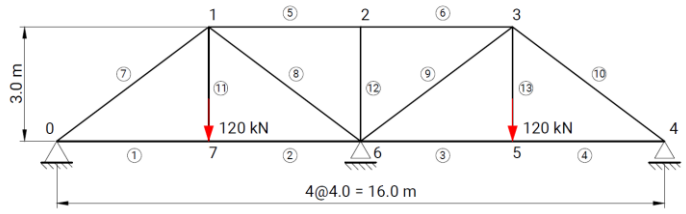
Problem 4

Figure



Description

Consider the symmetrical truss shown at figure. The structure is subjected to two equal vertical loads P=120 kN applied at the indicated joints. All members have the same axial stiffness EA.

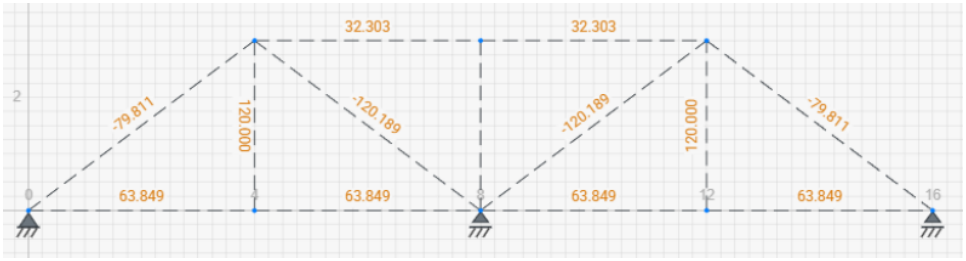
Determine:

- Axial forces in all truss members.

Model

Units:	m, kN
Element:	Truss element
Material:	Steel, E = 2.1×10^{8} kN/m^2
Section property:	A = 0.1 m^2
Constraints:	Node 0: Ux, Uy restrained; Node 6: Uy restrained; Node 4: Uy restrained
Load Case:	Node concentrated load –120 kN are applied at nodes 5 and 7 in the Y direction.

Results



Element	N	Q	M
1	63.8486	0	0
2	63.8486	0	0
3	63.8486	0	0
4	63.8486	0	0
5	32.3028	0	0
6	32.3028	0	0
7	-79.8107	0	0
8	-120.189	0	0
9	-120.189	0	0
10	-79.8107	0	0
11	120	0	0
12	0	0	0
13	120	0	0

Comparison of Results

Rod	Axial force, kN		
	Theoretical	RodX	Midas/Civil
1	63.710	63.849	63.849
2	63.710	63.849	63.849
3	63.710	63.849	63.849
4	63.710	63.849	63.849
5	32.430	32.303	32.303
6	32.430	32.303	32.303
7	-79.750	-79.811	-79.811
8	-120.250	-120.189	-120.189
9	-120.250	-120.189	-120.189
10	-79.750	-79.811	-79.811
11	120.000	120.000	120.000
12	0.0	0.0	0.0
13	120.000	120.000	120.000

Reference

1. Karnovsky I.A, Lebed O., Advanced Methods of Structural Analysis, 2010, Springer, p.235