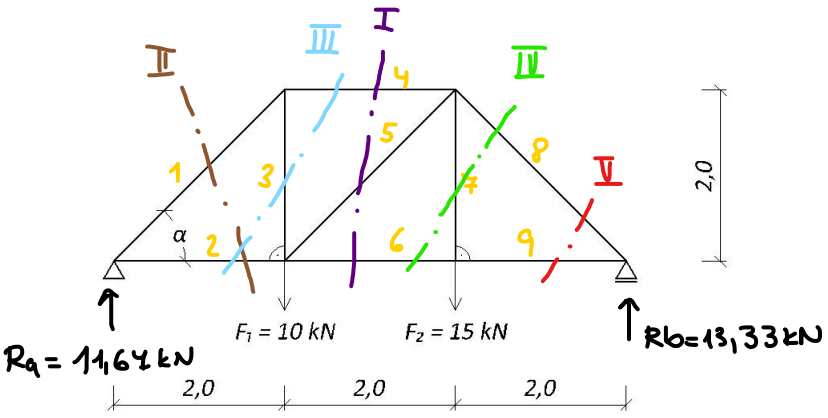
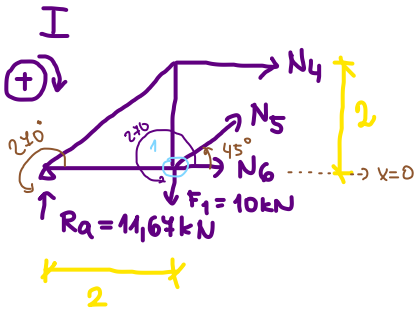
Příklad: Vyřešte osové síly v prutech příhradového nosníku pomocí průsečné metody.



$\Sigma M = 0$
$\Sigma F_x = 0$
$\Sigma F_z = 0$

Výsledky:

N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9
−16,5	11,67	11,67	−11,67	−2,36	13,33	15,0	−18,85	



• v bodě 1: $\Sigma M = 0$

$R_a \cdot 2 + N_4 \cdot 2 = 0$

$11{,}67 \cdot 2 + N_4 \cdot 2 = 0$

$N_4 = -11{,}67$ kN

• $\Sigma F_x = 0$ (cos)

$-R_a \cdot \cos 240 + F_1 \cdot \cos 270 + N_4 \cdot \cos 0 + N_5 \cdot \cos 45° + N_6 \cdot \cos 0 = 0$

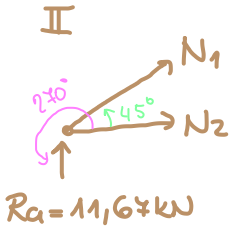
$-11{,}67 \cdot 1 + (-2{,}36) \cdot 0{,}707 + N_6 \cdot 1 = 0$

$N_6 = 13{,}33$ kN

• $\Sigma F_z = 0$ (sin)

$-R_a \cdot \sin 240 + F_1 \cdot \sin 270 + N_4 \cdot \sin 0 + N_5 \cdot \sin 45° + N_6 \cdot \sin 0 = 0$

$-11{,}67 \cdot (-1) + 10 \cdot (-1) + N_5 \cdot 0{,}707 = 0 \rightarrow N_5 = -2{,}36$ kN



• $\Sigma M = 0$

• $\Sigma F_x = 0$

$N_1 \cdot \cos 45° + N_2 \cdot \cos 0 - R_a \cdot \cos 240 = 0$

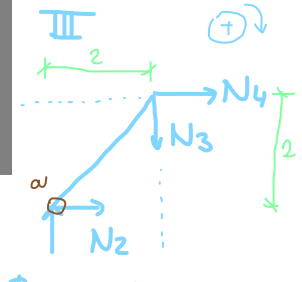
$-16{,}5 \cdot 0{,}707 + N_2 \cdot 1 = 0 \rightarrow N_2 = 11{,}67$ kN

• $\Sigma F_z = 0$

$N_1 \cdot \sin 45° + N_2 \cdot \sin 0 - R_a \cdot \sin 240 = 0$

$N_1 \cdot 0{,}707 - 11{,}67 \cdot (-1) = 0$

$N_1 = -16{,}5$ kN



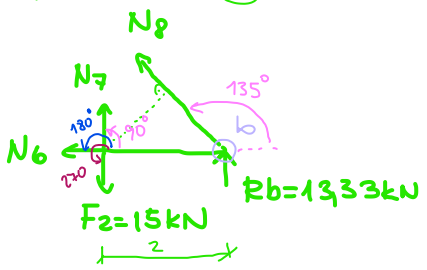
• $\Sigma M = 0$ (styčník a)

$N_3 \cdot 2 + N_4 \cdot 2 = 0$

$N_3 \cdot 2 + (-11{,}67) \cdot 2 = 0$

$N_3 = 11{,}67$ kN

IV



- $\Sigma M = 0$ (styčník b)

$N_7 \cdot 2 - F_2 \cdot 2 = 0$

$N_7 \cdot 2 - 15 \cdot 2 = 0$

$N_7 = 15\,kN$

- $\Sigma F_x = 0$

$-R_b \cdot \cos 270 + N_8 \cdot \cos 135° + N_7 \cdot \cos 90° + N_6 \cdot \cos 180° + F_2 \cdot \cos 270 = 0$

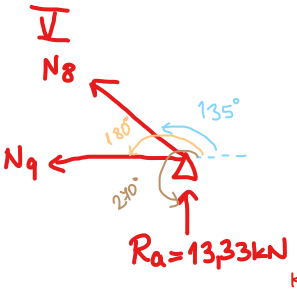
$-18,85 \cdot (-0,707) + 13,33 \cdot (-1) = 0$ ✓

- $\Sigma F_z = 0$

$-R_b \cdot \sin 270 + N_8 \cdot \sin 135° + N_7 \cdot \sin 90° + N_6 \cdot \sin 180° + F_2 \cdot \sin 270° = 0$

$-13,33 \cdot (-1) + N_8 \cdot 0,707 + 15 \cdot 1 + 15 \cdot (-1) = 0 \rightarrow N_8 = -18,85\,kN$

V



$\Sigma M = 0$

$\Sigma F_x = 0$ (cos)

$N_8 \cdot \cos 135° + N_9 \cdot \cos 180° - R_a \cdot \cos 270° = 0$

$(-18,85) \cdot (-0,707) + N_9 \cdot (-1) = 0$

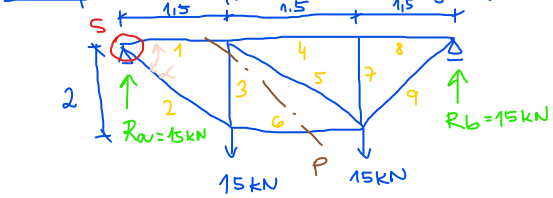
$N_9 = 13,33\,kN$

kontrola: $\Sigma F_z = 0$

$N_8 \cdot \sin 135° + N_9 \cdot \sin 180° - R_a \cdot \sin 270° = 0$

$(-18,85) \cdot 0,707 - 13,33 \cdot (-1) = 0$ ✓

mat. příklad: Vypočtěte osové síly v prutech 1, 2, 3 a 6. Dokažte stat. určitost.

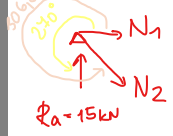


$p = 2 \cdot s - 3 \rightarrow q = 2 \cdot 6 - 3$ ✓

$R_a = 15\,kN = R_b$

$\operatorname{tg}\alpha = \frac{2}{1,5} \rightarrow \alpha = 53,13°$

STYČNÍK. METODA $\Sigma F_x = 0$; $\Sigma F_z = 0$



- $\Sigma F_x = 0$ (cos)

$N_1 \cdot \cos 0° + N_2 \cdot \cos 306,87° - R_a \cdot \cos 270° = 0$

$N_1 \cdot 1 + 18,75 \cdot 0,6 = 0 \rightarrow N_1 = -11,25\,kN$

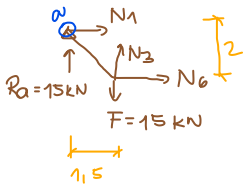
- $\Sigma F_z = 0$ (sin)

$N_1 \cdot \sin 0° + N_2 \cdot \sin 306,87° - R_a \cdot \sin 270° = 0$

$N_2 \cdot (-0,8) - 15 \cdot (-1) = 0 \rightarrow N_2 = 18,75\,kN$

N_1	N_2	N_3	N_6
-11,25	18,75	0	11,25

PRŮSEČNÁ METODA $\Sigma M = 0$; $\Sigma F_x = 0$; $\Sigma F_z = 0$



- $\Sigma M = 0$ (v bodě a)

$-N_3 \cdot 1,5 + F \cdot 1,5 - N_6 \cdot 2 = 0$

$-N_3 \cdot 1,5 + 15 \cdot 1,5 - 11,25 \cdot 2 = 0 \rightarrow N_3 = 0\,kN$

- $\Sigma F_x = 0$ (cos)

$N_1 \cdot \cos 0° + N_3 \cdot \cos 90° + N_6 \cdot \cos 0° - R_a \cdot \cos 270° + F \cdot \cos 270° = 0$

$-11,25 \cdot 1 + N_6 \cdot 1 = 0 \rightarrow N_6 = 11,25\,kN$

kontr. $\Sigma F_z = 0$