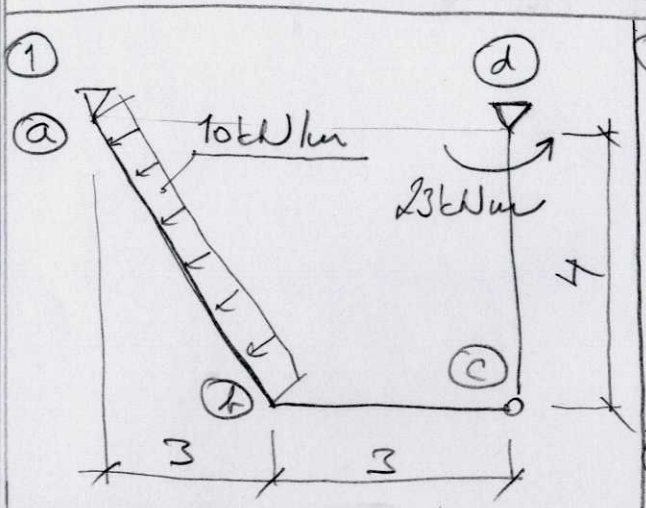
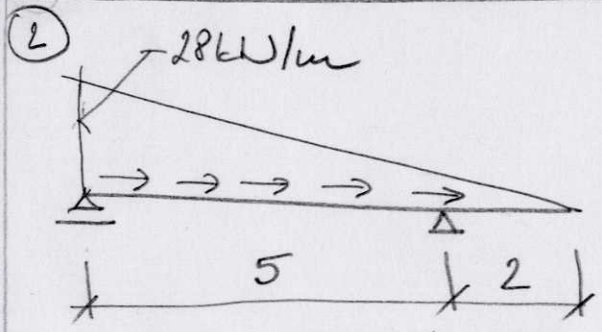
ZADÁNÍ ZTOUŠEK BD001 - ZÁKLADY STAVEBNÍ MECHANIKY
DNE 19.5.2017, KOMB. STUDIUM, ZKOUŠEJÍCÍ: P. BÍDEK

①



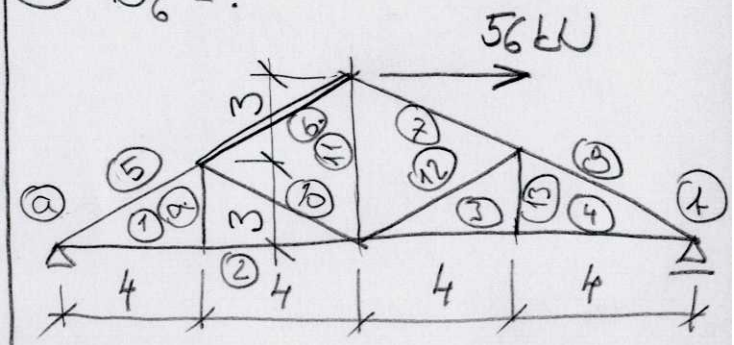
REAKCE = ? VNIT. SÍLY = ?

②

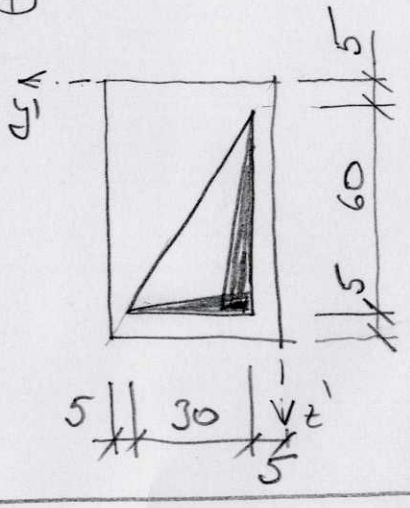


REAKCE = ? VNIT. SÍLY = ?

③ N_6 = ?



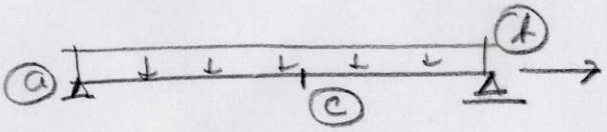
④



a) TĚŽIŠTĚ = ?
b) $I_{y'}$ k OSE y' = ?

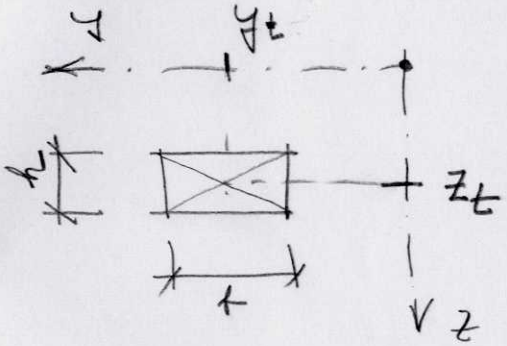
TEORIE

1) DEFINICE VNITŘNÍCH SIL. CO VYJADŘUJÍ VNITŘNÍ SÍLY V BODĚ ⓒ ?

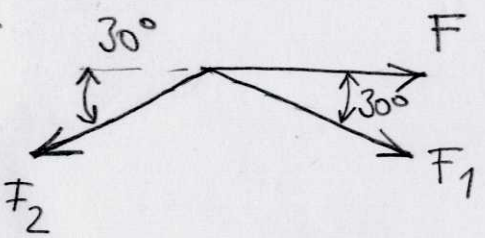


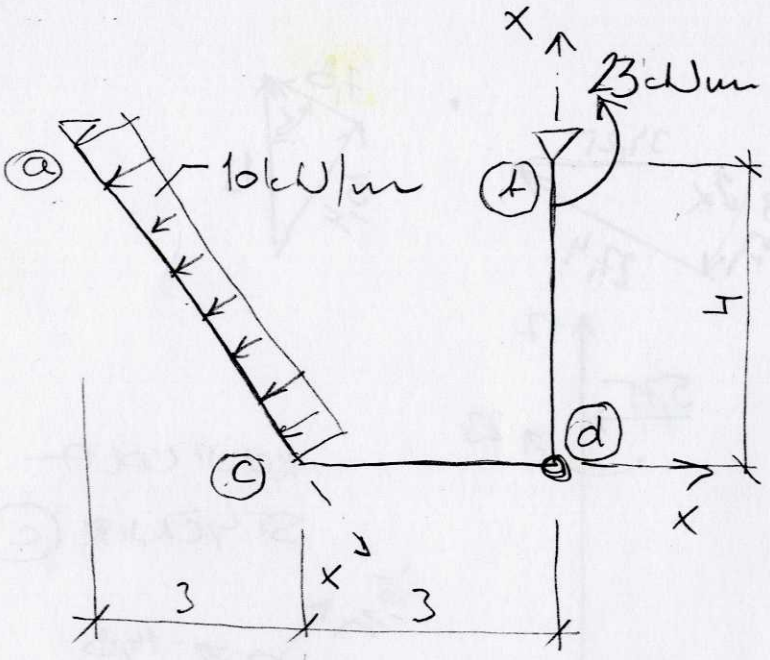
2) NAPIŠTE DIFERENCIÁLNÍ PODMÍNKU ROVNOVÁHY PRO MOMENTY. CO Z NÍ PLYNE PRO SKLON TEČNY A EXTRÉM OH. MOMENTŮ ?

3) NAPIŠTE OBECNÝ VZOREC PRO DEV. MOMENT D_{yz}. JAKÝ JE PRO SYMETRICKÝ A NESYMETRICKÝ PRŮŘEZ ? JAK VYPOČTETE D_{yz} K OSÁM y A z OBRAZCE DLE OBR ?

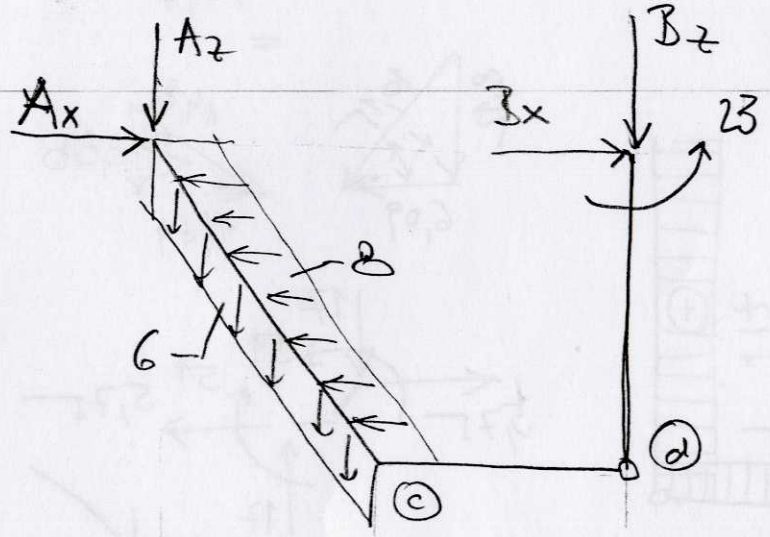


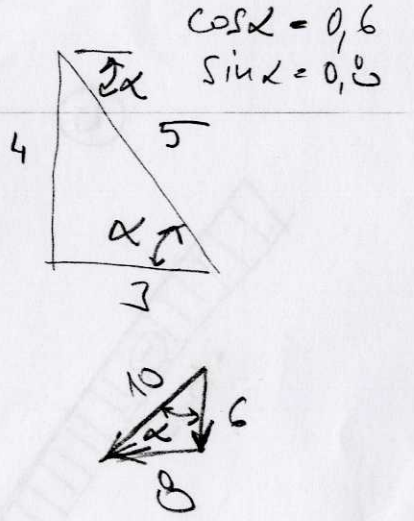
4) ROZLOŽTE SÍLU F DO SLOŽEK F_1 A F_2. POUŽIJTE PODMÍNKY EKVIVALENCE.





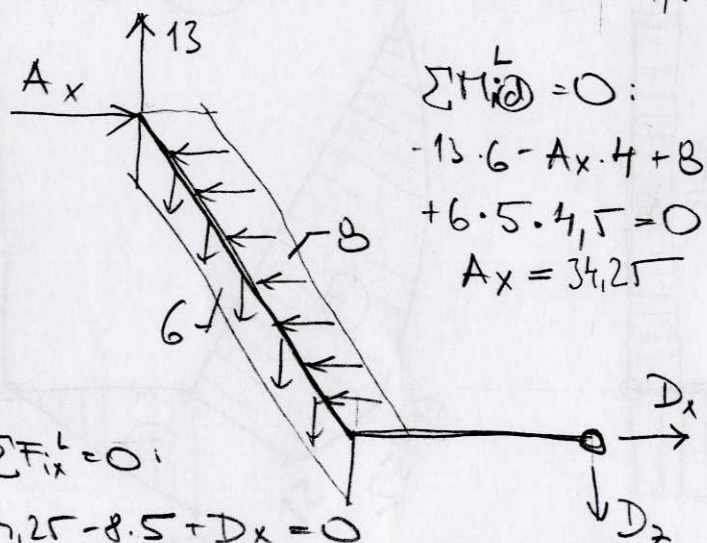
REŠENJE





$\sum M_{i(a)} = 0: \quad -10 \cdot 5 \cdot 2{,}5 + 23 - B_z \cdot 6 = 0 \qquad B_z = -17$

$\sum M_{i(b)} = 0: \quad 23 - 8 \cdot 5 \cdot 2 + 6 \cdot 5 \cdot 4{,}5 + A_z \cdot 6 = 0 \qquad A_z = -13$



$\sum M_{i(d)}^{L} = 0:$

$-13 \cdot 6 - A_x \cdot 4 + 8 \cdot 5 \cdot 2 + 6 \cdot 5 \cdot 4{,}5 = 0$

$A_x = 34{,}25$

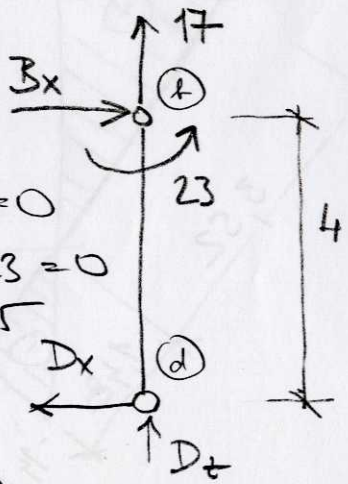
$\sum F_{ix}^{L} = 0:$

$34{,}25 - 8 \cdot 5 + D_x = 0$

$D_x = 5{,}75$

$\sum F_{iz}^{L} = 0:$

$D_z - 13 + 6 \cdot 5 = 0 \Rightarrow D_z = -17$



$\sum M_{i(d)}^{P} = 0$

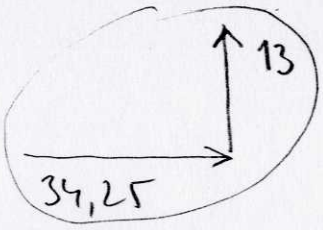
$B_x \cdot 4 - 23 = 0$

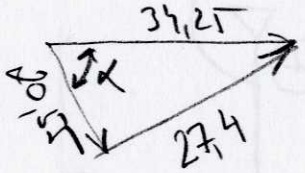
$B_x = 5{,}75$

$\sum F_{ix}^{P} = 0: \quad 5{,}75 - D_x = 0$

$D_x = 5{,}75$

$\sum F_{iz}^{P} = 0 \quad D_z + 17 = 0; \quad D_z = -17$





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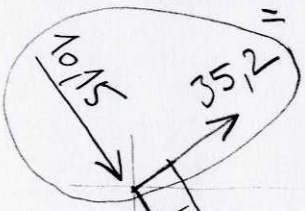
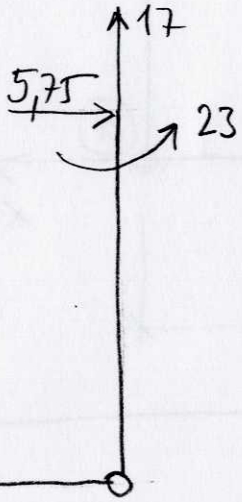
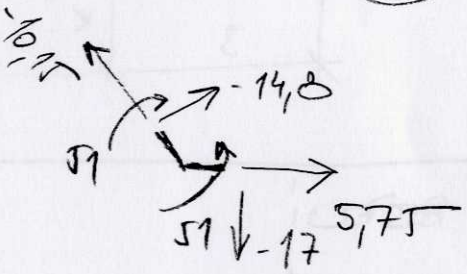




c

KONTROLA – STYCZNIK (c)



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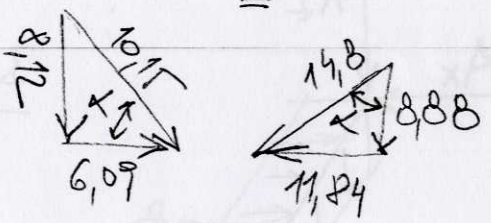
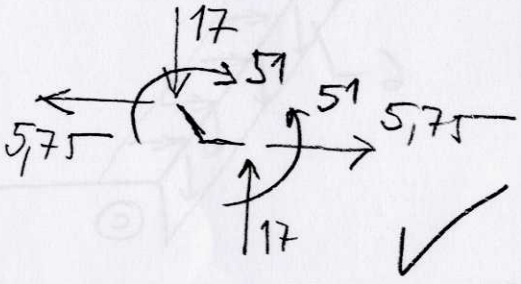
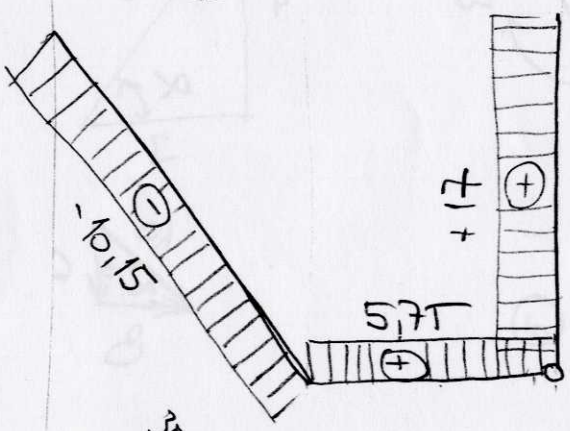
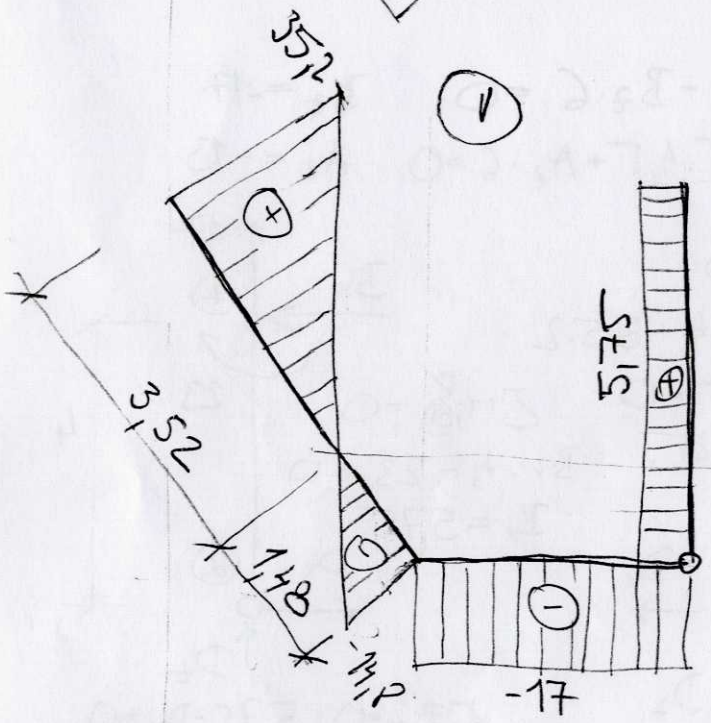




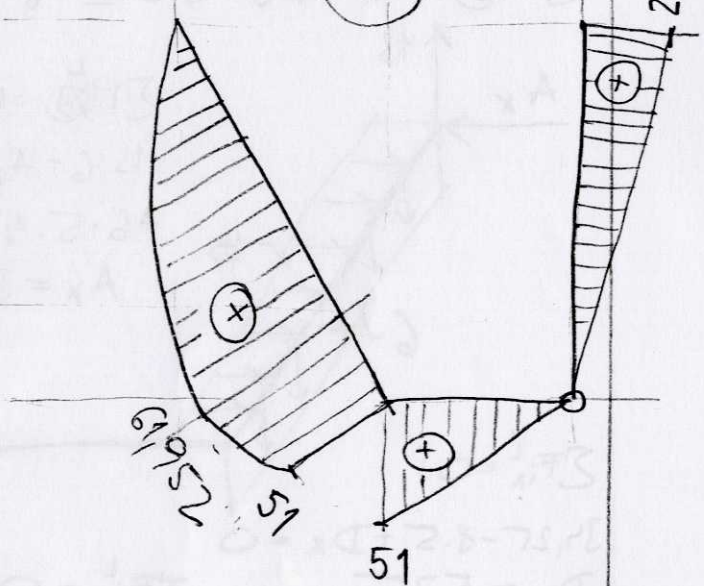


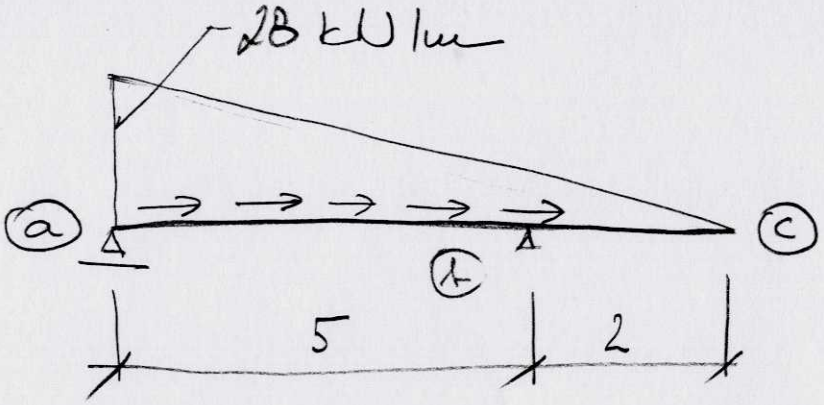
N

V

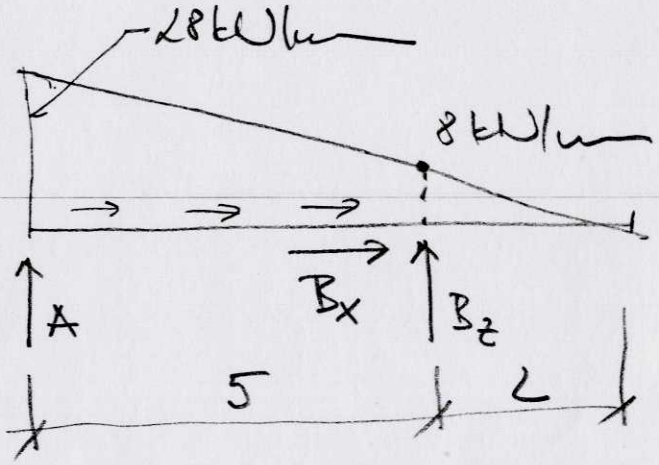


M





VYKRESLETE PRŮBĚHY VNITŘNÍCH SIL

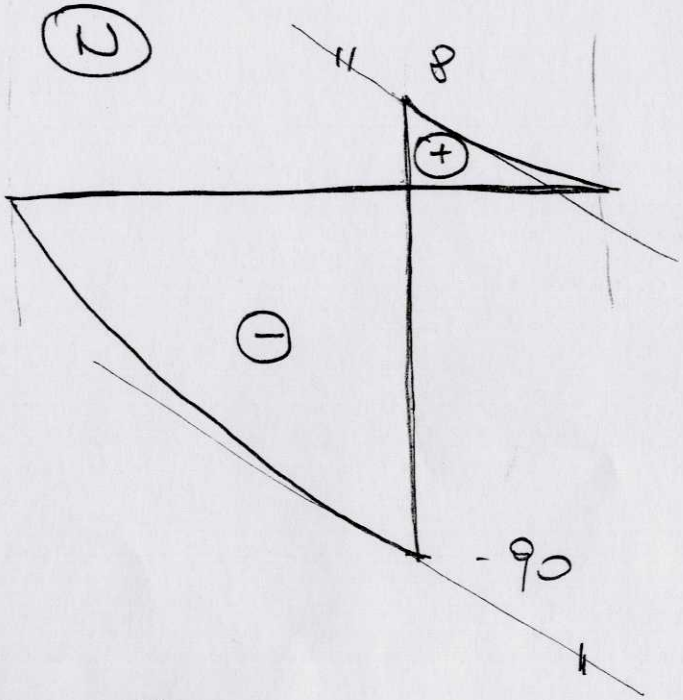


$A = B_z = 0$

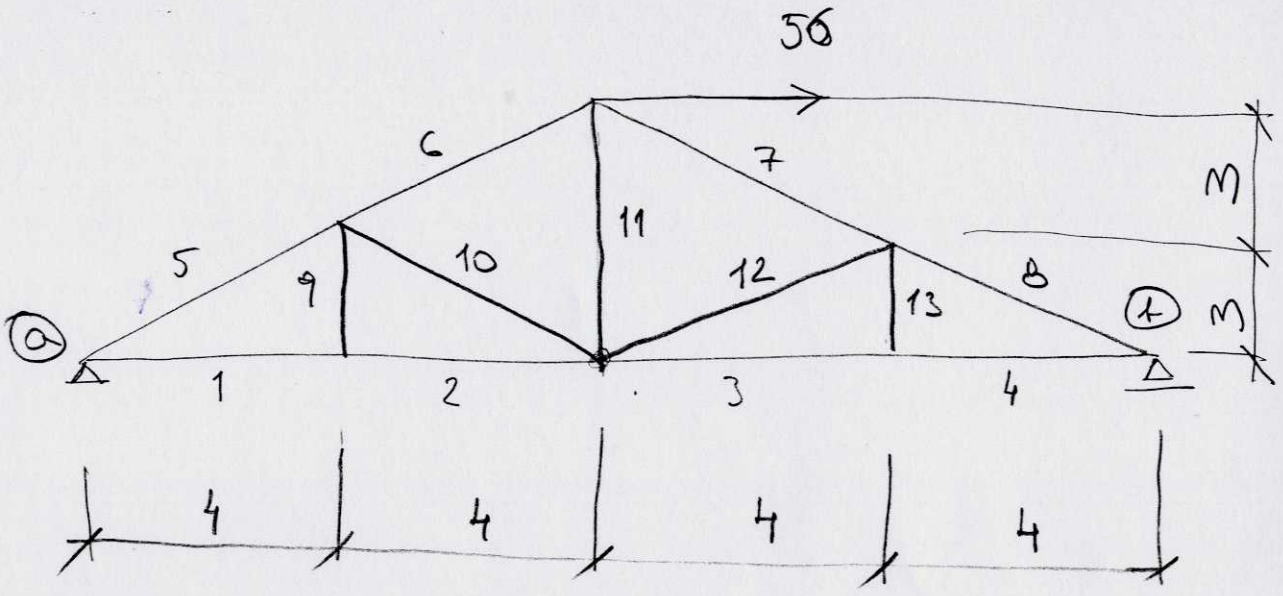
$\sum F_{ix} = 0:$

$B_x + \frac{1}{2} \cdot 28 \cdot 7 = 0$

$B_x = -98$



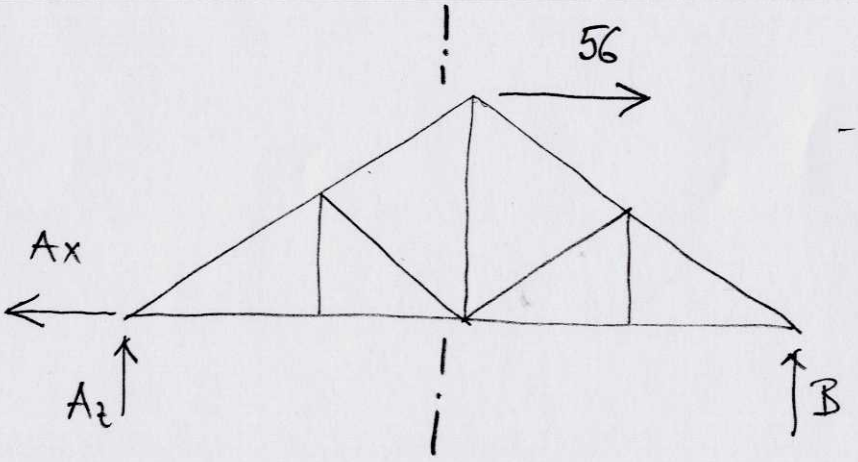
(V) = (M) = 0



VYPOČTĚTE:

a) REAKCE

b) SÍLU N_6



$\sum F_{ix} = 0$:

$-A_x + 56 = 0$

$A_x = 56$

$\sum M_{i(A)} = 0$:

$B \cdot 16 - 56 \cdot 6 = 0$

$B = 21\ kN$

$\sum M_{i(B)} = 0$:

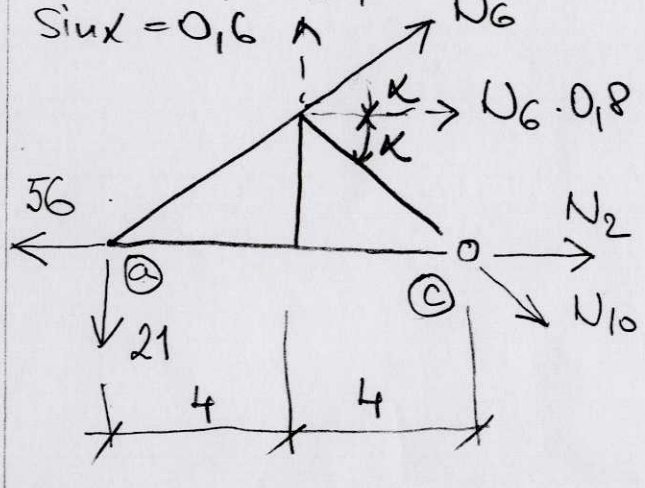
$A_z \cdot 16 + 56 \cdot 6 = 0$

$A_z = -21\ kN$

PRŮSEČNÁ METODA:

$\cos\alpha = 0{,}8$ $N_6 \cdot 0{,}6$

$\sin\alpha = 0{,}6$



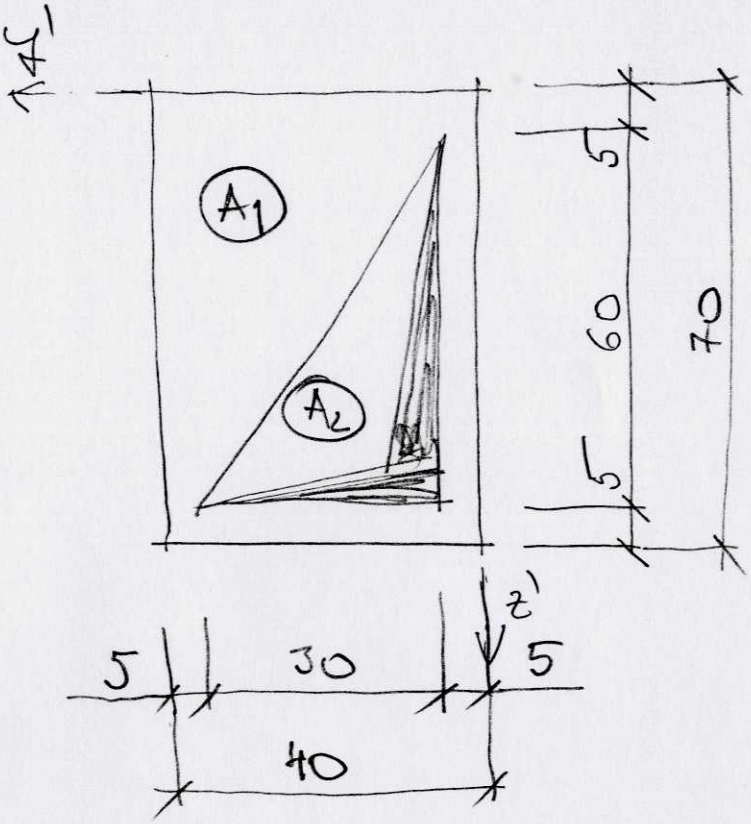
$M_{i(C)} = 0$:

$0{,}8 \cdot N_6 \cdot 3 + 0{,}6 \cdot N_6 \cdot 4$

$-21 \cdot 8 = 0$

$4{,}8 \cdot N_6 = 168$

$N_6 = 35\ kN$



VYPOČTĚTE:

a) TĚŽIŠTĚ

b) I_y' K OSE y'

$A_1 = 40 \cdot 70 = 2800\ cm$

$A_2 = -\frac{1}{2} \cdot 30 \cdot 60 = -900\ cm$

$A = 1900\ cm^2$

$S_{y1}' = 2800 \cdot 35 = 98000$ $\quad S_{z1}' = 2800 \cdot 20 = 56000\ cm^3$

$S_{y2}' = -900 \cdot 45 = -40500$ $\quad S_{z2}' = -900 \cdot 15 = -13500\ cm^3$

$S_y' = 57500$ $\quad S_z' = 42500\ cm^3$

$$y_t = \frac{S_z'}{A} = 22{,}368\ cm \qquad z_t = \frac{S_y'}{A} = 30{,}263\ cm$$

$$I_{y1}' = \frac{1}{12} \cdot 40 \cdot 70^3 + 2800 \cdot 35^2 = 1{,}14\bar{3} \cdot 10^6 + 3{,}43 \cdot 10^6 = 4{,}57\bar{3} \cdot 10^6$$

$$I_{y2}' = -\left(\frac{1}{36} \cdot 30 \cdot 60^3 + 900 \cdot 45^2\right) = -(0{,}18 \cdot 10^6 + 1{,}8225 \cdot 10^6) =$$

$$= -2{,}0025 \cdot 10^6$$

$I_y' = 2{,}570833 \cdot 10^6\ cm^4$