Aufgabe 1.1

a) (1) $\overset{+}{\circlearrowleft} \sum M^{(C)} = G \cdot R - H \cdot R - S \cdot r = 0$

(2) $\overset{+}{\rightarrow} \sum F_h = S\,\cos(30°) - N = 0$

(3) $+\uparrow \sum F_v = S\,\sin(30°) - 2\,G - H = 0$

aus (1): $S = \dfrac{R}{r}\,(G - H) = 2\,(G - H)$

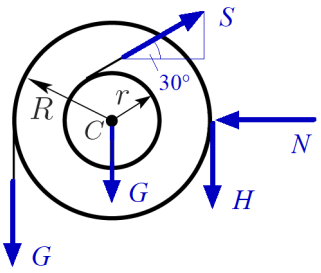
in (3): $H = S\,\sin(30°) - 2\,G = \dfrac{1}{2}\,S - 2\,G = G - H - 2\,G$

$\Rightarrow H = -\dfrac{1}{2}\,G = -1\,\text{kN}$

aus (1): $S = 2\,G - 2\,H = 2\,G + G = 3\,G = 6\,\text{kN}$

aus (2): $N = S\,\cos(30°) = 3\,G \cdot \dfrac{\sqrt{3}}{2} \approx 5,196\,\text{kN}$

$|H| \le \mu_0\,N \quad \Rightarrow \quad \mu_0 \ge \dfrac{|H|}{N} \approx \dfrac{1}{5,196} \approx 0,192$



b) Knoten I:

$S_1 = 0$ Nullstab

$S_3 = S = 6\,\text{kN}$ Zugstab

Knoten B:

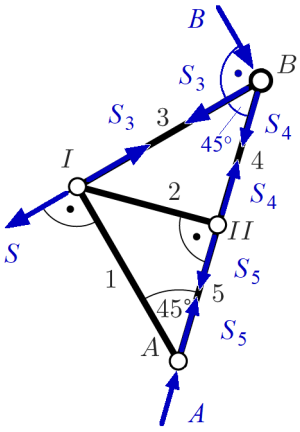
$\overset{+}{\nearrow} \sum F_h = -S_3 - S_4\,\cos(45°) = 0$

$\Rightarrow S_4 = -\dfrac{S_3}{\cos(45°)} = -3\,\sqrt{2}\,G \approx -8,485\,\text{kN}$ Druckstab

Knoten II:

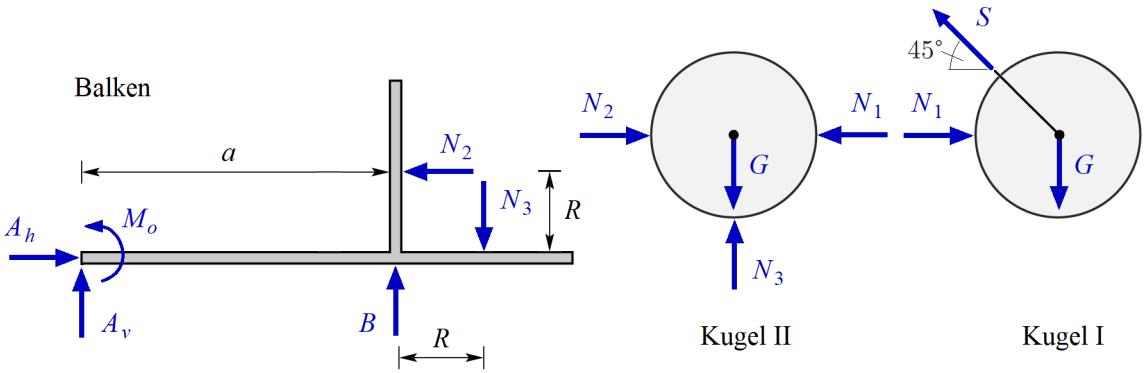
$S_2 = 0$ Nullstab

$S_5 = S_4 = -3\,\sqrt{2}\,G \approx -8,485\,\text{kN}$ Druckstab



Aufgabe 1.2

a)



Kugel I: $\quad +\!\uparrow \sum F_v = S\,\sin(45°) - G = 0 \quad \Rightarrow \quad S = \sqrt{2}\,G \approx 7,07\,\text{kN}$

$\quad \overset{+}{\rightarrow} \sum F_h = -S\,\cos(45°) + N_1 = 0 \quad \Rightarrow \quad N_1 = S/\sqrt{2} = G = 5\,\text{kN}$

Kugel II: $\quad \overset{+}{\rightarrow} \sum F_h = -N_1 + N_2 = 0 \quad \Rightarrow \quad N_2 = N_1 = G = 5\,\text{kN}$

$\quad +\!\uparrow \sum F_v = N_3 - G = 0 \quad \Rightarrow \quad N_3 = G = 5\,\text{kN}$

b) $\overset{+}{\circlearrowleft} \sum M^{(A)} = M_o + B \cdot a - N_3 \cdot (a+R) + N_2 \cdot R = M_o + B \cdot a - G \cdot (a+R) + G \cdot R = 0$

$\Rightarrow B = G - M_o/a = 3\,\text{kN}$

$+\!\uparrow \sum F_v = A_v + B - N_3 = A_v + G - M_o/a - G = 0$

$\Rightarrow A_v = M_o/a = 2\,\text{kN}$

$\overset{+}{\rightarrow} \sum F_v = A_h - N_2 = A_h - G = 0$

$\Rightarrow A_h = G = 5\,\text{kN}$