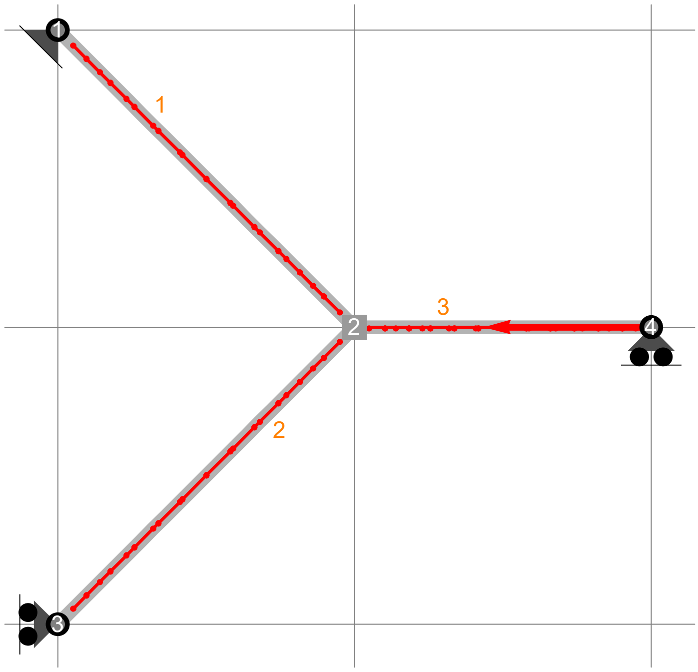
```
Needs["dsvsolve`"];
```

Input

Edit or simply evaluate the following cell to see the input

In[143]:=
```
example = {$$nodes -> {{-L, L}, {0, 0}, {-L, -L}, {L, 0}},
$$edges -> {{1, 2}, {2, 3}, {2, 4}}, $$absname -> s,
$$constraints -> {{{"hinge", 1}},
     {{"clamp", 1, 2}, {"clamp", 2, 3}}, {{"rollv", 2}}, {{"rollh", 3}}},
$$bodyloads -> {{1, {0, 0, 0}}},
$$nodalloads -> {{4, {-F, 0, 0}}},
$$predeformations -> {{1, {0, 0, 0}}},
$$cdisplacements -> {{1, {0, 0, 0}}},
$$EIoverEAL2 -> 0};
(*All constraints are initialized to hinge constraints;
use "BFConstraintsPalette[BFConstraintTypes];" to input different constraints.*)
BFShowInput[example]
```

Out[144]=



Output

Evaluate the following cell to solve the problem and see the output

In[145]:=
```
BFClassify[example]; sol = {{Ns, Qs, Ms}, details} = BFForcesSolve[example];
(*A=Transpose[First[BFStaticProblem[example]]];MatrixForm[A]
BFShowRigidMotions[example]*)
(*BFEquations[example,"Nodal"];
sol = {{us, vs}, {Ns, Qs, Ms}, details} = BFDisplacementsSolve[example];*)
gsol = BFShowOutput[example, sol]
```

BFClassify: Statically undetermined system of order 1.

10 possible choices of static unknows are as follows:

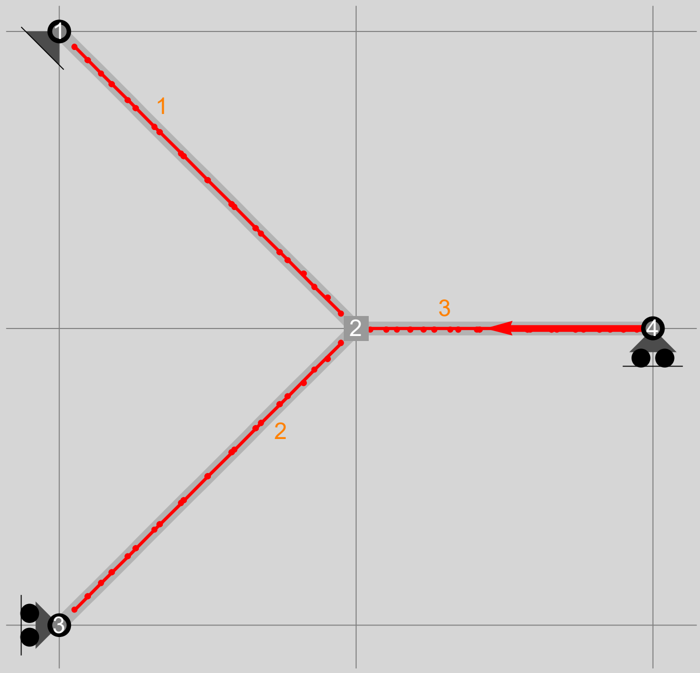
1	2	3	4	5	6	7	8	9	10
$N_1[0]$	$N_1[1]$	$N_2[0]$	$Q_2[0]$	$M_2[0]$	$N_2[1]$	$Q_2[1]$	$Q_3[0]$	$M_3[0]$	$Q_3[1]$

BFClassify: Kinematically determined system.

BFForcesSolve: Chosen set of static unknows: $\{N_1[0]\}$

Assigned input | 0 | 1 | Main results ... | and solution details

Out[146]=



Evaluate the following cell to print the above output

In[147]:=
```
CellPrint /@ Rest /@ Last[sol];
Print /@ Cases[gsol, Graphics[___], Infinity];
```

Dimensionless abscissa

s

Static equilibrium matrix

$$
\begin{aligned}
\{&\{-1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0\},\\
&\{0, -1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, -1, 0, \sqrt{2}\, L, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, -1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, -1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, -1, 0, \sqrt{2}\, L, 1, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, 0, 0, 1, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, 0, 0, 1, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, 0, L, 1\},\\
&\{0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, -\sqrt{2}, -\sqrt{2}, 0, -\sqrt{2}, \sqrt{2}, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, \sqrt{2}, -\sqrt{2}, 0, -\sqrt{2}, -\sqrt{2}, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, -1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, 0, 0, 0, 0, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1, 0, 0\},\\
&\{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -1\}\}
\end{aligned}
$$

Static equilibrium vector

$$\{0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, F, 0\}$$

Fredholm condition: are the loads orthogonal to allowed rigid motions?

True

Bending stiffnesses

$$\{EI, EI, EI\}$$

Axial stiffnesses

$$\{\infty, \infty, \infty\}$$

Degree of static undetermination

1

Some possible choices for the static unknowns

$$\{\{"N"_{"1"}[0]\}, \{"N"_{"1"}[1]\}, \{"N"_{"2"}[0]\}, \{"Q"_{"2"}[0]\}, \{"M"_{"2"}[0]\}, \{"N"_{"2"}[1]\}, \{"Q"_{"2"}[1]\}, \{"Q"_{"3"}[0]\}, \{"M"_{"3"}[0]\}, \{"Q"_{"3"}[1]\}\}$$

Actually chosen static unknowns

$$\{"N"_{"1"}[0]\}$$

Reactions in the auxiliary problem 0

$$\left\{\left\{0, -\frac{F}{2\sqrt{2}}, 0, 0, -\frac{F}{2\sqrt{2}}, \frac{F L}{2}\right\}, \left\{-\frac{3F}{4\sqrt{2}}, \frac{3F}{4\sqrt{2}}, \frac{3 F L}{4}, -\frac{3F}{4\sqrt{2}}, \frac{3F}{4\sqrt{2}}, 0\right\}, \left\{-F, -\frac{F}{4}, -\frac{F L}{4}, -F, -\frac{F}{4}, 0\right\}\right\}$$

Reactions in the auxiliary problem 1

$$\left\{\{1, 0, 0, 1, 0, 0\}, \left\{-\frac{1}{2}, \frac{1}{2}, \frac{L}{\sqrt{2}}, -\frac{1}{2}, \frac{1}{2}, 0\right\}, \left\{0, -\frac{1}{\sqrt{2}}, -\frac{L}{\sqrt{2}}, 0, -\frac{1}{\sqrt{2}}, 0\right\}\right\}$$

Internal actions (N,Q,M) in the auxiliary problem 0

$$\left\{\left\{0, -\frac{3F}{4\sqrt{2}}, -F\right\}, \left\{-\frac{F}{2\sqrt{2}}, \frac{3F}{4\sqrt{2}}, -\frac{F}{4}\right\}, \left\{\frac{F L s}{2}, -\frac{3}{4} F L (-1+s), \frac{1}{4} F L (-1+s)\right\}\right\}$$

Internal actions (N,Q,M) in the auxiliary problem 1

$$\left\{\left\{1, -\frac{1}{2}, 0\right\}, \left\{0, \frac{1}{2}, -\frac{1}{\sqrt{2}}\right\}, \left\{0, -\frac{L(-1+s)}{\sqrt{2}}, \frac{L(-1+s)}{\sqrt{2}}\right\}\right\}$$

Mohr's Integrals: coefficient matrix ηij

$$\left\{\left\{\frac{L^3}{6\,EI} + \frac{L^3}{3\sqrt{2}\,EI}\right\}\right\}$$

Mohr's Integrals: vector ηi0

$$\left\{\frac{F\,L^3}{4\,EI} + \frac{F\,L^3}{12\sqrt{2}\,EI}\right\}$$

Mohr's Integrals: solution for the static unknowns

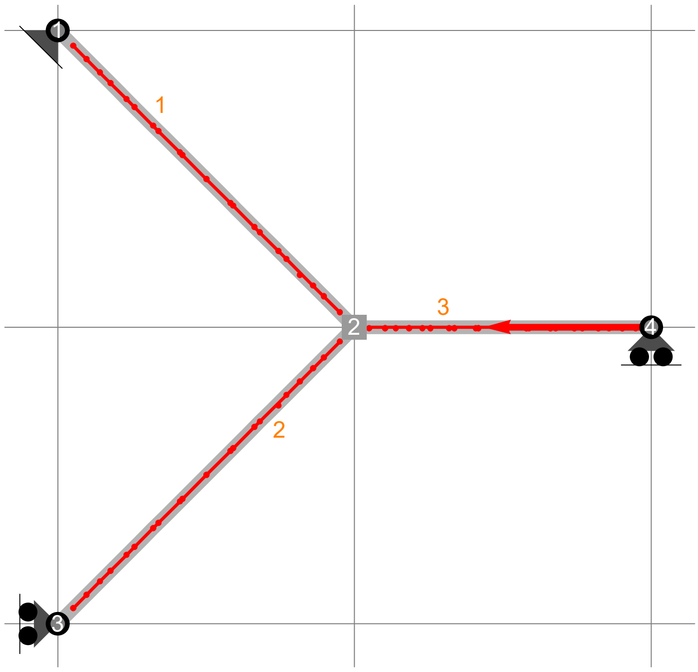
$$\left\{\text{"N"}_{\text{"1"}}[0] \to F - \frac{5\,F}{2\sqrt{2}}\right\}$$

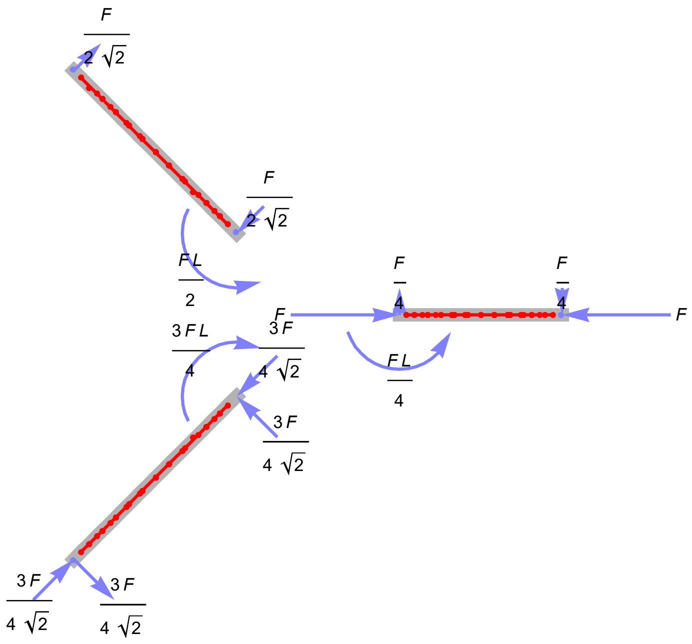
Actual reactions

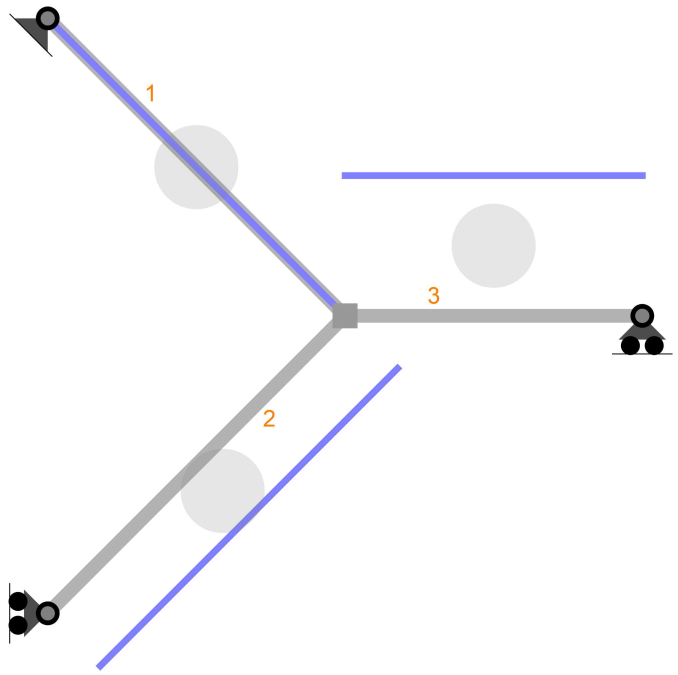
$$\left\{\left\{F - \frac{5\,F}{2\sqrt{2}}, -\frac{F}{2\sqrt{2}}, 0, F - \frac{5\,F}{2\sqrt{2}}, -\frac{F}{2\sqrt{2}}, \frac{F\,L}{2}\right\},\right.$$
$$\left\{\frac{1}{4}\left(-2+\sqrt{2}\right)F, -\frac{1}{4}\left(-2+\sqrt{2}\right)F, \frac{1}{2}\left(-1+\sqrt{2}\right)F\,L, \frac{1}{4}\left(-2+\sqrt{2}\right)F, -\frac{1}{4}\left(-2+\sqrt{2}\right)F, 0\right\},$$
$$\left.\left\{-F, F - \frac{F}{\sqrt{2}}, -\frac{1}{2}\left(-2+\sqrt{2}\right)F\,L, -F, F - \frac{F}{\sqrt{2}}, 0\right\}\right\}$$

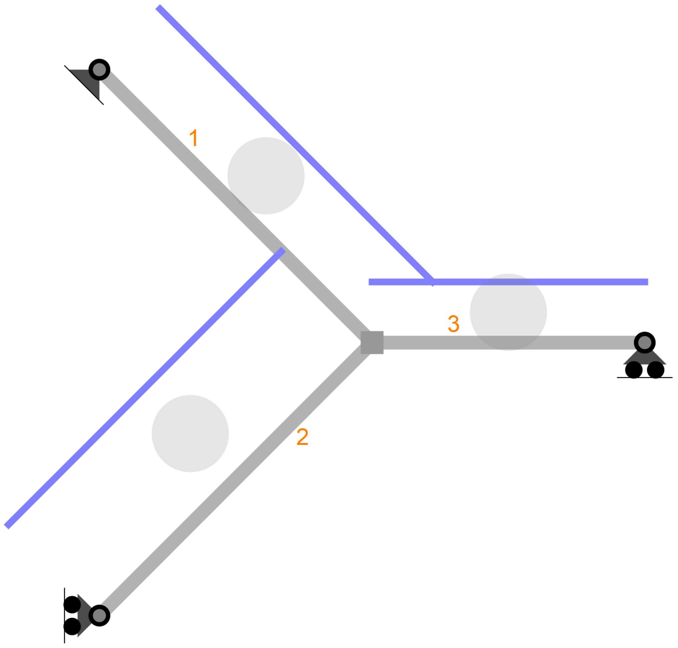
Actual internal actions (N,Q,M)

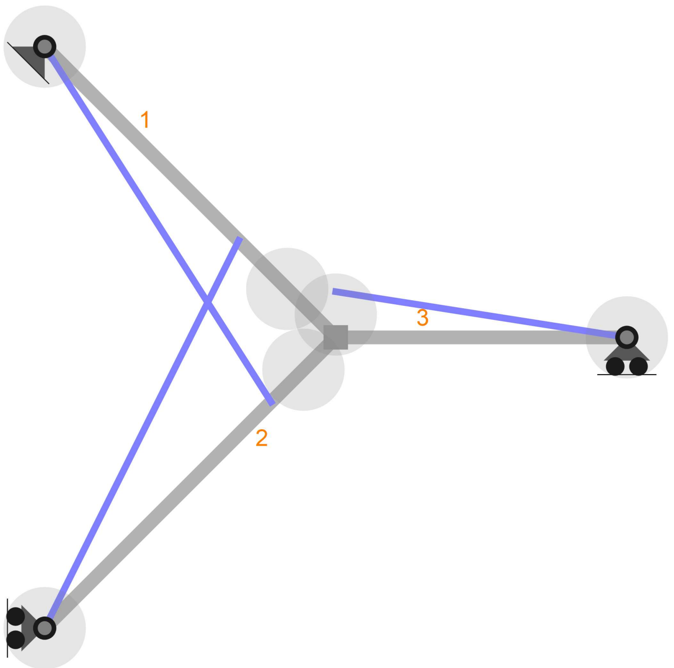
$$\left\{\left\{F - \frac{5\,F}{2\sqrt{2}}, \frac{1}{4}\left(-2+\sqrt{2}\right)F, -F\right\}, \left\{-\frac{F}{2\sqrt{2}}, -\frac{1}{4}\left(-2+\sqrt{2}\right)F, F - \frac{F}{\sqrt{2}}\right\},\right.$$
$$\left.\left\{\frac{F\,L\,s}{2}, -\frac{1}{2}\left(-1+\sqrt{2}\right)F\,L\,(-1+s), \frac{1}{2}\left(-2+\sqrt{2}\right)F\,L\,(-1+s)\right\}\right\}$$

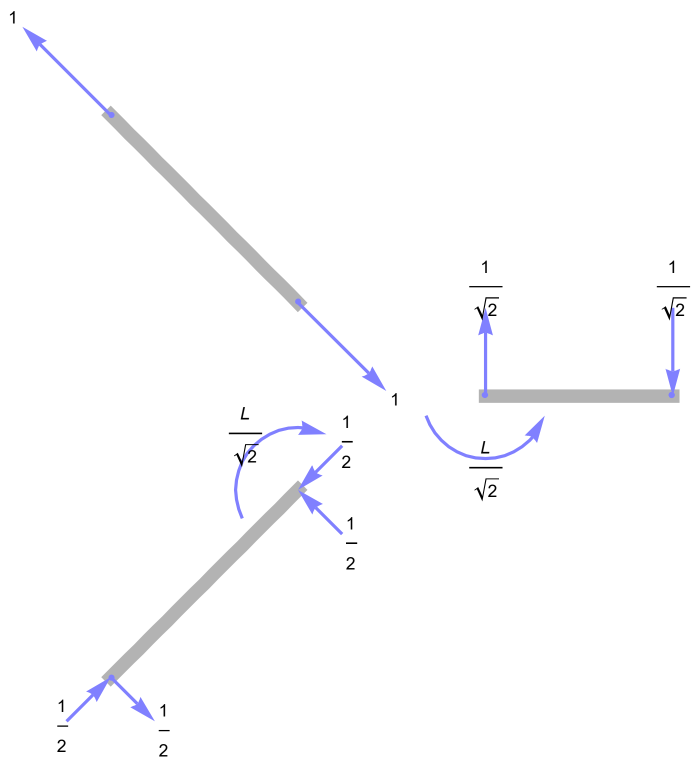


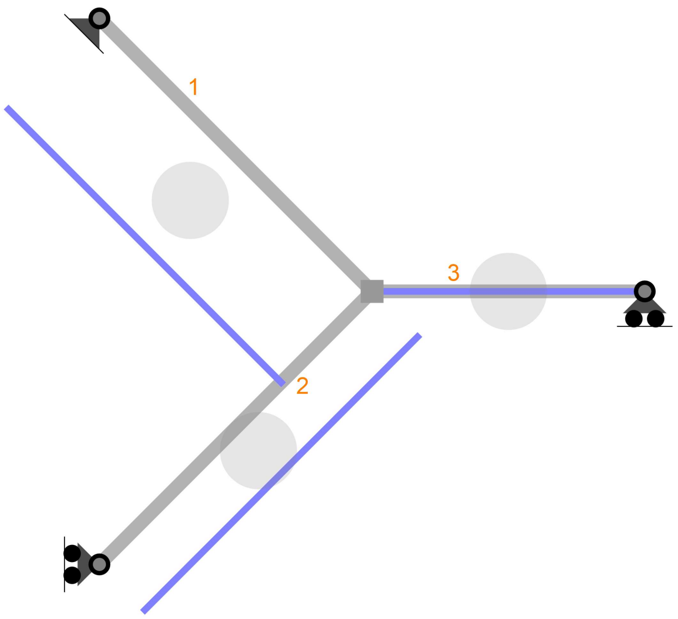

$\frac{F}{2\sqrt{2}}$
$\frac{F}{2\sqrt{2}}$
$\frac{F L}{2}$
$\frac{F}{4}$
$\frac{F}{4}$
F
F
$\frac{3 F L}{4}$
$\frac{3 F}{4\sqrt{2}}$
$\frac{F L}{4}$
$\frac{3 F}{4\sqrt{2}}$
$\frac{3 F}{4\sqrt{2}}$
$\frac{3 F}{4\sqrt{2}}$

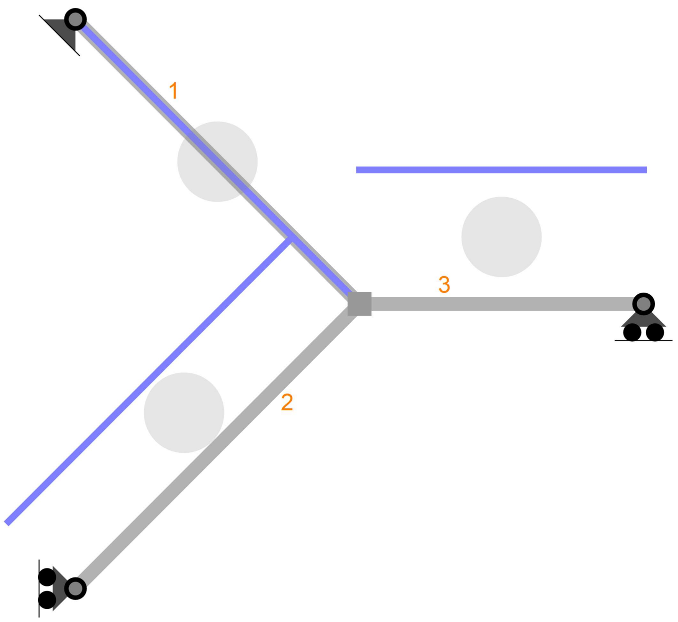

1
3
2

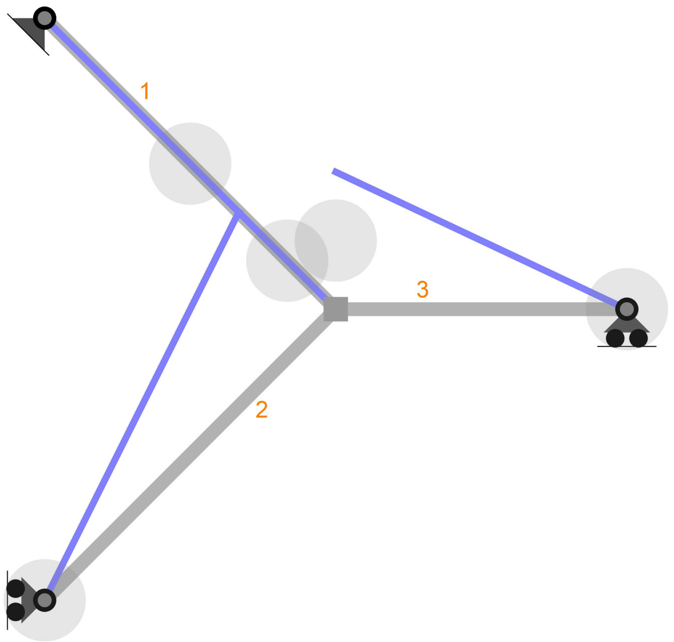

1
3
2

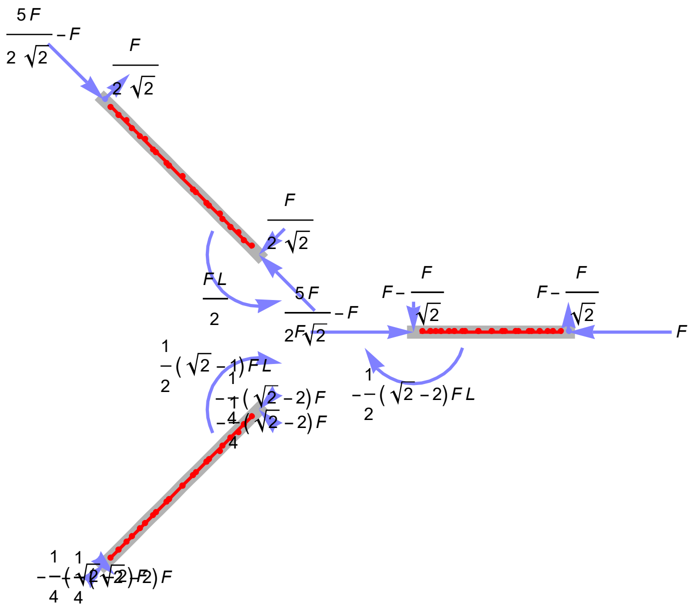

1
3
2

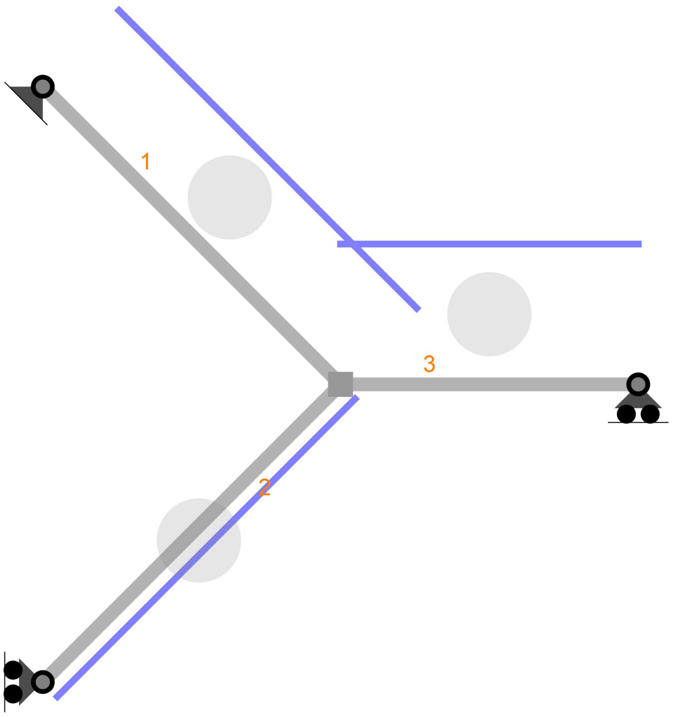

1
1
$\frac{1}{\sqrt{2}}$
$\frac{1}{\sqrt{2}}$
$\frac{L}{\sqrt{2}}$
$\frac{1}{2}$
$\frac{L}{\sqrt{2}}$
$\frac{1}{2}$
$\frac{1}{2}$
$\frac{1}{2}$

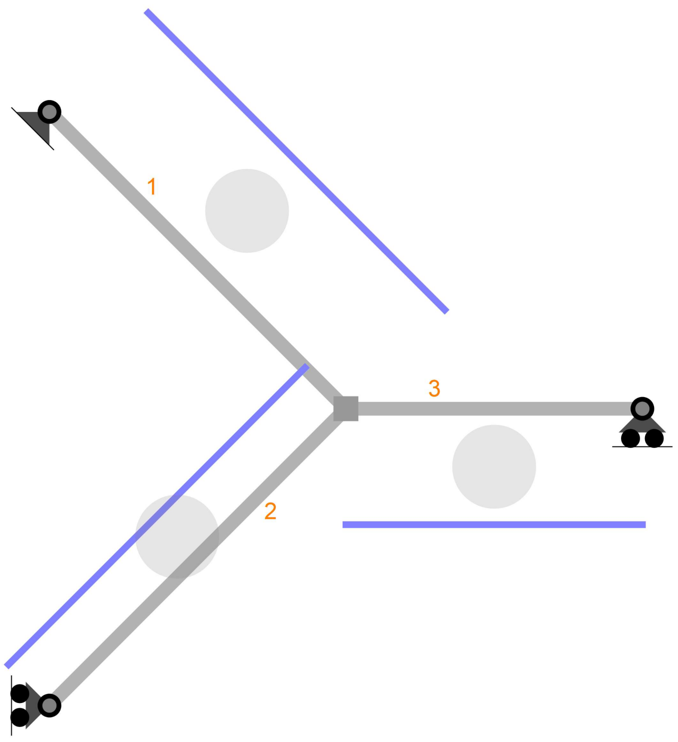

1
3
2

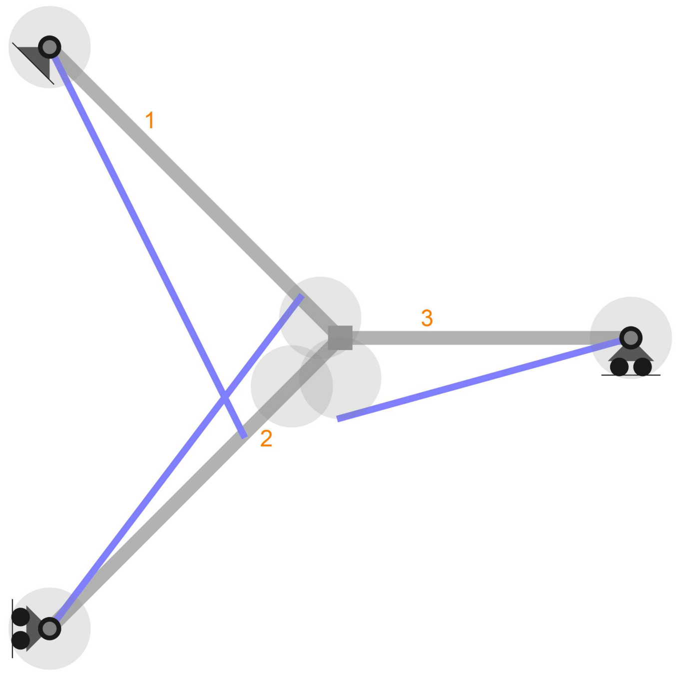

1
3
2


1
3
2


5F / (2 √2) − F
F / (2 √2)
F / (2 √2)
FL / 2
5F / (2√2) − F
F − F / √2
F − F / √2
F
1/2 (√2 − 1) F L
−1/2 (√2 − 2) F L


1
3
2


1
3
2


1
3
2