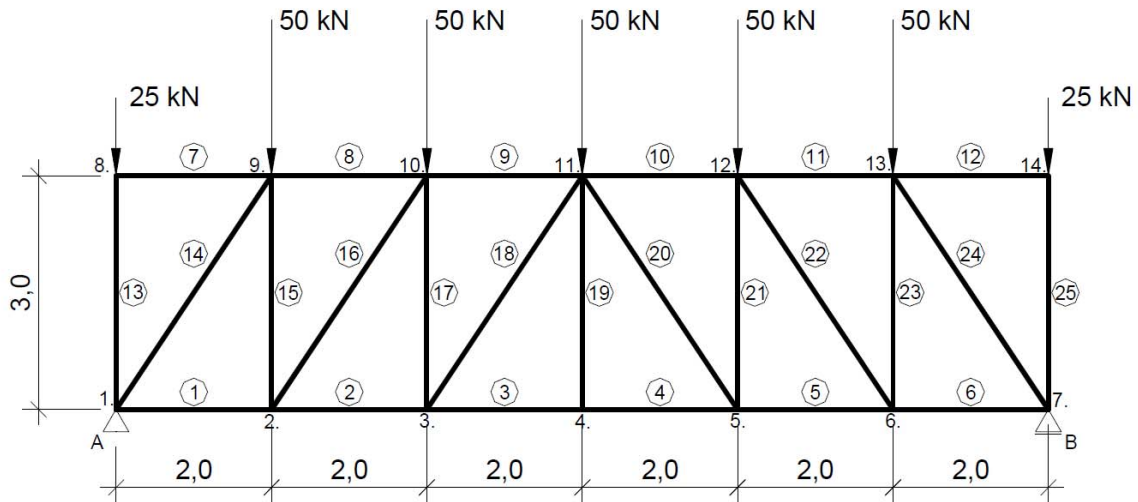
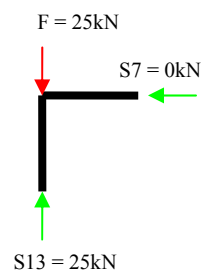


Opgave 2.1



$$F_{Av} = F_{Bv} = 300 / 2 = 150 \text{ kN}$$

Knoop 8



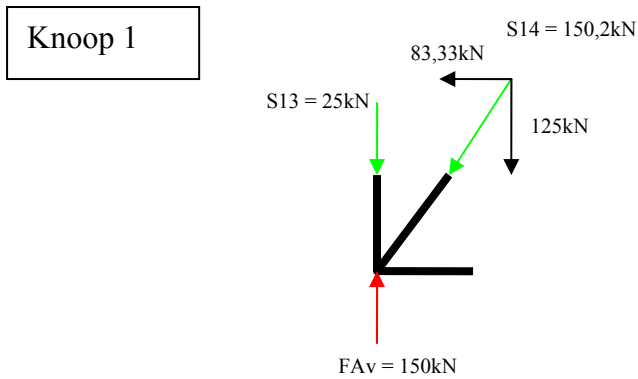
2 staven in een knooppunt waarbij de kracht op 1 staaf in het verlengde ligt van die staaf, dan is de andere staaf een nulstaaf

$$\begin{aligned} \sum V &= 0 \\ 25 - S_{13} &= 0 \\ S_{13} &= 25 \text{ kN} \end{aligned}$$

Druk

$$\begin{aligned} \sum H &= 0 \\ 0 - S_7 &= 0 \\ S_7 &= 0 \text{ kN} \end{aligned}$$

Nulstaaf



$$\sum V = 0$$

$$-F + S13 + N14v = 0$$

$$-150 + 25 + N14v = 0$$

$$N14v = 125 \text{ kN}$$

$$N14h = 125 / \sin(56,3^\circ) = 83,33 \text{ kN}$$

$$N14 = 150,2 \text{ kN (pythagoras)}$$

Druk

$$\sum H = 0$$

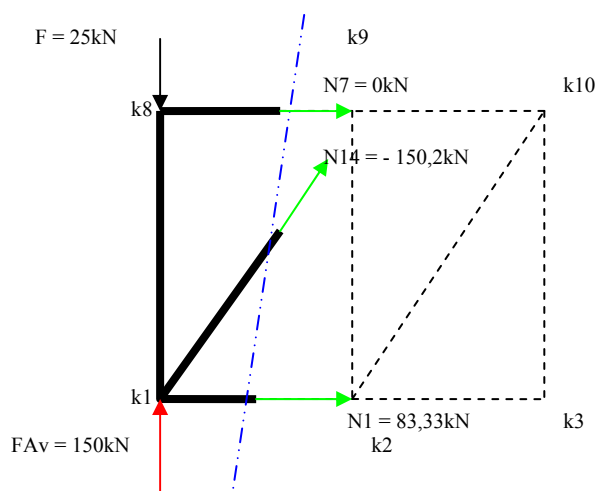
$$S1 - S14h = 0$$

$$S1 - 83,33 = 0$$

$$S1 = 83,33 \text{ kN}$$

Trek

Volgens de Sneede van Ritter



Sneede aanbrengen door staaf 7, 14 en 1, ga uit van trekkrachten.

$$\sum M \text{ t.o.v. } k1 = 0$$

$$N7 \times 3 = 0$$

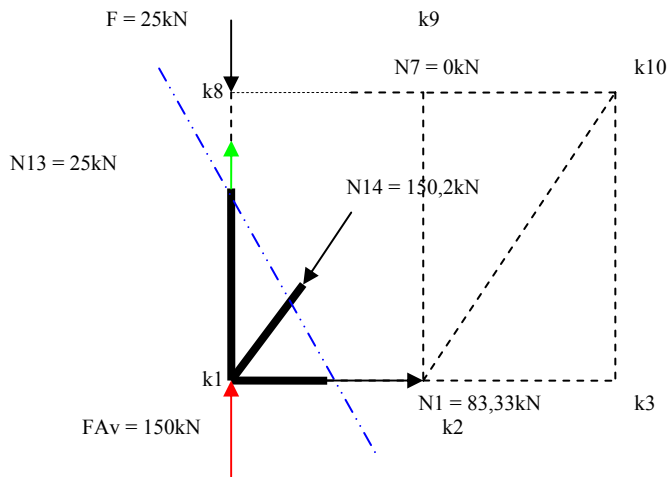
$$N7 = 0 \text{ kN}$$

Nulstaaf

$$\begin{aligned} \sum M \text{ t.o.v. } k_9 \\ (25 \times 2) - (150 \times 2) + 3N_1 &= 0 \\ N_1 &= 83,33 \text{ kN} \\ \text{Trek} \end{aligned}$$

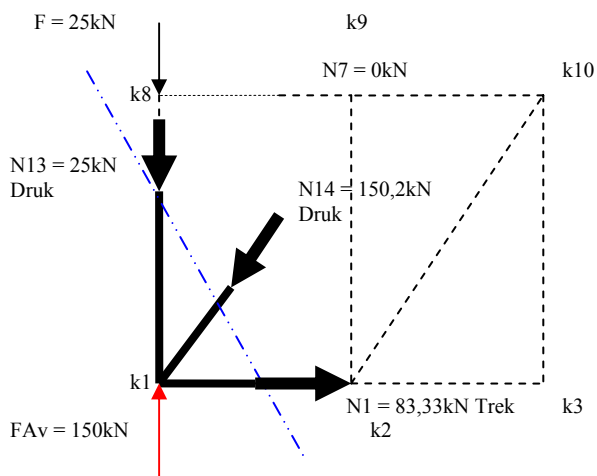
$$\begin{aligned} \sum M \text{ t.o.v. } k_2 \\ (25 \times 2) - 150 \times 2 - N_{14}(2 \times \sin(56,3^\circ)) &= 0 \\ N_{14} &= -150,2 \text{ kN (kracht verkeerd om aangenomen)} \\ \text{Druk} \end{aligned}$$

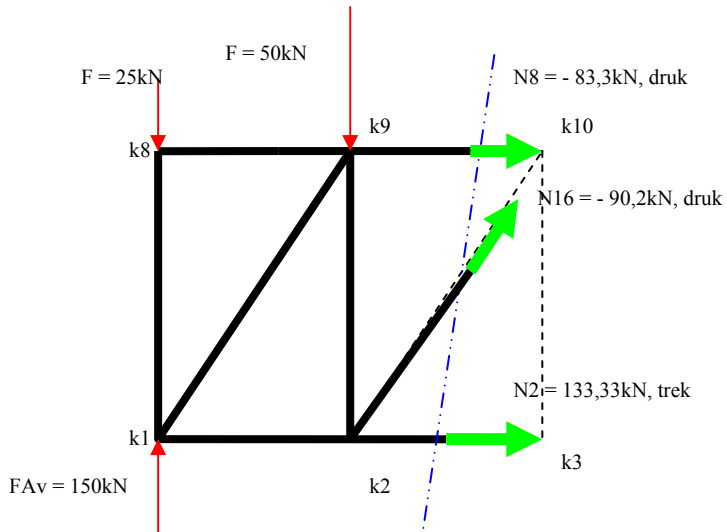
Bepalen van N_{13} met Snede van Ritter, neem N_{13} aan als trekkracht.



$$\begin{aligned} \sum M \text{ t.o.v. } k_2 &= 0 \\ -(150 \times 2) + (150,2 \times 1,66) - (N_{13} \times 2) &= 0 \\ N_{13} &= -25 \text{ kN (kracht verkeerd om aangenomen)} \\ \text{Druk} \end{aligned}$$

Schema nu met de krachten in de juiste richting

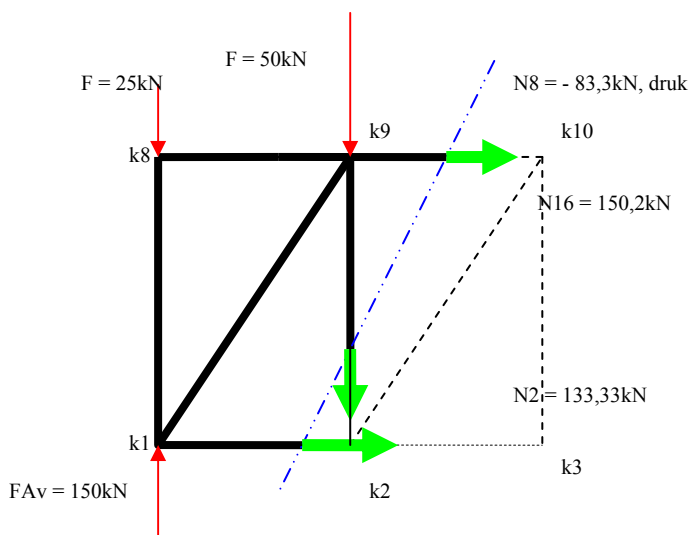




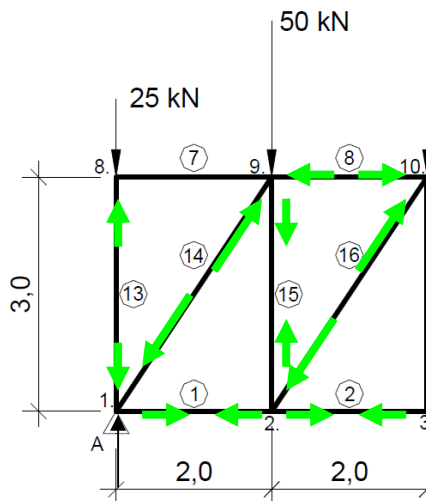
$$\begin{aligned} \sum M \text{ t.o.v. } k2 &= 0 \\ (25 \times 2) - (150 \times 2) - (N8 \times 3) &= 0 \\ N8 &= -83,33\text{kN} \text{ (kracht verkeerd om aangenomen)} \\ \text{Druk} \end{aligned}$$

$$\begin{aligned} \sum M \text{ t.o.v. } k10 &= 0 \\ (25 \times 4) + (50 \times 2) - (150 \times 4) + (3 \times N2) &= \\ N2 &= 133,33\text{kN} \\ \text{Trek} \end{aligned}$$

$$\begin{aligned} \sum M \text{ t.ov. } k3 &= 0 \\ (25 \times 4) + (50 \times 2) - (150 \times 4) + (83,33 \times 3) - (\sin(56,31) \times 2 \times N16) &= 0 \\ N16 &= -90,2 \text{ kN (kracht verkeerd om aangenomen)} \\ \text{Druk} \end{aligned}$$



$$\begin{aligned} \sum M \text{ t.o.v. } k1 &= 0 \\ -(50 \times 2) + (83,33 \times 3) - (N15 \times 2) &= 0 \\ N15 &= 75\text{kN} \\ \text{Trek} \end{aligned}$$



Voor de overige knooppunten dezelfde werkwijze volgen.

Opgave 2.1

$$F_{v;A} = 150,0 \text{ kN}$$

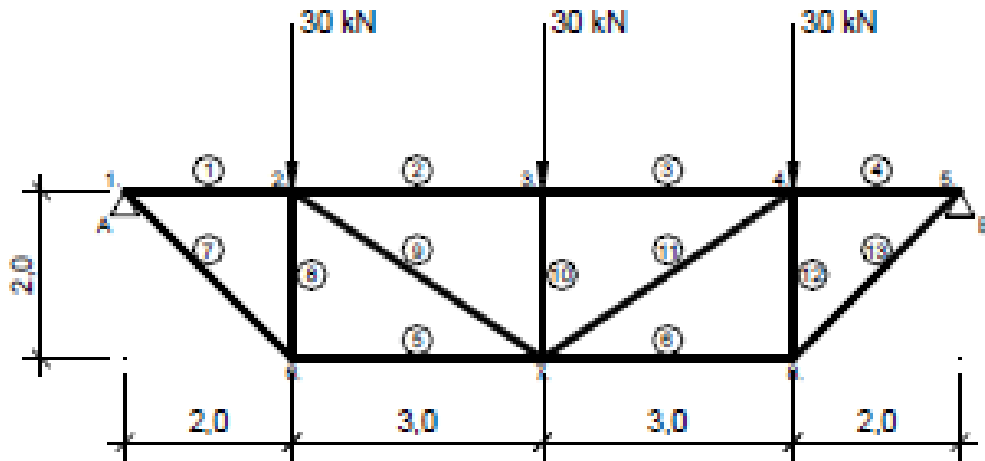
$$F_{h;A} = 0,0 \text{ kN}$$

$$F_{v;B} = 150,0 \text{ kN}$$

$$F_{h;B} = 0,0 \text{ kN}$$

staaf	kracht (kN)
1	83,3
2	133,3
3	150,0
4	150,0
5	133,3
6	83,3
7	0,0
8	-83,3
9	-133,3
10	-133,3
11	-83,3
12	0,0
13	-25
14	-150,2
15	75
16	-90,1
17	25
18	-30,1
19	0,0
20	-30,1
21	25,0
22	-90,1
23	75,0
24	-150,2
25	-25,0

Opgave 2.2 Bereken de staafkrachten in staaf 7, 2, 9, 5



$$\sum M \text{ t.o.v. } A = 0$$

$$-(30 \times 2) - (30 \times 5) - (30 \times 8) + 10F_{Bv} = 0$$

$$F_{Bv} = 45 \text{ kN}$$

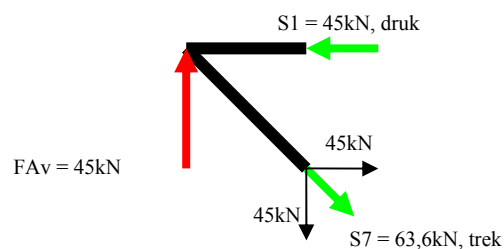
$$\sum V = 0$$

$$30 + 30 + 30 - F_{Av} = 90$$

$$F_{Av} = 45 \text{ kN}$$

Knooppuntsberekening

Knoop 1



$$\begin{aligned}\sum V &= 0 \\ F_{Av} - S_{7v} &= 0 \\ 45 - S_{7v} &= 0 \\ S_{7v} &= 45 \text{ kN, druk}\end{aligned}$$

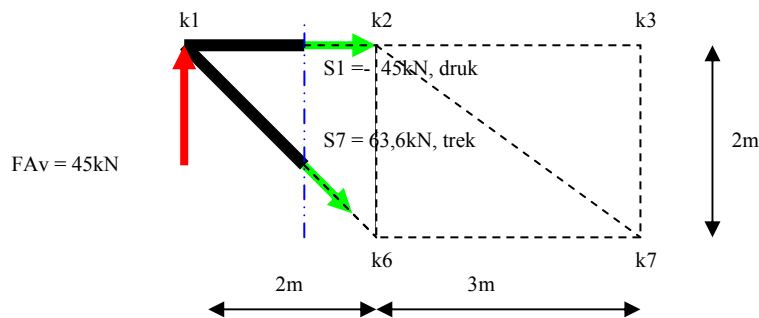
$$\text{Hoek} = 45^\circ$$

$$\begin{aligned}S_{7h} &= 45 \text{ kN} \\ S_7 &= 45\sqrt{2} = 63,6 \text{ kN, trek}\end{aligned}$$

$$\begin{aligned}\sum H &= 0 \\ S_{7h} - S_1 &= 0 \\ 45 - S_1 &= 0 \\ S_1 &= 45 \text{ kN, druk}\end{aligned}$$

Met Sneede van Ritter

Knoop 1



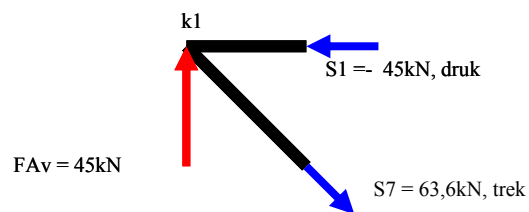
$$\sum M \text{ tov } k_6 = 0$$

$$\begin{aligned}-F_{Av} \times 2 - 2S_1 &= 0 \\ -(45 \times 2) - 2S_1 &= 0 \\ S_1 &= -45, \text{ kN, druk} \quad \leftarrow\end{aligned}$$

$$\sum M \text{ tov } k_2 = 0$$

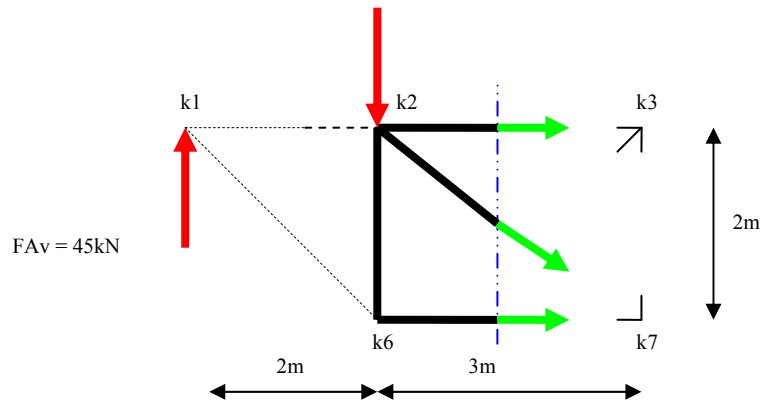
$$\begin{aligned}-F_{Av} \times 2 + S_7 \times \sqrt{2} &= 0 \\ -(45 \times 2) + S_7\sqrt{2} &= 0\end{aligned}$$

$$S_7 = 63,6 \text{ kN, trek} \quad \rightarrow$$



Staven 2,9, 5

S1 = - 45kN, druk



$$\sum M \text{ tov } k2 = 0$$

$$-FA_v \times 2 + S5 \times 2 = 0$$

$$-45 \times 2 = - S5 \times 2$$

$$S5 = 45 \text{ kN, trek} \longrightarrow$$

$$\sum M \text{ t.ov. } k7$$

$$-FA_v \times 5 + F \times 3 - S2 \times 2 = 0$$

$$-45 \times 5 + 30 \times 3 - S2 \times 2 = 0$$

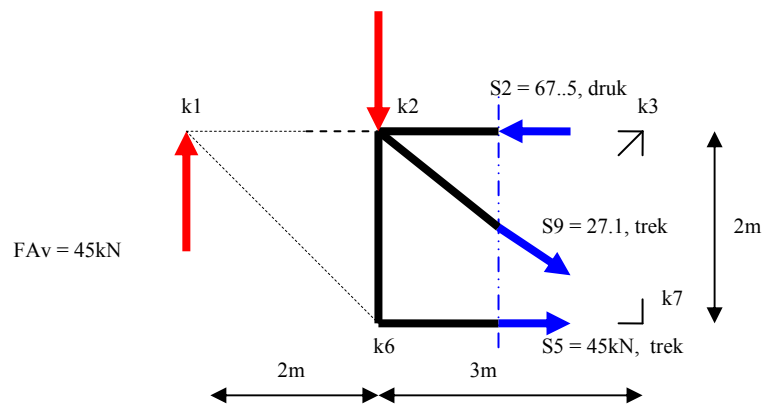
$$S2 = 67,5 \text{ kN, druk} \longrightarrow$$

$$\sum M = 0 \text{ tov } k6$$

$$-FA_v \times 2 - S9 \times (\sin(56,3^\circ) \times 2) + S2 \times 2 = 0$$

$$-45 \times 2 - S9 \times (\sin(56,3^\circ) \times 2) + 67,5 \times 2 = 0$$

$$S9 = 27,1 \text{ kN, trek} \longrightarrow$$



Staaf S8, knooppuntberekening

Knooppunt 6

$$\sum V = 0$$

$$-S7 + S8 = 0$$

$$-45 + S8 = 0$$

$$S8 = 45 \text{ kN, druk}$$

Staaf S10, knooppuntberekening

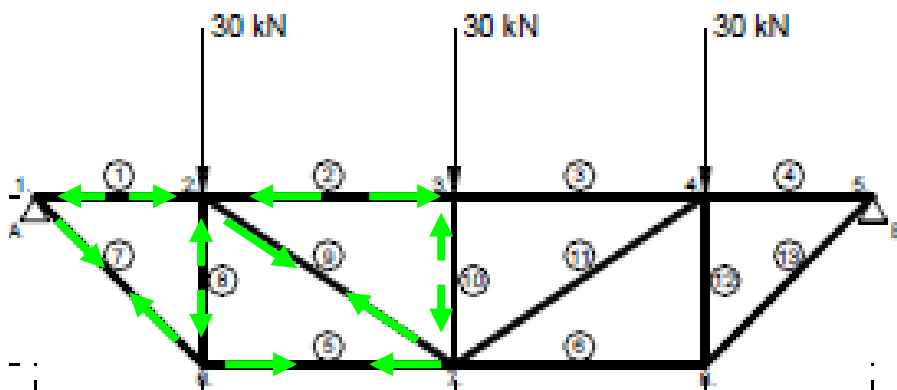
$$\sum V = 0$$

$$F - S10 = 0$$

$$30 - S10 = 0$$

$$S10 = 30 \text{ kN, druk}$$

Overige staafkrachten volgen uit de symmetrie van het spant.



Opgave 2.2

$$F_{v,A} = 45,0 \text{ kN}$$

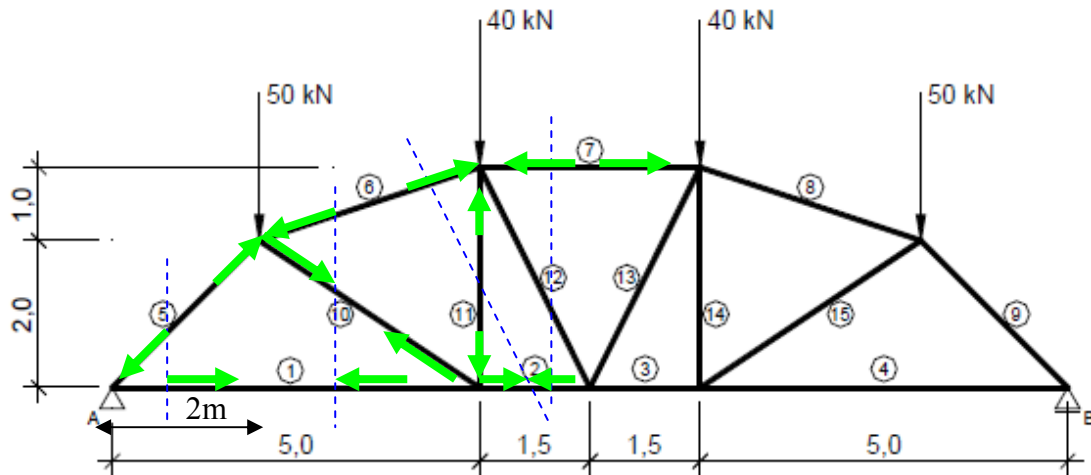
$$F_{h,A} = 0,0 \text{ kN}$$

$$F_{v,B} = 45,0 \text{ kN}$$

$$F_{h,B} = 0,0 \text{ kN}$$

staaf	kracht (kN)
1	-45,0
2	-67,5
3	-67,5
4	-45,0
5	45,0
6	45,0
7	63,6
8	-45,0
9	27,0
10	-30,0
11	27,0
12	-45,0
13	63,6

Opgave 2.3



$$F_{Av} = F_{Bv} = 180 / 2 = 90 \text{ kN}$$

$$\text{Hoek } k6-k1-k2 = 45$$

$$\text{Hoek } k1-k2-k6 = 33,69$$

$$\text{Hoek } k2-k6-k1 = 101,31$$

$$\text{Hoek } k6-k2-k7 = 56,3$$

$$\text{Hoek } k2-k7-k6 = 71,6$$

$$\text{Hoek } k2-k6-k7 = 52,125$$

$$\text{Hoek } k2-k7-k3 = 26,57$$

$$\text{Hoek } k2-k3-k7 = 63,43$$

$$\text{Hoek } k3-k7-k8 = 63,43$$

$$\text{Hoek } k7-k3-k8 = 53,13$$

$$\sum M \text{ tov } k1 = 0$$

$$-F_{Av} \times 5 - S5 \times (\sin(45) \times 5) = 0$$

$$-90 \times 5 - S5 \times (\sin(45) \times 5) = 0$$

$$S5 = 127,3 \text{ kN, druk}$$

$$\sum M \text{ tov } k6 = 0$$

$$-F_{Av} \times 2 + S1 \times 2 = 0$$

$$-90 \times 2 + S1 \times 2 = 0$$

$$S1 = 90 \text{ kN, trek}$$

$$\sum M \text{ tov } k2 = 0$$

$$\text{Lengt } S10 = S10 / \sin(45) = 5 / \sin(101,3) \rightarrow S10 = 3,61 \text{ m}$$

$$\text{Loodrechte afstand van } S6 \text{ tot aan } k2 = 3,61 / \sin(90) = a / \sin(52,2) = 2,85 \text{ m}$$

$$-F_{Av} \times 5 + 50 \times 3 - S6 \times 2,85 = 0$$

$$-90 \times 5 + 50 \times 3 - S6 \times 2,85 = 0$$

$$S6 = 105,3 \text{ kN, druk}$$

$\sum M$ tov k8

Lengte staaf 6 (S6): $\sqrt{1^2 + 3^2} = 3,16m$

Loodrechte afstand(a) van staaf 10(S10) tot aan k8=: $3,16 \times \sin(52,125) = 2,49m$

$$-F_{Av} \times 5 + 50 \times 3 + S1 \times 3 + S10 \times 2,49 = 0$$

$$-90 \times 5 + 50 \times 3 + 90 \times 3 + S10 \times 2,49 = 0$$

$$S10 = 12kN, \text{ trek}$$

$\sum M$ tov k7 = 0

$$-F_{Av} \times 5 + 50 \times 3 + S2 \times 3 = 0$$

$$-90 \times 5 + 50 \times 3 + S2 \times 3 = 0$$

$$S2 = 100kN, \text{ trek}$$

$\sum M$ tov k6 = 0

$$-F_{Av} \times 2 + S2 \times 2 + S11 \times 3 = 0$$

$$-90 \times 2 + 100 \times 2 + S11 \times 3 = 0$$

$$S11 = 6,7 kN, \text{ druk}$$

$\sum M$ tov k8 = 0

Loodrechte afstand(a) S12 tot aan k8: $3/\sin(90) = a / \sin(63,43) \rightarrow a = 2,68m$

$$-F_{Av} \times 8 + 50 \times 6 + 40 \times 3 + S2 \times 3 + S12 \times 2,68 = 0$$

$$-90 \times 8 + 50 \times 6 + 100 \times 3 + 40 \times 3 - S12 \times 2,68 = 0$$

$$S12 = 0 kN, \text{ nulstaaf}$$

$\sum M$ tov k2 = 0

$$-F_{Av} \times 5 + 50 \times 3 - S7 \times 3 = 0 \text{ (let op: } S12 = 0, \text{ niet meegenomen in de vergelijking)}$$

$$-90 \times 5 + 50 \times 3 - S7 \times 3 = 0$$

$$S7 = 100kN, \text{ druk}$$

Overige staafkrachten volgen uit de symmetrie van het spant.

Opgave 2.3

$$F_{v,A} = 90,0 kN$$

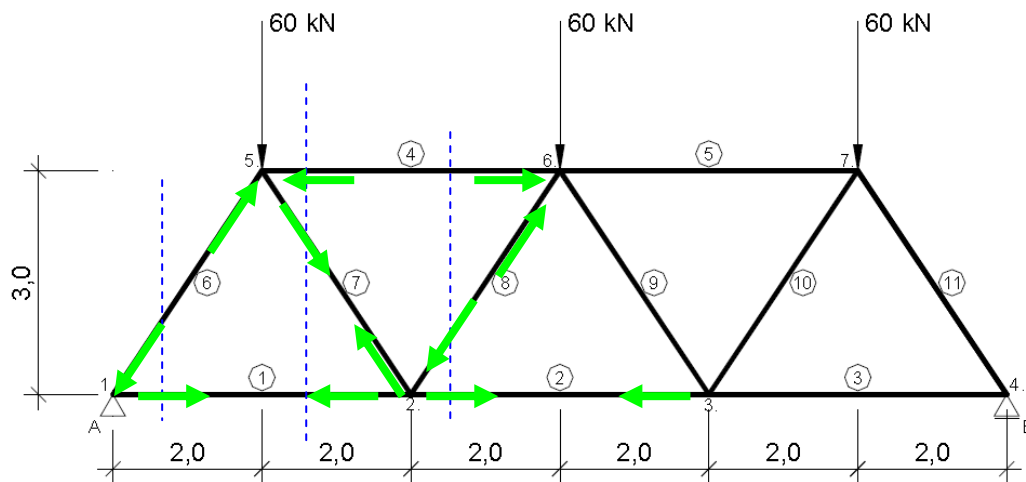
$$F_{h,A} = 0,0 kN$$

$$F_{v,B} = 90,0 kN$$

$$F_{h,B} = 0,0 kN$$

staaf	kracht (kN)
1	90,0
2	100,0
3	100,0
4	90,0
5	-127,3
6	-105,4
7	-100,0
8	-105,4
9	-127,3
10	12,0
11	-6,7
12	0,0
13	0,0
14	-6,7
15	12,0

Opgave 2.4



$$F_{Av} = F_{Bv} = 180 / 2 = 90 \text{ kN}$$

$$\text{Hoek } k5 - k1 - k2 = 56,31$$

$$\text{Hoek } k1 - k2 - k5 = 56,31$$

$$\text{Hoek } k1 - k5 - k2 = 67,38$$

$$\sum M \text{ tov } k2 = 0$$

$$\text{Lengte } S6 = \sqrt{2^2 + 3^2} = 3,61 \text{ m}$$

$$\text{Loodrechte afstand (a) staaf 6 (S6) tot aan } k2: 4 \times \sin(56,31) = 3,33 \text{ m}$$

$$-F_{Av} \times 4 - S6 \times 3,33 = 0$$

$$-90 \times 4 - S6 \times 3,33 = 0$$

$$S6 = 108,1 \text{ kN, druk}$$

$$\sum M \text{ tov } k5 = 0$$

$$-F_{Av} \times 2 + S1 \times 3 = 0$$

$$-90 \times 2 + S1 \times 3 = 0$$

$$S1 = 60 \text{ kN, trek}$$

$$\sum M \text{ tov } k2 = 0$$

$$-F_{Av} \times 4 + 60 \times 2 - S4 \times 3 = 0$$

$$-90 \times 4 + 60 \times 2 - S4 \times 3 = 0$$

$$S4 = 80 \text{ kN, druk}$$

$$\sum M \text{ tov } k1 = 0$$

$$-60 \times 2 + S4 \times 3 - S7 \times 3,33 = 0$$

$$-60 \times 2 + 80 \times 3 - S7 \times 3,33 = 0$$

$$S7 = 36 \text{ kN, trek}$$

$$\sum M_{\text{toev } k6} = 0$$

$$-F_{Av} \times 6 + 60 \times 4 + S_2 \times 3 = 0$$

$$-90 \times 6 + 60 \times 4 + S_2 \times 3 = 0$$

$$S_2 = 100 \text{ kN, trek}$$

$$\sum M_{\text{toev } k5} = 0$$

$$-F_{Av} \times 2 + S_2 \times 3 + S_8 \times 3,33 = 0$$

$$-90 \times 2 + 100 \times 3 + S_8 \times 3,33 = 0$$

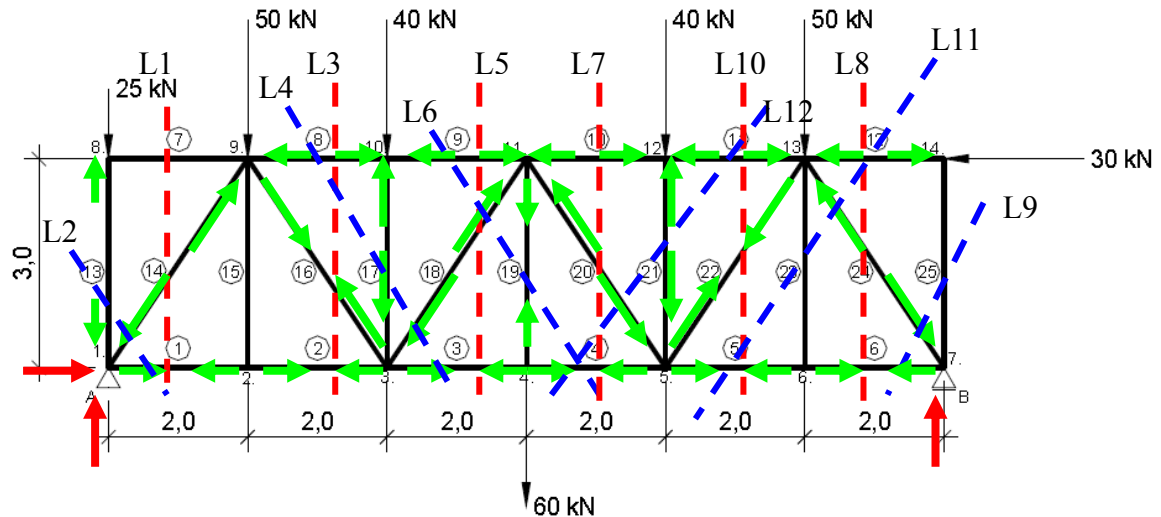
$$S_8 = 36 \text{ kN, druk}$$

Overige staafkrachten volgen uit de symmetrie van het spant

Opgave 2.4

	staaf	kracht (kN)
$F_{v;A} = 90,0 \text{ kN}$	1	60,0
$F_{h;A} = 0,0 \text{ kN}$	2	100,0
$F_{v;B} = 90,0 \text{ kN}$	3	60,0
$F_{h;B} = 0,0 \text{ kN}$	4	-80,0
	5	-80,0
	6	-108,2
	7	36,1
	8	-36,1
	9	-36,1
	10	36,1
	11	-108,2

Opgave 2.5



$$\sum M \text{ tov } A = 0$$

$$-50 \times 2 - 40 \times 4 - 60 \times 6 - 40 \times 8 - 50 \times 10 + 30 \times 3 + F_{Bv} \times 12 = 0$$

$$F_{Bv} = 112,5 \text{ kN}$$

$$\sum V = 0$$

$$-F_{Av} + 25 + 50 + 40 + 60 + 40 + 50 - 112,5 = 0$$

$$F_{Av} = 152,5 \text{ kN}$$

$$\sum H = 0$$

$$F_{Ah} - 30 = 0$$

$$F_{Ah} = 30 \text{ kN}$$

$$\text{Hoek } k9 - k1 - k2 = 56,31$$

$$\text{Hoek } k8 - k1 - k9 = 33,69$$

$$\text{Hoek } k1 - k9 - k2 = 33,69$$

$$\text{Hoek } k1 - k9 - k8 = 56,31$$

Loodrechte afstand diagonalen tot aan knooppunten:

$$a = 2 \times \sin(56,31) = 1,66 \text{ m}$$

SNIJLIJN 1

$$\sum M \text{ tov } k9 = 0$$

$$-F_{Av} \times 2 + F_{Ah} \times 3 + 25 \times 2 + S1 \times 3 = 0$$

$$-152,5 \times 2 + 30 \times 3 + 25 \times 2 + S1 \times 3 = 0$$

$$S1 = 55 \text{ kN, trek}$$

$$\sum M \text{ tov } k8 = 0$$

$$F_{Ah} \times 3 + S1 \times 3 + S14 \times 1,66 = 0$$

$$30 \times 3 + 55 \times 3 + S14 \times 1,66 = 0$$

$$S14 = 153,6 \text{ kN, druk}$$

$$\sum M \text{ tov } k2 = 0$$

$$-F_{Av} \times 2 + F \times 2 + S14 \times 1,66 - S7 \times 3 = 0$$

$$-152,5 \times 2 + 25 \times 2 + 153,6 \times 1,66 - S7 \times 3 = 0$$

$S_7 = 0$ kN, nulstaaf

SNIJLIJN 2

$$\sum M \text{ tov } k_9 = 0$$

$$-F_{Av} \times 2 + F_{Ah} \times 3 + S_1 \times 3 - S_{13} \times 2 = 0$$

$$-152,5 \times 2 + 30 \times 3 + 55 \times 3 - S_{13} \times 2 = 0$$

$$S_{13} = 25 \text{ kN, druk}$$

SNIJLIJN 3

$$\sum M \text{ tov } k_3 = 0$$

$$-F_{Av} \times 4 + 25 \times 4 + 50 \times 2 - S_8 \times 3 = 0$$

$$-152,5 \times 4 + 25 \times 4 + 50 \times 2 - S_8 \times 3 = 0$$

$$S_8 = 136,7 \text{ kN, druk}$$

$$\sum M \text{ tov } k_2 = 0$$

$$-F_{Av} \times 2 + F \times 2 + S_8 \times 3 - S_{16} \times 1,66 = 0$$

$$-152,5 \times 2 + 25 \times 2 + 136,7 \times 3 - S_{16} \times 1,66 = 0$$

$$S_{16} = 93,4 \text{ kN, trek}$$

$$\sum M \text{ tov } k_9 = 0$$

$$-F_{Av} \times 2 + F_{Bh} \times 3 + F \times 2 + S_2 \times 3 = 0$$

$$-152,5 \times 2 + 30 \times 3 + 25 \times 2 + S_2 \times 3 = 0$$

$$S_2 = 55 \text{ kN, trek}$$

Staaf 15 (S_{15}) is een nulstaaf. Zie knooppunt 2:

3 staven in een onbelaste knooppunt waarvan 2 in elkaars verlengde liggen dan moet de 3^e staaf een nulstaaf zijn.

$$S_{15} = 0 \text{ kN, nulstaaf.}$$

SNIJLIJN 5

$$\sum M \text{ tov } k_3 = 0$$

$$-F_{Av} \times 4 + 25 \times 4 + 50 \times 2 - S_9 \times 3 = 0$$

$$-152,5 \times 4 + 25 \times 4 + 50 \times 2 - S_9 \times 3 = 0$$

$$S_9 = 136,7 \text{ kN, druk}$$

$$\sum M \text{ tov } k_{11} = 0$$

$$-F_{Av} \times 6 + F_{Bh} \times 3 + 25 \times 3 + 50 \times 4 + 40 \times 2 + S_3 \times 3 = 0$$

$$-152,5 \times 6 + 30 \times 3 + 25 \times 6 + 50 \times 4 + 40 \times 2 + S_3 \times 3 = 0$$

$$S_3 = 131,7 \text{ kN, trek}$$

$$\sum M \text{ tov } k_{10} = 0$$

$$-F_{Av} \times 4 + F_{Bh} \times 3 + 25 \times 4 + 50 \times 2 + 131,7 \times 3 + S_{18} \times 1,66 = 0$$

$$-152,5 \times 4 + 30 \times 3 + 25 \times 4 + 50 \times 2 + 131,7 \times 3 + S_{18} \times 1,66 = 0$$

$$S_{18} = 45,2 \text{ kN, druk}$$

SNIJLIJN 4

$$\sum M \text{ tov } k_4 = 0$$

$$-F_{Av} \times 6 + 25 \times 6 + 50 \times 4 + S_8 \times 3 + S_{18} \times 1,66 - S_{17} \times 2 = 0$$

$$-152,5 \times 6 + 25 \times 6 + 50 \times 4 + 136,7 \times 3 + 45,2 \times 1,66 - S_{17} \times 2 = 0$$

$$S_{17} = 40,2 \text{ kN, druk}$$

SNIJLIJN 6

$$\sum M \text{ tov } K_5 = 0$$

$$-F_{av} \times 8 + 25 \times 8 + 50 \times 6 + 40 \times 4 + 60 \times 2 + 136,7 \times 3 + 45,2 \times 3,33 - S_{19} \times 2 = 0$$

$$S_{19} = 60,3 \text{ kN, trek}$$

$$\sum M \text{ tov } k_{11} = 0$$

$$-F_{Av} \times 6 + F_{Bh} \times 3 + 25 \times 6 + 50 \times 4 + 40 \times 2 + S_4 \times 3 = 0$$

$$-152,5 \times 6 + 30 \times 3 + 25 \times 6 + 50 \times 4 + 40 \times 2 + S_4 \times 3 = 0$$

$$S_4 = 131,9 \text{ kN, trek}$$

SNIJLIJN 7

$$\sum M \text{ tov } k_5 = 0$$

$$-F_{Av} \times 8 + 25 \times 8 + 50 \times 6 + 40 \times 4 + 60 \times 2 - S_{10} \times 3 = 0$$

$$S_{10} = 146,7 \text{ kN, druk}$$

$$\sum M \text{ tov } k_4 = 0$$

$$-F_{Av} \times 6 + 25 \times 6 + 50 \times 4 + 40 \times 2 + S_{10} \times 3 - S_{20} \times 1,66 = 0$$

$$-152,5 \times 6 + 25 \times 6 + 50 \times 4 + 40 \times 2 + 146,7 \times 3 - S_{20} \times 1,66 = 0$$

$$S_{20} = 27 \text{ kN, druk}$$

SNIJLIJN 8

$$\sum M \text{ tov } k_7 = 0$$

$$S_{12} \times 3 + F_{Bv} \times 2 = 0$$

$$S_{12} \times 3 + 30 \times 3 = 0$$

$$S_{12} = 30 \text{ kN, druk}$$

$$\sum M \text{ tov } k_6 = 0$$

$$-S_{12} \times 3 + F_{Bh} \times 3 + F_{Bv} \times 2 + S_{24} \times 1,66 = 0$$

$$-30 \times 3 + 30 \times 3 + 112,5 \times 2 + S_{24} \times 1,66 = 0$$

$$S_{24} = 135,5 \text{ kN, druk}$$

SNIJLIJN 9

$$\sum M \text{ tov } k_6 = 0$$

$$F_{Bv} \times 2 - S_{24} \times 1,66 + S_{25} \times 2 = 0$$

$$112,5 \times 2 - 135,5 \times 1,66 + S_{25} \times 2 = 0$$

$$S_{25} = 0 \text{ kN, nulstaaf}$$

$$\sum M \text{ tov } k_{13} = 0$$

$$112,5 \times 2 + 0 \times 2 - S_6 \times 3 = 0$$

$$S_6 = 75 \text{ kN, trek}$$

SNIJLIJN 10

$$\sum M \text{ tov } k_{13} = 0$$

$$F_{Bv} \times 2 - S_5 \times 3 = 0$$

$$112,5 \times 2 - S_5 \times 3 = 0$$

$$S_5 = 75 \text{ kN, trek}$$

$$\sum M \text{ tov } k_{12} = 0$$

$$F_{Bv} \times 4 - 50 \times 2 - S_5 \times 3 - S_{22} \times 1,66 = 0$$

$$112,5 \times 4 - 50 \times 2 - 75 \times 3 - S_{22} \times 1,66 = 0$$

$$S_{22} = 75,3 \text{ kN, trek}$$

$$\sum M \text{ tov } k_5 = 0$$

$$F_{Bv} \times 4 + F_{Bh} \times 3 - 50 \times 2 + S_{11} \times 3 = 0$$

$$112,5 \times 4 + 30 \times 3 - 50 \times 2 + S_{11} \times 3 = 0$$

$$S_{11} = 146,7 \text{ kN, druk}$$

SNIJLIJN 10

$$\sum M \text{ tov } k_7 = 0$$

$$F_{Bh} \times 3 - S_{12} \times 3 - S_{23} \times 2 = 0$$

$$S_{23} = 0 \text{ kN, nulstaaf}$$

SNIJLIJN 10

$$\sum M \text{ tov } k_{13} = 0$$

$$F_{Bv} \times 2 + S_{20} \times 3,33 - S_4 \times 3 - S_{21} \times 2 = 0$$

$$112,5 \times 2 + 27 \times 3,33 - 131,7 \times 3 - S_{21} \times 2 = 0$$

$S_{21} = 40,1 \text{ kN}$, druk

Opgave 2.5

$$F_{v:A} = 152,5 \text{ kN}$$
$$F_{h:A} = 30,0 \text{ kN}$$
$$F_{v:B} = 112,5 \text{ kN}$$
$$F_{h:B} = 0,0 \text{ kN}$$

staaf	kracht (kN)
1	55,0
2	55,0
3	131,7
4	131,7
5	75,0
6	75,0
7	0,0
8	-136,7
9	-136,7
10	-146,7
11	-146,7
12	-30,0
13	-25,0

staaf	kracht (kN)
14	-153,2
15	0,0
16	93,1
17	-40,0
18	-45,1
19	60,0
20	-27,0
21	-40,0
22	75,1
23	0,0
24	-135,2
25	0,0