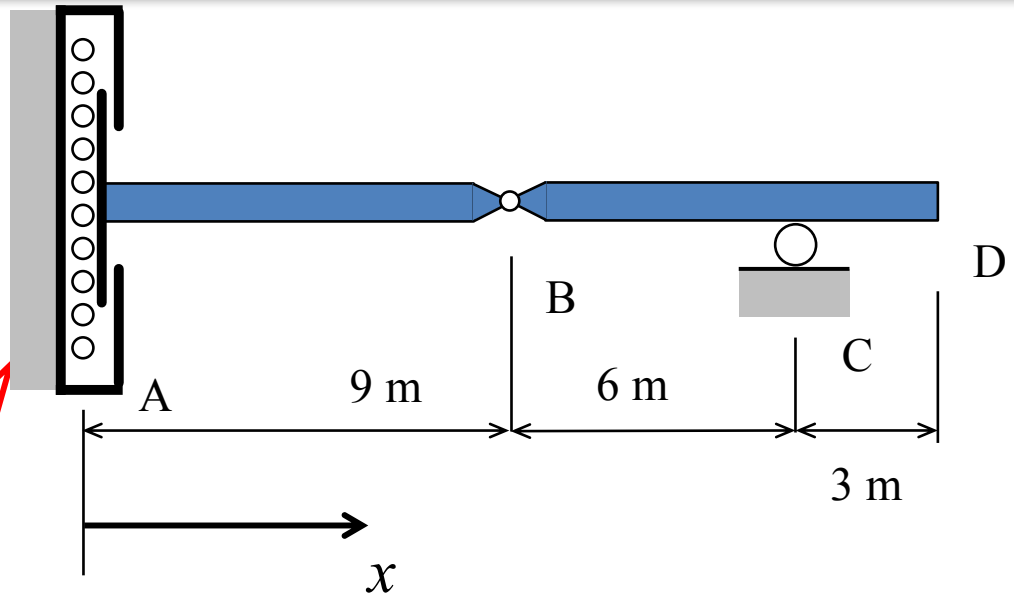
Shape of C_y Influence Line!



3. The **rigid body** motion of the modified unstable structure is the shape of the influence line for the response quantity.

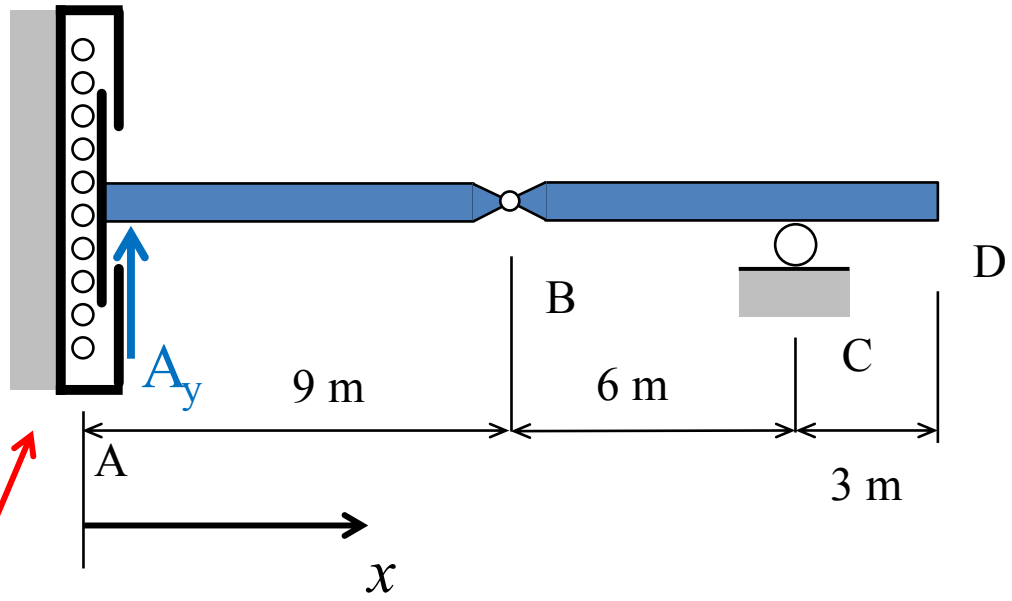
Shape of A_y Influence Line

Use the Muller-Breslau Principle to find the shape of the influence line for the vertical support reaction at A for our model problem:



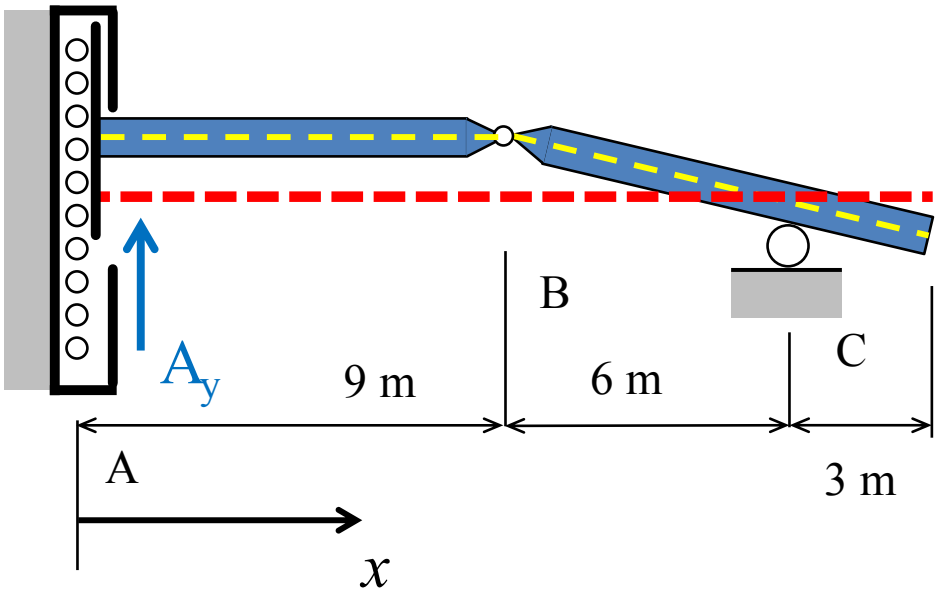
Remove the ability of the Support to resist vertical motion. Rotation is still restrained

Shape of A_y Influence Line

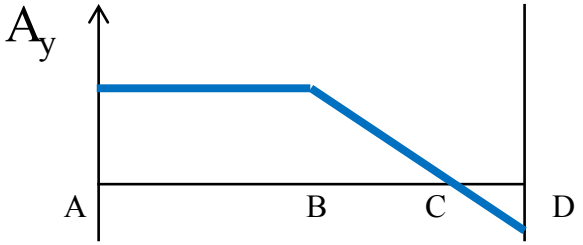


Apply A_y consistent
with positive sign convention

Shape of A_y Influence Line

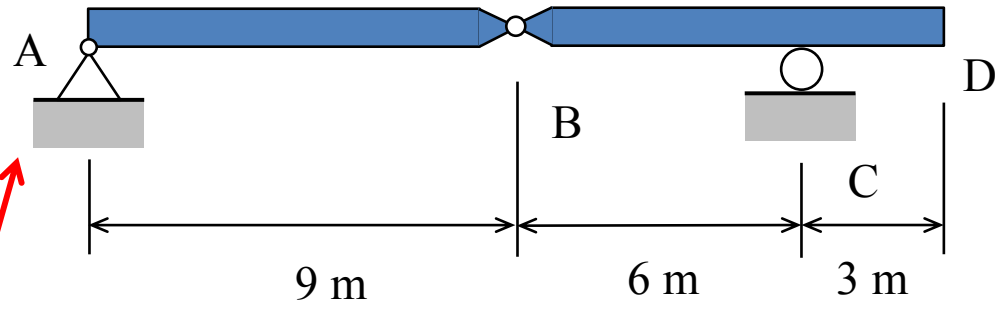


Shape of A_y Influence Line!



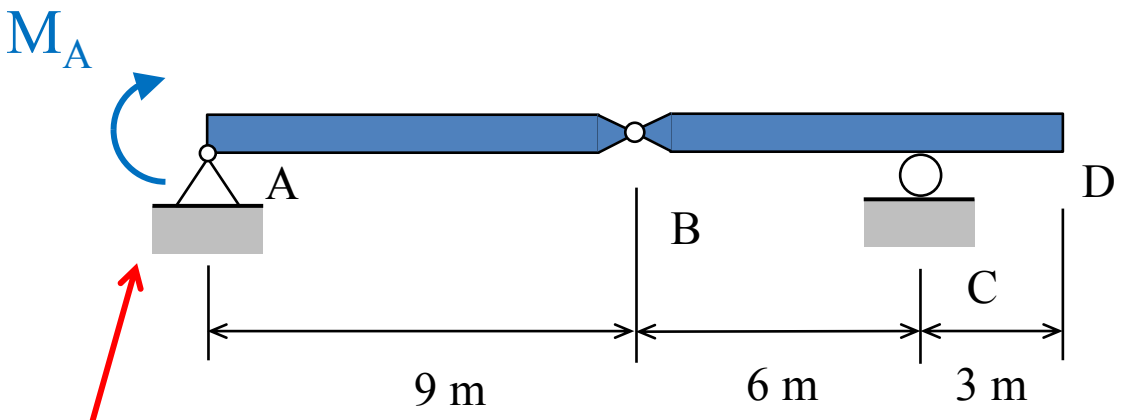
Shape of M_A Influence Line

Use the Muller-Breslau Principle to find the shape of the influence line for the moment reaction at A for our model problem:



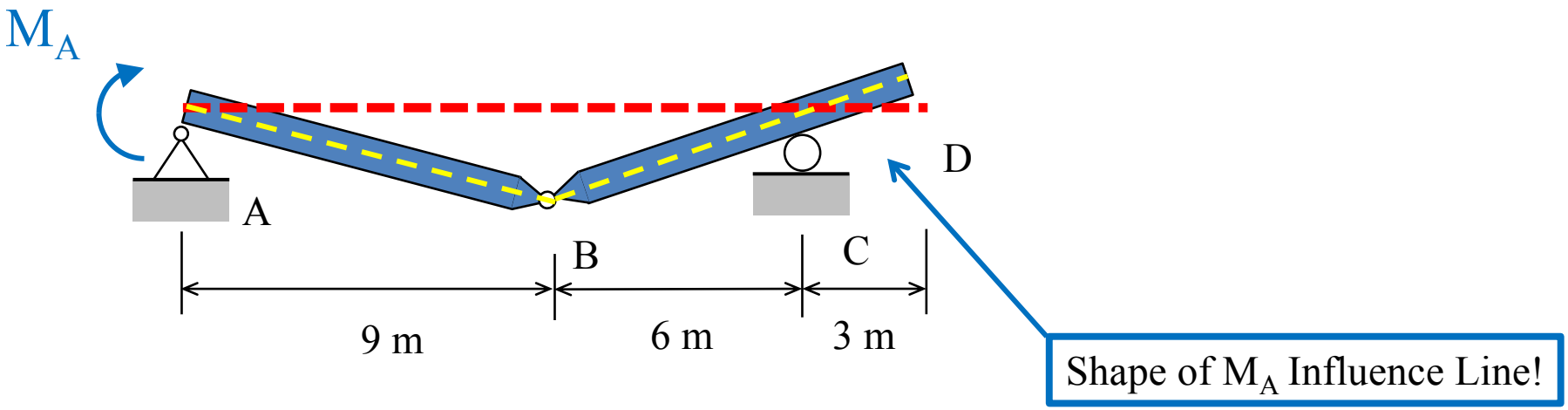
Remove the ability of the Support to resist rotation. Vertical movement is restrained

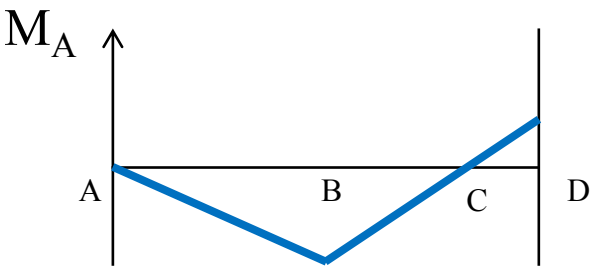
Shape of M_A Influence Line



Apply M_A consistent
with positive sign convention

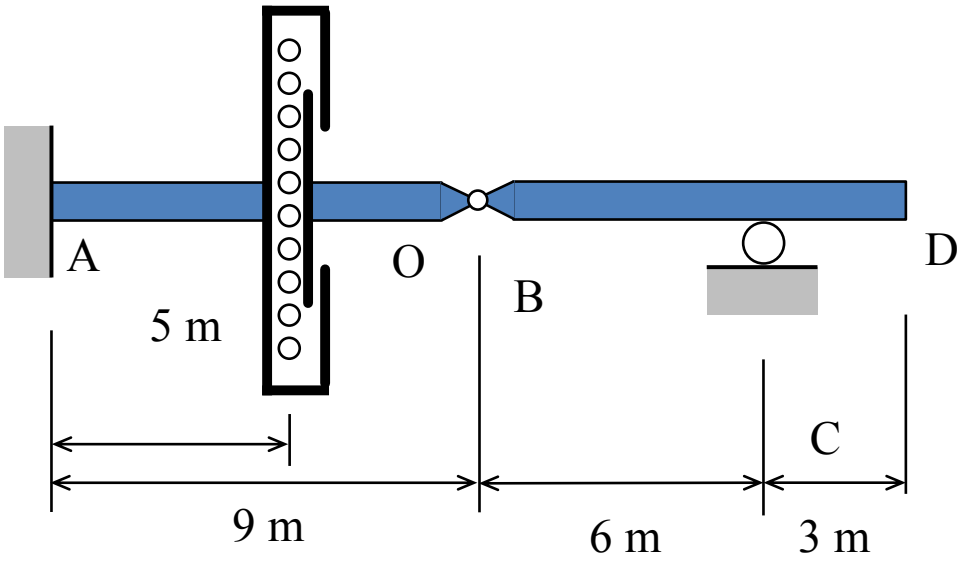
Shape of M_A Influence Line





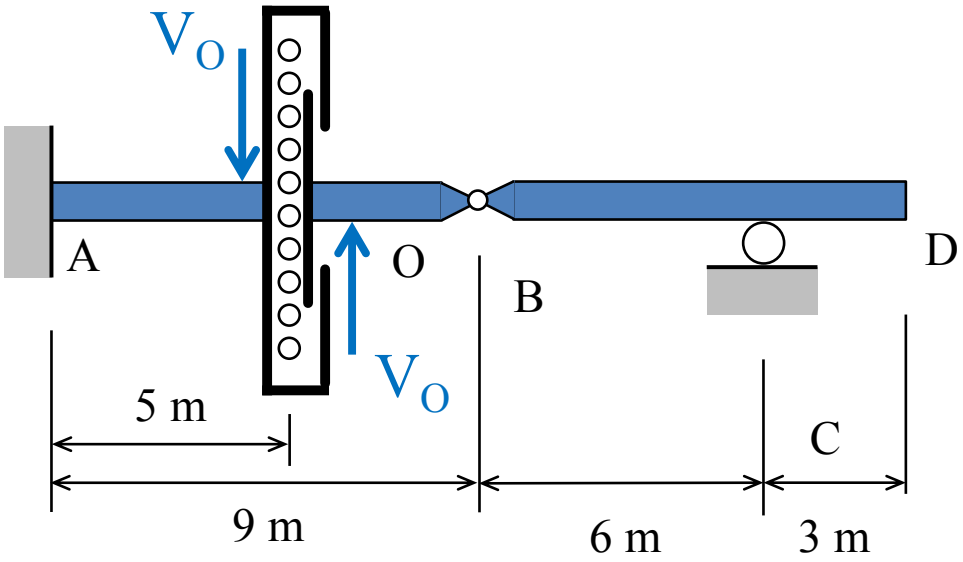
Shape of V_O Influence Line

Use the Muller-Breslau Principle to find the shape of the influence line for the internal shear force at O for our model problem:



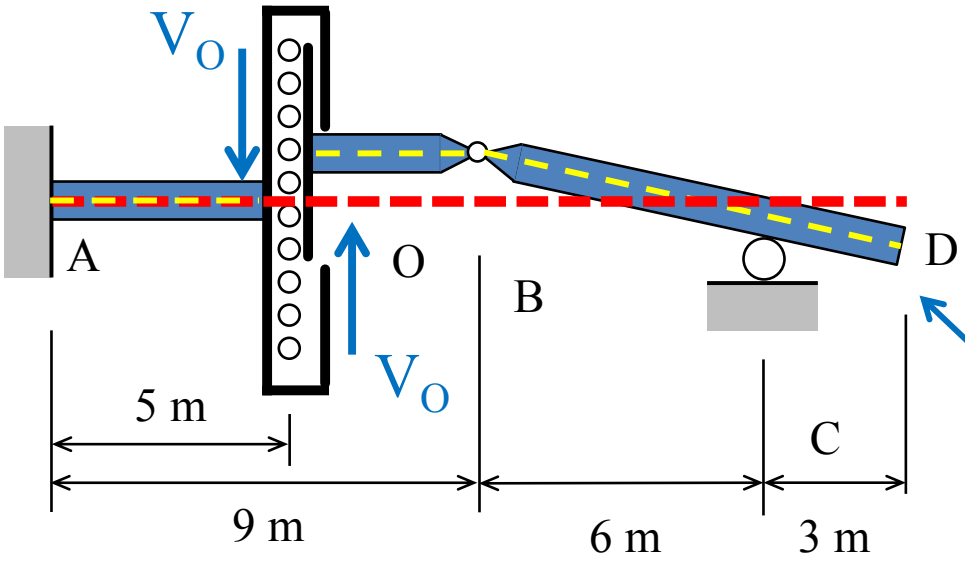
Remove the ability of point O to resist shear force.
Rotation is still restrained

Shape of V_O Influence Line

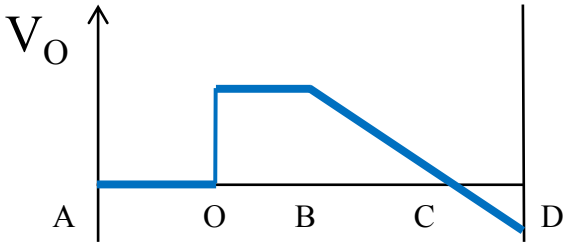


Apply V_O consistent with positive sign convention

Shape of V_O Influence Line

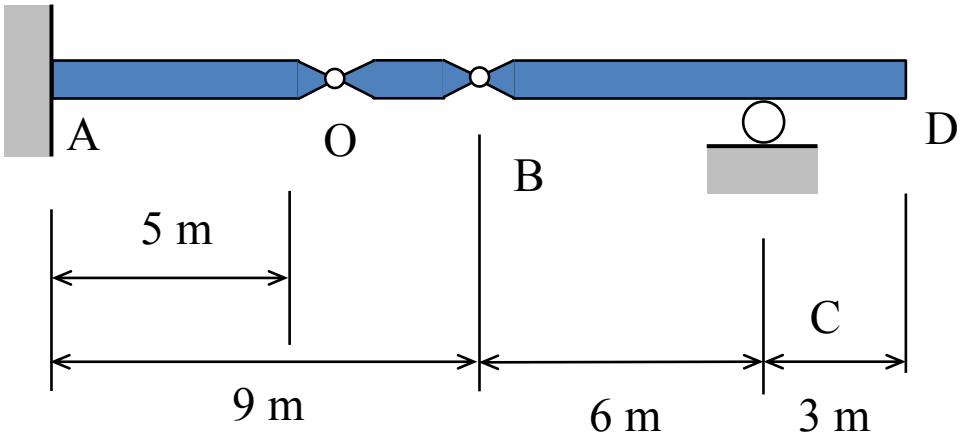


Shape of V_O influence line!



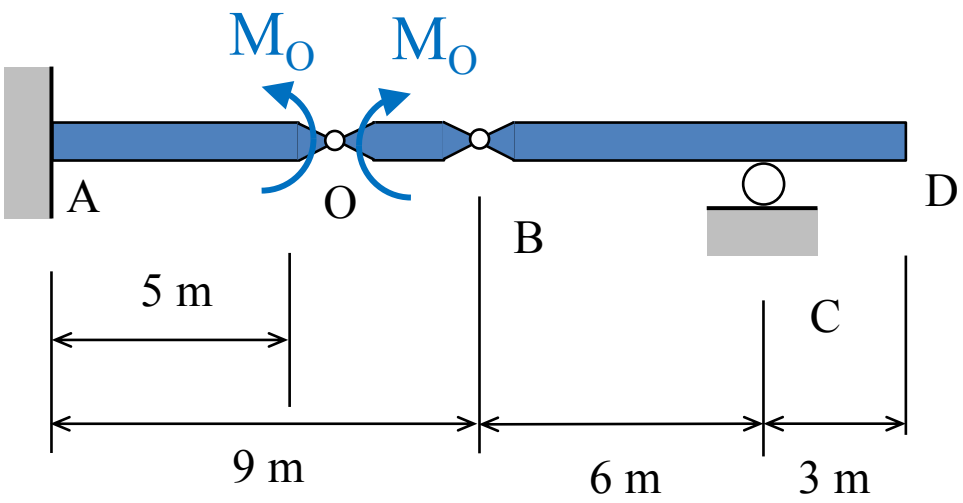
Shape of M_O Influence Line

Use the Muller-Breslau Principle to find the shape of the influence line for the internal shear force at O for our model problem:



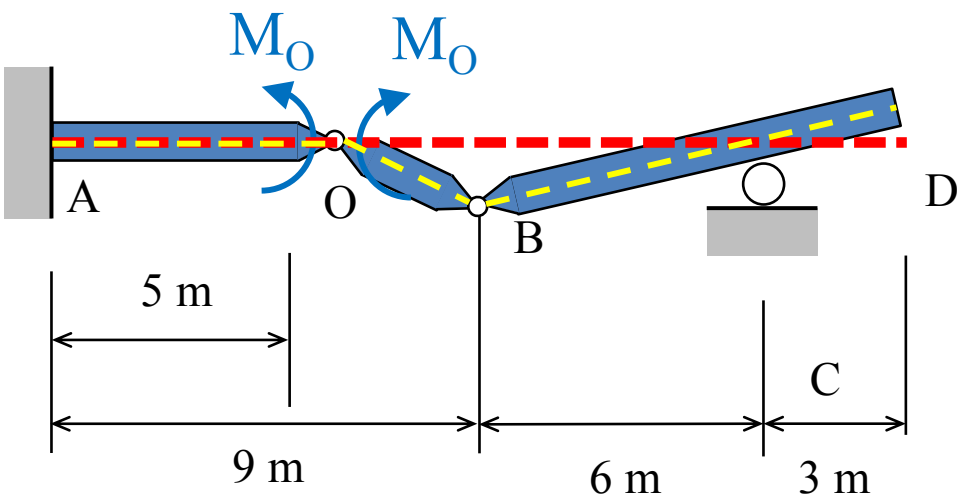
Remove the ability of point O to resist bending moment.
Shear is still restrained.

Shape of M_O Influence Line



Apply M_O consistent with positive sign convention

Shape of M_O Influence Line



Shape of M_O influence line!