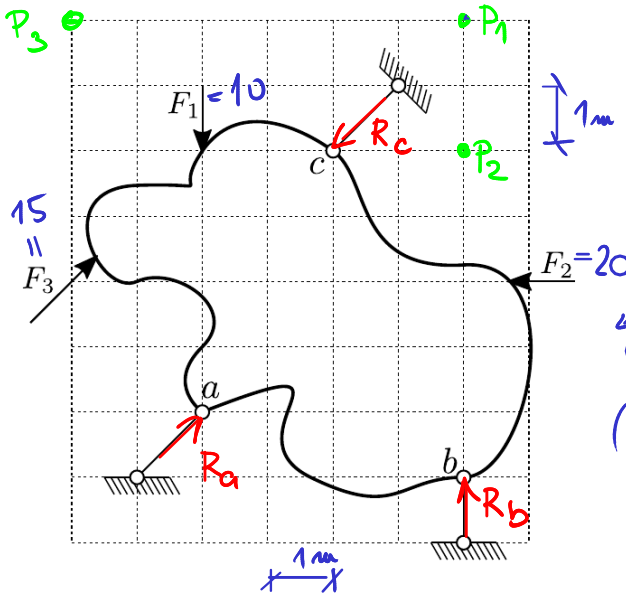
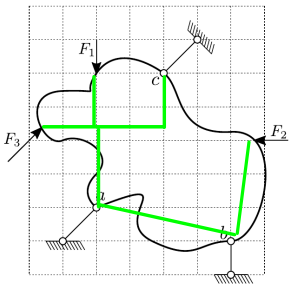
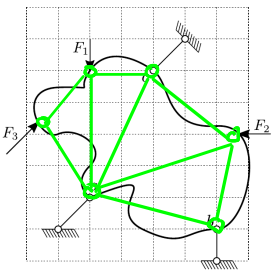
REAKCE







$F_1 = 10\,kN$; $F_2 = 20\,kN$; $F_3 = 15\,kN$; $R_a, R_b, R_c = ?$

$\oplus \quad \Sigma M_{P_1} = 0$

$(R_c \cdot 0 + R_b \cdot 0) + F_1 \cdot 4 - F_2 \cdot 4 - F_3 \cdot \sqrt{2} + R_a \cdot \sqrt{2} = 0$

$10 \cdot 4 - 20 \cdot 4 - 15 \cdot \sqrt{2} + \sqrt{2} R_a = 0$

$R_a = 43{,}284\,kN$

$\oplus \quad \Sigma M_{P_2} = 0$

$(R_a \cdot 0 + R_b \cdot 0) + R_c \cdot \sqrt{2} + F_1 \cdot 4 - F_2 \cdot 2 - F_3 \cdot 2 \cdot \sqrt{2} = 0$

$R_c \cdot \sqrt{2} + 10 \cdot 4 - 20 \cdot 2 - 15 \cdot 2 \cdot \sqrt{2} = 0$

$R_c = 30\,kN$

$\oplus \quad \Sigma M_{ci} = 0$

$(R_c \cdot 0) + F_1 \cdot 2 - F_2 \cdot 2 - F_3 \sqrt{2} + R_a \sqrt{2} + R_b \cdot 2 = 0$

$10 \cdot 2 - 20 \cdot 2 - 15 \cdot \sqrt{2} + 43{,}284 \cdot \sqrt{2} + 2 R_b = 0$

$R_b = -10\,kN$

$\oplus \quad \Sigma M_{P_3} = 0$ KONTROLA

$-F_1 \cdot 2 - F_2 \cdot 4 + F_3 \cdot 2\sqrt{2} + R_a \cdot 4\sqrt{2} + R_b \cdot 6 - R_c \cdot 3\sqrt{2} = 0$

$0 = 0$ ✓

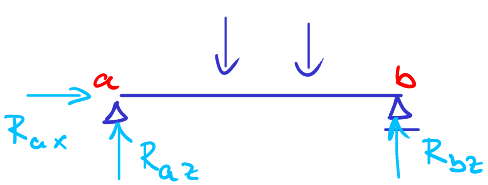
ΣF kolmo na (a) $\oplus \uparrow$

$-F_1' + F_2' + R_b' = 0$

$-F_1 \frac{\sqrt{2}}{2} + F_2 \frac{\sqrt{2}}{2} + R_b \cdot \frac{\sqrt{2}}{2} = 0$

$\frac{\sqrt{2}}{2} \left(-10 + 20 + (-10)\right) = 0$

$0 = 0$ ✓

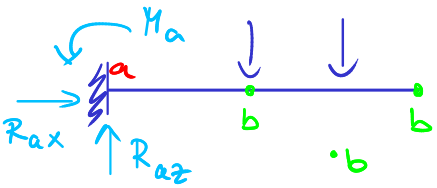


$\Sigma F_{xi} = 0$

$\Sigma M_{ai} = 0$

$\Sigma M_{bi} = 0$

kontrola $\Sigma F_{zi} = 0$

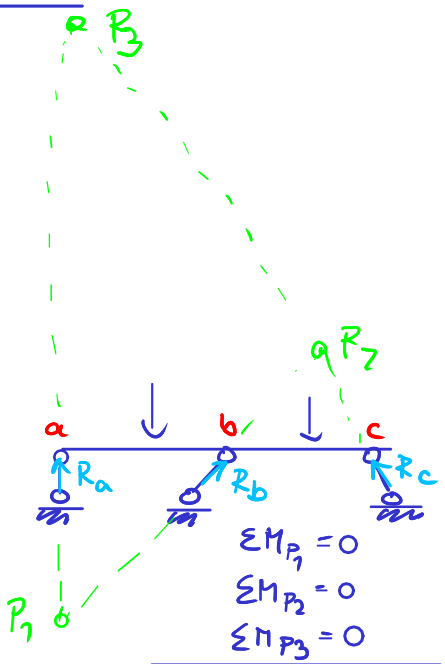


$\Sigma F_{xi} = 0$

$\Sigma F_{zi} = 0$

$\Sigma M_{ai} = 0$

kontrola: $\Sigma M_{bi} = 0$



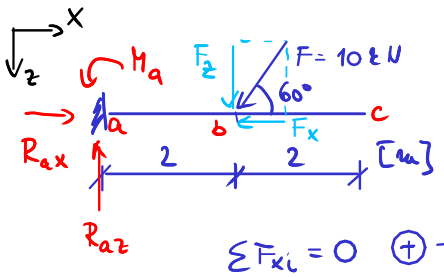
$\Sigma M_{P_1} = 0$

$\Sigma M_{P_2} = 0$

$\Sigma M_{P_3} = 0$

kontrola: $\Sigma F_{xi} = 0$

$\Sigma F_{zi} = 0$



$F_x = F\cos 60° = 10 \cdot \frac{1}{2} = 5\,kN$

$F_z = F\sin 60° = 10 \cdot \frac{\sqrt{3}}{2}\,kN$

$\Sigma F_{xi} = 0 \quad \oplus \rightarrow$

$R_{ax} - F_x = 0$ $\qquad R_{ax} = +F_x = \underline{5\,kN}$ $(\rightarrow)$

$\Sigma F_{zi} = 0 \quad \oplus \uparrow$

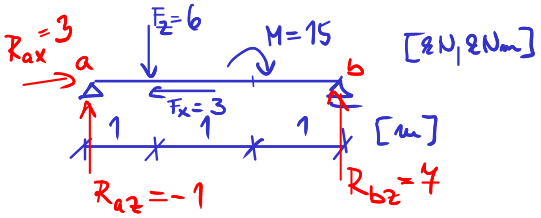
$R_{az} - F_z = 0$ $\qquad R_{az} = F_z = 5\sqrt{3}\,kN = \underline{8{,}66\,kN}$ $(\uparrow)$

$\Sigma M_{ai} = 0 \quad \oplus \circlearrowleft$

$M_a - F_z \cdot 2 = 0$ $\qquad M_a = 2F_z = 10\sqrt{3} = \underline{17{,}321\,kNm}\,(\circlearrowleft)$

kontrola: $\Sigma M_{bi} = 0 \quad \oplus \circlearrowleft$

$M_a - R_{az} \cdot 2 = 0$ $\qquad \underline{0 = 0}\ V$



$\Sigma F_{xi} = 0 \quad \oplus \rightarrow$

$R_{ax} - F_x = 0$ $\qquad R_{ax} = F_x = \underline{3\,kN}$ $(\rightarrow)$

$\Sigma M_{ai} = 0 \quad \oplus \circlearrowleft$

$-F_z \cdot 1 - M + R_{bz} \cdot 3 = 0$ $\qquad \underline{R_{bz} = 4\,kN}$ $(\uparrow)$

$\Sigma M_{bi} = 0 \quad \oplus \circlearrowleft$

$-M + F_z \cdot 2 - R_{az} \cdot 3 = 0$ $\qquad \underline{R_{az} = -1\,kN}$ $(\downarrow)$

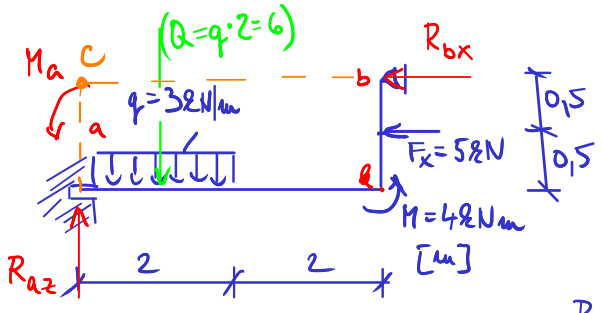
kontrola:

$\Sigma F_{zi} = 0 \quad \oplus \uparrow$

$R_{az} - F_z + R_{bz} = 0$

$-1 - 6 + 4 = 0$

$\underline{0 = 0}\ V$



$\Sigma F_{xi} = 0 \quad \oplus \rightarrow$

$-F_x - R_{bx} = 0$

$R_{bx} = -F_x = -5kN \ (\rightarrow)$

$\oplus \leftarrow$

$F_x + R_{bx} = 0$

$R_{bx} = -F_x$

$\Sigma F_{zi} = 0 \quad \oplus \uparrow$

$R_{az} - Q = 0 \qquad R_{az} = Q = 6kN \ (\uparrow)$

$\Sigma M_{ci} = 0 \quad \oplus \circlearrowleft$

$M_a - Q \cdot 1 + M - F_x \cdot 0{,}5 = 0$

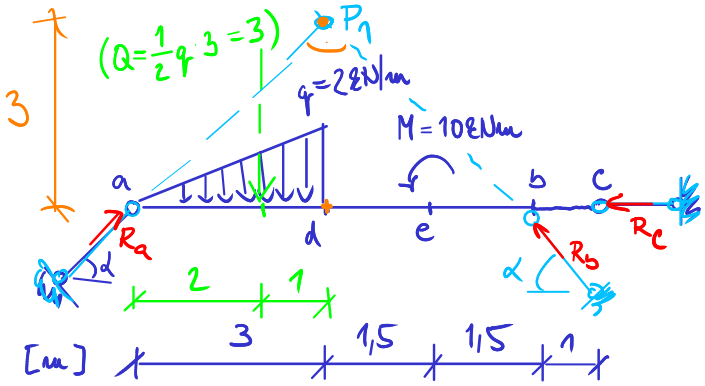
$M_a = 4{,}5kNm$

kontrola:

$\Sigma M_{ai} = 0 \quad \oplus \circlearrowleft$

$M_a - Q \cdot 1 + M + F_x \cdot 0{,}5 + R_{bx} \cdot 1 = 0$

$0 = 0 \ \checkmark$



$\alpha = 45°$

$\Sigma M_{ai} = 0$

$\Sigma M_{bi} = 0$

$\Sigma M_{P_1 i} = 0$

kontrola:

$\Sigma F_{zi} = 0$, $\Sigma F_{xi} = 0$ } rozklad R_a, R_b

$\Sigma M_{ai} = 0 \quad \oplus \circlearrowleft$

$(R_a \cdot 0 + R_c \cdot 0) - Q \cdot 2 + M + R_b \cdot p = 0$

kolmá vzdálenost papisku R_b a bodu (a) (v našem případě vzdálenost $|aP_1|$) $= \sqrt{3^2+3^2} = 3\sqrt{2}$

$R_{bz} \cdot 6$

$R_{bz} = R_b \cdot \sin\alpha$

$-Q \cdot 2 + M + R_b \cdot \sin 45° \cdot 6 = 0$

$-3 \cdot 2 + 10 + R_b \cdot \frac{\sqrt{2}}{2} \cdot 6 = 0 \quad \Rightarrow R_b = -0{,}9428kN \ (\searrow)$

$3\sqrt{2}$

$\Sigma M_{bi} = 0 \quad \oplus \circlearrowleft$

$-R_{az} \cdot 6 + Q \cdot 4 + M = 0$

$-R_a \cdot \sin 45° \cdot 6 + 3 \cdot 4 + 10 = 0 \rightarrow R_a = 5{,}1854kN \ (\nearrow)$

$\Sigma M_{P_1 i} = 0 \quad \oplus \circlearrowleft$

$(R_a \cdot 0 + R_b \cdot 0) + Q \cdot 1 + M - R_c \cdot 3 = 0$

$3 \cdot 1 + 10 - 3 \cdot R_c = 0$

$R_c = 4{,}3\overline{3}kN \ (\leftarrow)$

kontrola: $\Sigma F_{xi} = 0 \quad \oplus \rightarrow$

$R_{ax} - R_{bx} - R_c = 0 \qquad R_a \cos\alpha - R_b \cos\alpha - R_c = 0$

$0 = 0 \ \checkmark$

$\Sigma F_{zi} = 0$

$0 = 0 \checkmark$

... $\Sigma M_{z_i} = 0$