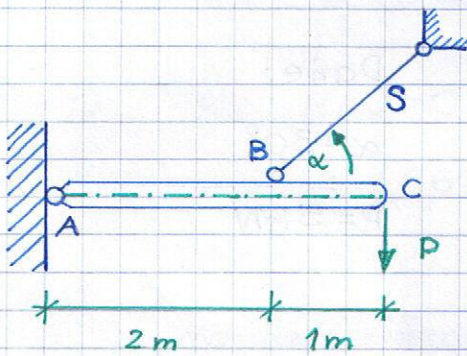


Zad.1. W danym układzie wyznaczyć reakcje podporowe w punkcie A i siłę w pręcie S.

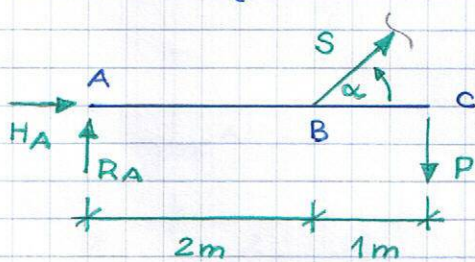
Dane: $P=2\text{ kN}$

str. 1

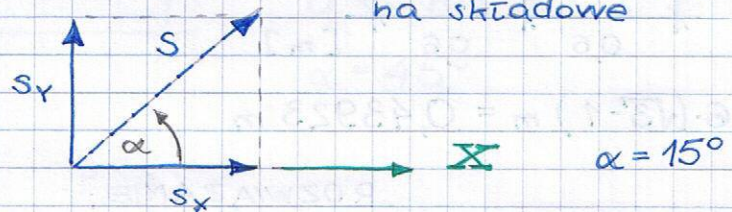
$\alpha = 15^\circ$



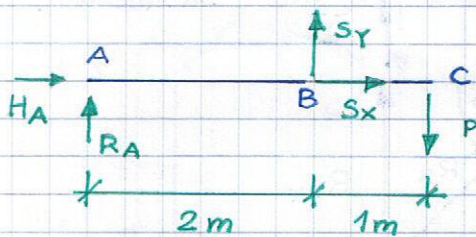
ROZWIĄZANIE:



rozkład siły w pręcie S na składowe



$$\begin{cases} \frac{S_x}{S} = \cos \alpha \rightarrow S_x = S \cdot \cos \alpha = 0,966 \cdot S \\ \frac{S_y}{S} = \sin \alpha \rightarrow S_y = S \cdot \sin \alpha = 0,259 \cdot S \end{cases}$$



$$\oplus \curvearrowright \sum M_A = 0 \quad S_y \cdot 2 - 3 \cdot P = 0$$

$$0,259 \cdot S \cdot 2 - 3P = 0$$

$$S = \frac{3 \cdot P}{2 \cdot 0,259} = \frac{3 \cdot 2}{2 \cdot 0,259} = 11,583 \text{ kN}$$

$$\oplus \uparrow \sum P_y = 0 \quad R_A + S_y - P = 0$$

$$R_A = P - S_y = 2 - 0,259 \cdot 11,583 = -1 \text{ kN}$$

$$\oplus \rightarrow \sum P_x = 0 \quad H_A + S_x = 0$$

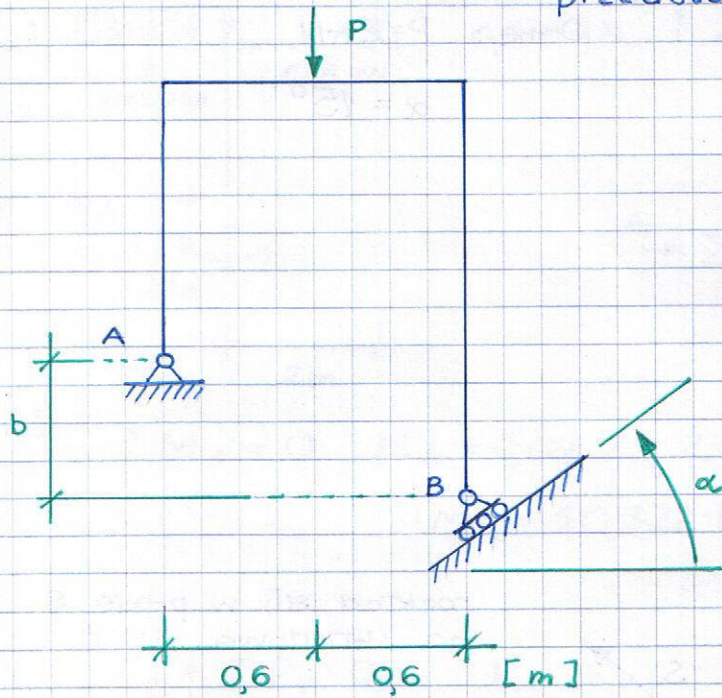
$$H_A + 0,966 \cdot S = 0$$

$$H_A = -11,189 \text{ kN}$$

Zad. 2.

Wyznaczyć reakcje podporowe w układzie przedstawionym na rysunku

str. 2.



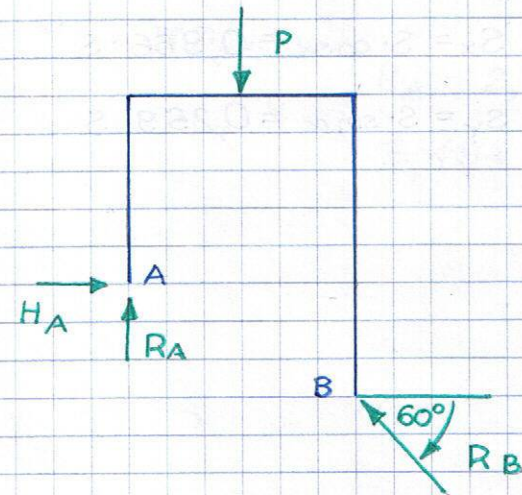
Dane:

$$\alpha = 30^\circ$$

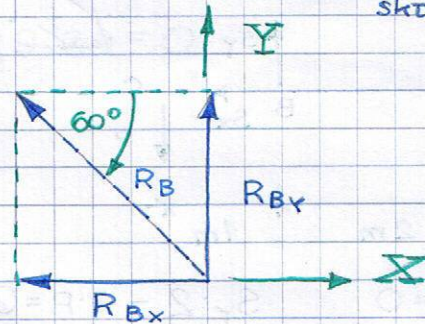
$$P = 5 \text{ kN}$$

$$b = 0,6 \cdot (\sqrt{3} - 1) \text{ m} = 0,43923 \text{ m}$$

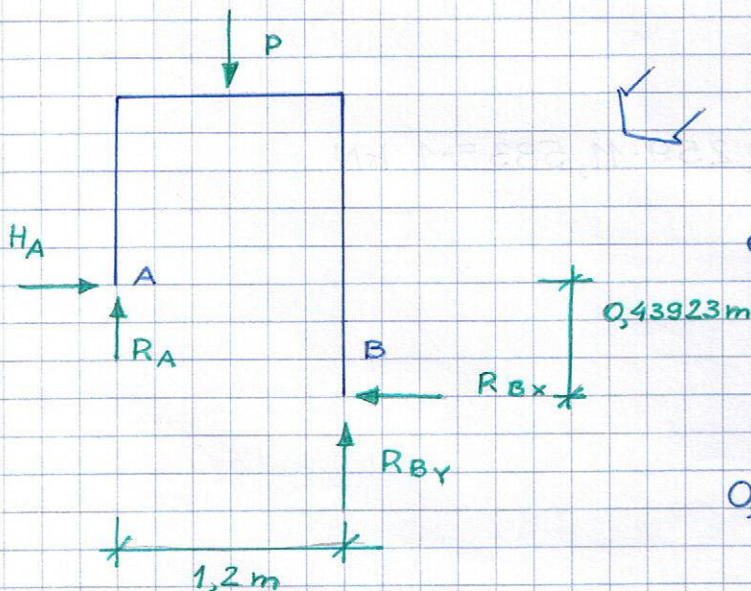
ROZWIĄZANIE:



rozkład reakcji podporowej R_B na składowe:



$$\begin{cases} \frac{R_{By}}{R_B} = \sin 60^\circ \rightarrow R_{By} = \frac{\sqrt{3}}{2} \cdot R_B \\ \frac{R_{Bx}}{R_B} = \cos 60^\circ \rightarrow R_{Bx} = \frac{1}{2} \cdot R_B \end{cases}$$



$$\oplus \sum M_A = 0$$

$$R_{By} \cdot 1,2 - R_{Bx} \cdot 0,43923 - P \cdot 0,6 = 0$$

$$1,039 \cdot R_B - 0,2196 \cdot R_B - P \cdot 0,6 = 0$$

$$0,8194 \cdot R_B - 0,6 \cdot 5 = 0$$

$$R_B = 3,661 \text{ kN}$$

$$\oplus \uparrow \sum P_y = 0 \quad R_A + R_{By} - P = 0$$

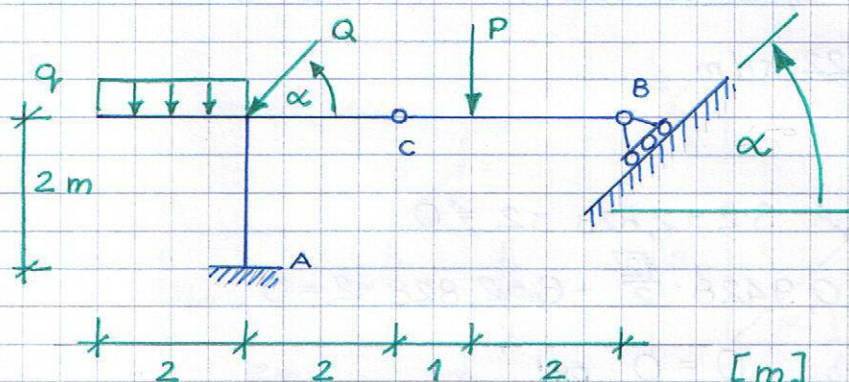
$$R_A + \frac{\sqrt{3}}{2} \cdot 3,661 - 5 = 0 \rightarrow R_A = 1,8295 \text{ kN}$$

$$\oplus \rightarrow \sum P_x = 0 \quad H_A - R_{Bx} = 0$$

$$H_A - \frac{1}{2} \cdot 3,661 = 0 \rightarrow H_A = 1,8305 \text{ kN}$$

Zad. 3

Wyznaczyć reakcje podporowe w układzie przedstawionym na rysunku



Dane:

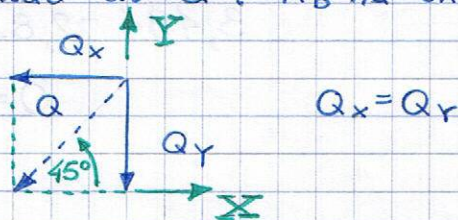
$$P = 2 \text{ kN} \quad Q = 4 \text{ kN}$$

$$q = 3 \text{ kN/m}$$

$$\alpha = 45^\circ$$

ROZWIĄZANIE:

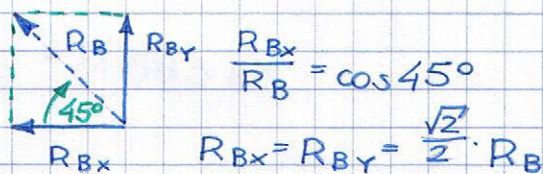
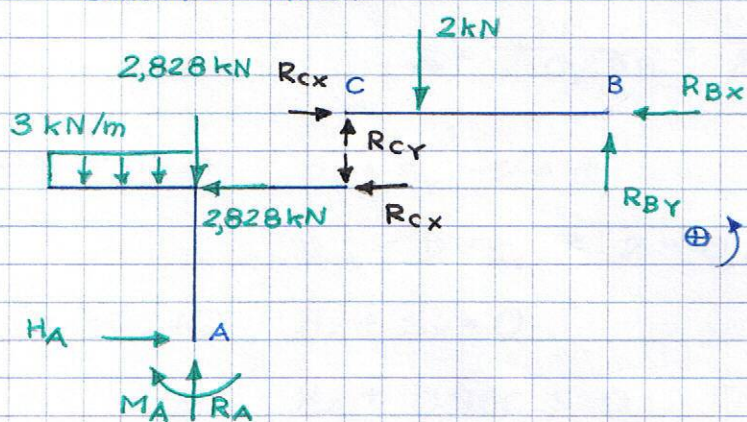
rozkład sił Q; RB na składowe:



$$Q_x = Q_y$$

$$\frac{Q_y}{Q} = \sin 45^\circ \rightarrow Q_y = \frac{\sqrt{2}}{2} \cdot Q = 2,828 \text{ kN}$$

SCHEMAT PRACY



$$\frac{R_{Bx}}{R_B} = \cos 45^\circ$$

$$R_{Bx} = R_{By} = \frac{\sqrt{2}}{2} \cdot R_B$$

$$\oplus \sum M_C = 0 \quad R_{By} \cdot 3 - 2 \cdot 1 = 0$$

$$\frac{\sqrt{2}}{2} \cdot R_B \cdot 3 - 2 = 0$$

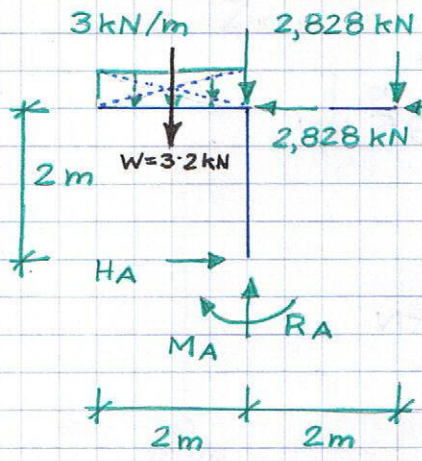
$$R_B = 0,9428 \text{ kN}$$

$$\oplus \rightarrow \sum P_x = 0 \quad R_{cx} - R_{Bx} = 0$$

$$R_{cx} = \frac{\sqrt{2}}{2} \cdot R_B = 0,667 \text{ kN}$$

$$\oplus \uparrow \sum P_y = 0 \quad R_{cy} + R_{By} - 2 = 0$$

$$R_{cy} = 2 - \frac{\sqrt{2}}{2} \cdot 0,9428 = 1,333 \text{ kN}$$



$$\oplus \uparrow \sum P_Y = 0$$

$$R_A - 1,333 - 2,828 - 3 \cdot 2 = 0$$

$$R_A = 10,161 \text{ kN}$$

$$\oplus \rightarrow \sum P_X = 0 \quad H_A - 2,828 - 0,666 = 0$$

$$H_A = 3,494 \text{ kN}$$

$$\oplus \curvearrowleft \sum M_A = 0 \quad M_A - 0,666 \cdot 2 - 2,828 \cdot 2 - 3 \cdot 2 \cdot 1 + 1,333 \cdot 2 = 0$$

$$M_A = 10,322 \text{ kNm}$$

SPR

$$\oplus \uparrow \sum P_Y = 0 \quad R_A + R_{BY} - 3 \cdot 2 - 2,828 - 2 = 0$$

$$10,161 + 0,9428 \cdot \frac{\sqrt{2}}{2} - 6 - 2,828 - 2 = 0$$

$$0 = 0 \text{ ok!}$$

$$\oplus \rightarrow \sum P_X = 0$$

$$H_A - 2,828 + R_{BX} = 0$$

$$3,494 - 2,828 - \frac{\sqrt{2}}{2} \cdot 0,9428 = 0$$

$$0 = 0 \text{ ok!}$$

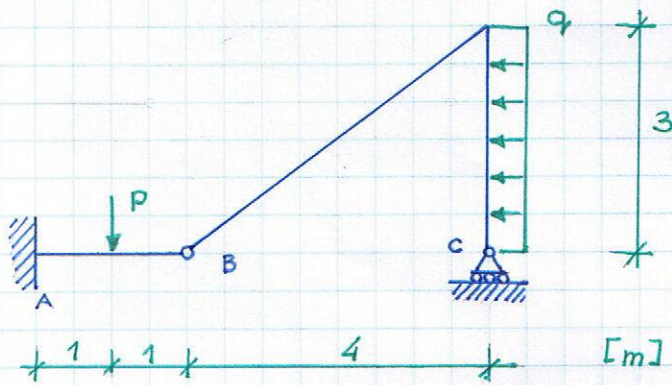
Zad. 4. Wyznaczyć reakcje podporowe w układzie przedstawionym na rysunku

Dane:

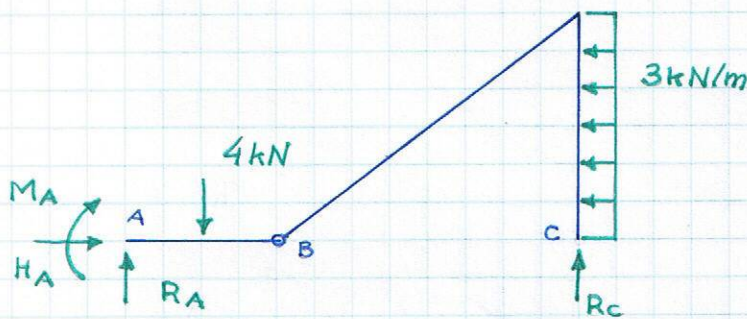
str. 5

$P = 4 \text{ kN}$

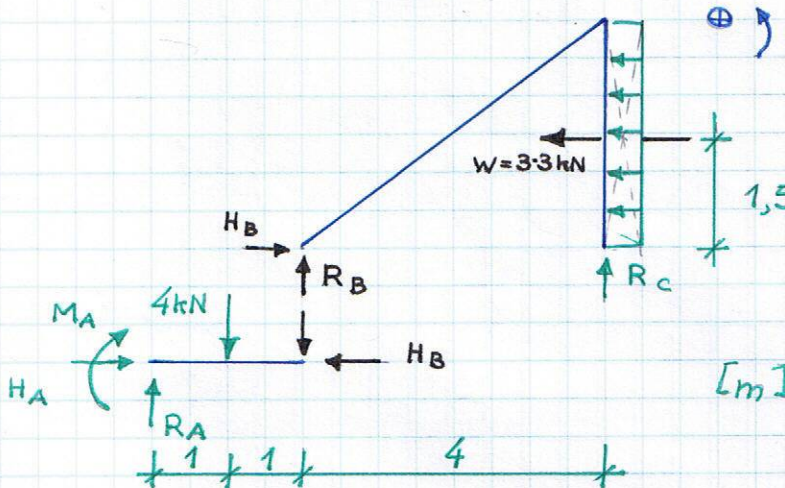
$q = 3 \text{ kN/m}$



ROZWIĄZANIE:



SCHEMAT PRACY



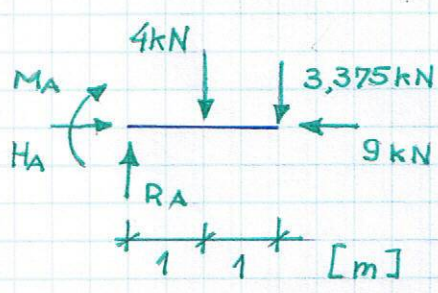
$$\oplus \sum M_B = 0 \quad R_c \cdot 4 + 3 \cdot 3 \cdot 1,5 = 0$$

$$R_c = -3,375 \text{ kN}$$

$$\oplus \sum M_C = 0 \quad R_B \cdot 4 - 3 \cdot 3 \cdot 1,5 = 0$$

$$R_B = 3,375 \text{ kN}$$

$$\oplus \sum P_x = 0 \quad H_B - 3 \cdot 3 = 0 \rightarrow H_B = 9 \text{ kN}$$



$$\oplus \sum P_y = 0 \quad R_A - 4 - 3,375 = 0 \rightarrow R_A = 7,375 \text{ kN}$$

$$\oplus \sum P_x = 0 \quad H_A - 9 = 0 \rightarrow H_A = 9 \text{ kN}$$

$$\oplus \sum M_A = 0 \quad M_A + 1 \cdot 4 + 2 \cdot 3,375 = 0$$

$$M_A = 10,75 \text{ kNm}$$