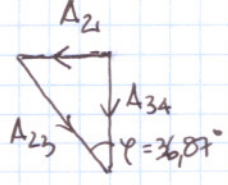
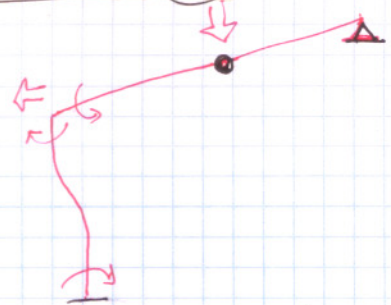
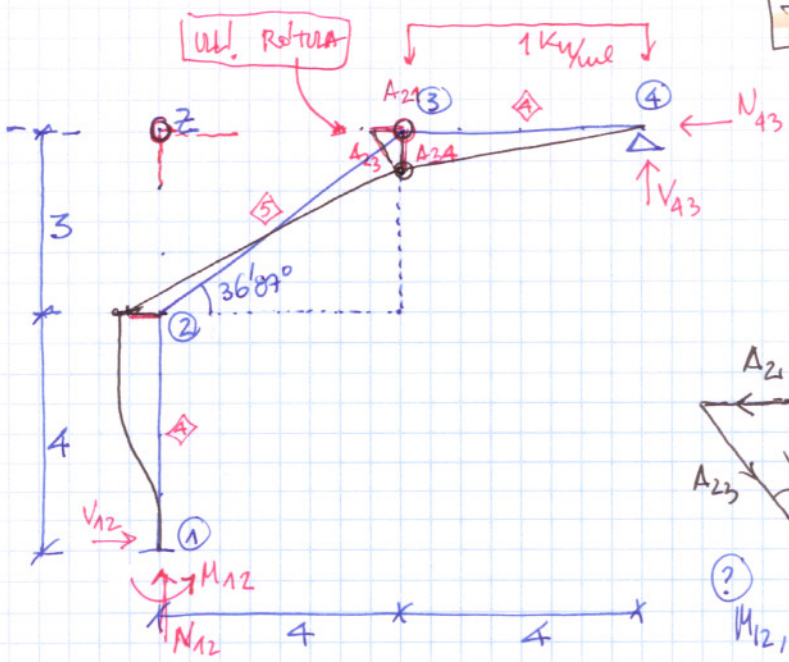


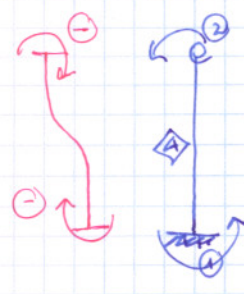
TRASLACIONAL 16



$\cos 36,87^\circ = \frac{\Delta_{21}}{\Delta_{23}} = 0,6$   
 $\sin 36,87^\circ = \frac{\Delta_{34}}{\Delta_{23}} = 0,8$

$M_{12}, M_{21}, M_{23} / M_{32} = M_{34} = M_{43} = 0$

$\Delta_{23}, \Delta_{21} \Rightarrow \Delta_{21} = 0,6 \Delta_{23}$



$M_{21} = \frac{4EI\theta_2}{L} - \frac{6EI\Delta_{21}}{L^2} = EI\theta_2 - \frac{6}{16}EI\Delta_{21} = EI\theta_2 - 0,225EI\Delta_{23}$

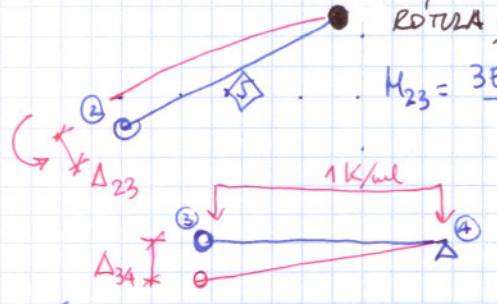
$M_{12} = \frac{2EI\theta_2}{L} - \frac{6EI\Delta_{21}}{L^2} = \frac{EI\theta_2}{2} - \frac{6}{16}EI\Delta_{21} = 0,5EI\theta_2 - 0,225EI\Delta_{23}$

$M_{32} = 0$

ROTORA!

$M_{23} = \frac{3EI\theta_2}{L} + \frac{3EI\Delta_{23}}{L^2} = \frac{3}{5}EI\theta_2 + \frac{3}{25}EI\Delta_{23} = 0,6EI\theta_2 + 0,12EI\Delta_{23}$

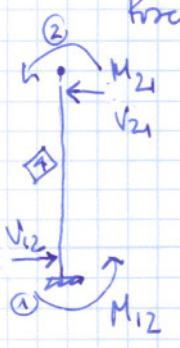
$M_{34} = M_{43} = 0$



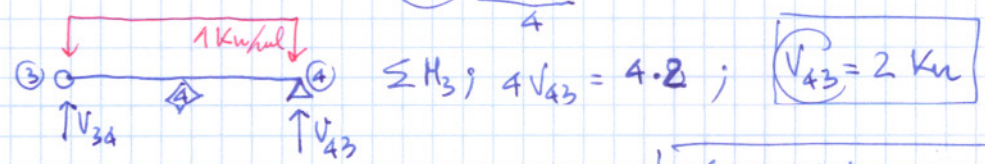
ECUACIONES  $\Rightarrow$   $M_{21} + M_{23} = 0$  Ecuación adicional  $\sum M_3 = 0$  
 $EI\theta_2 ?$   
 $EI\Delta_{23} ?$   $\rightarrow$  FALTA 1 ECUACION

(U!) EL MOMENT M12 EL POSIT ENCAJES  
 COM EN TOTS EN (+) ENCAJES  
 QUE EL RESULTAT FINAL SIGUI  
 AL INVERTIT.

Procés de fallants en funció dels moments  $\Rightarrow V_{12}$  i  $V_{43}$



$\sum M_2, 4V_{12} + M_{21} + M_{12} = 0 ; V_{12} = \frac{-M_{21} - M_{12}}{4}$



$\sum M_3, 4V_{43} = 4 \cdot 8 ; V_{43} = 2 \text{ kN}$

Ara, la equació adicional queda:  $7\left(\frac{-M_{21} - M_{12}}{4}\right) + 6 + M_{12} = 24$

$M_{12} - 8 - 1,75M_{21} - 1,75M_{12} = 0$

$$M_{21} + M_{23} = 0$$

$$M_{12} - 1,75 M_{21} - 1,75 M_{12} - 8 = 0$$

$$EI \theta_2 = a = 1,242$$

$$EI \Delta_{23} = b = 18,933$$

$$\left[ \begin{array}{l} a - 0,225b + 0,6a + 0,12b = 0 \\ 0,5a - 0,225b - [1,75(a - 0,225b)] - [1,75(0,5a - 0,225b)] - 8 = 0 \end{array} \right.$$

$$\left[ \begin{array}{l} 1,6a - 0,105b \\ 0,5a - 0,225b - 1,75a + 0,3937b - 0,875a + 0,3937b - 8 = 0 \end{array} \right.$$

$$\left. \begin{array}{l} 1,6a - 0,105b \\ -2,125a + 0,562b - 8 = 0 \end{array} \right\} \rightarrow -2,125a + 0,562b = 8$$

**(M)**

$$M_{21} = 1,242 - (0,225 \cdot 18,933) = -3,017$$

$$M_{12} = (0,5 \cdot 1,242) - (0,225 \cdot 18,933) = -3,639$$

$$M_{23} = (0,6 \cdot 1,242) + (0,12 \cdot 18,933) = 3,017$$

$$M_{32} = 0$$

$$M_{34} = 0$$

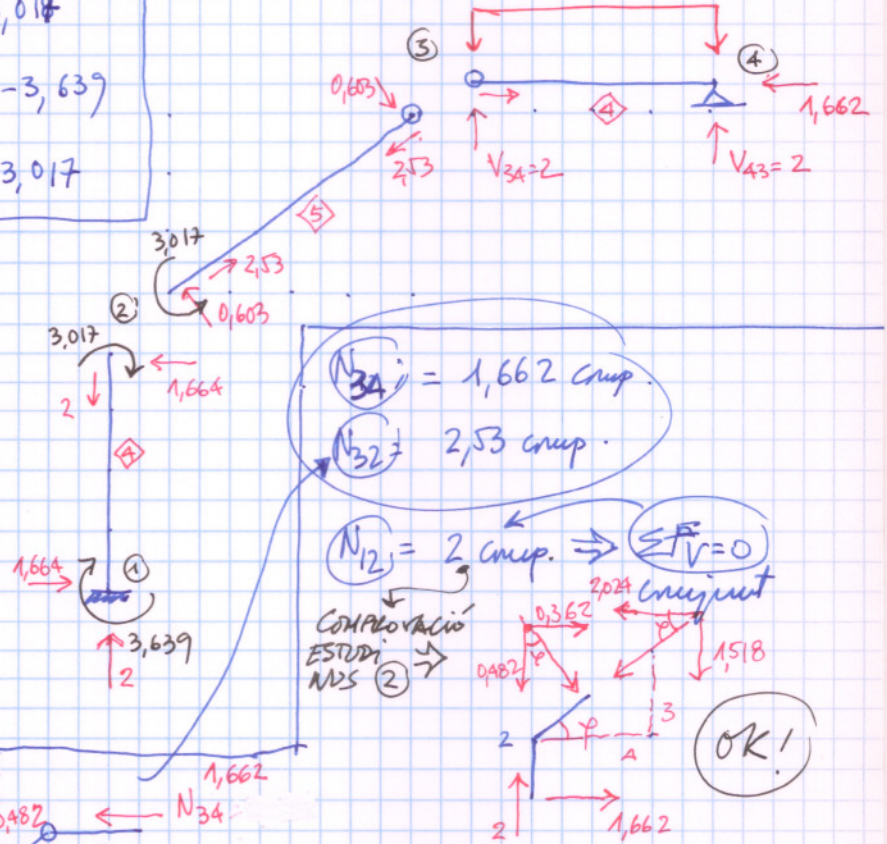
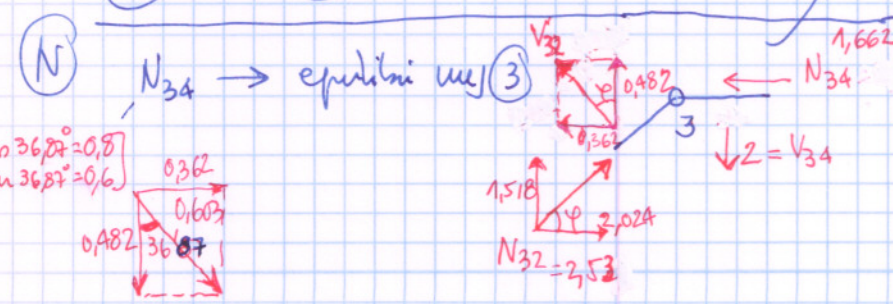
$$M_{43} = 0$$

**(V)**

$$V_{12} = V_{21} = \frac{3,017 + 3,639}{4} = 1,664$$

$$V_{23} = V_{32} = \frac{3,017}{5} = 0,603$$

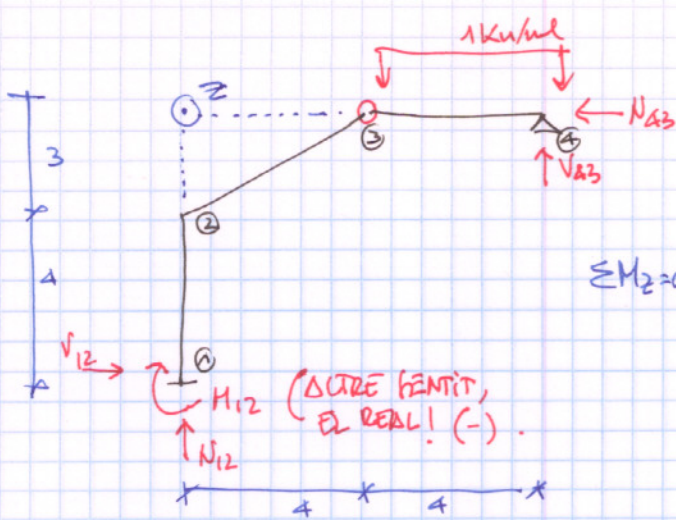
$$V_{43} = 2 ; = V_{34}$$



COMPRESSIÓ FINAL  
 CONJUNT ESTRUCTURA

$\sum F_V = 0$   
 $\sum F_H = 0$   
 $\sum M = 0$

OK



$$EI\theta_2 = a = 0,644$$

$$EI\Delta_{23} = b = 9,817$$

$$M_{21} + M_{23} = 0$$

$$\sum M_2 = 0 \Rightarrow 7V_{12} + 8V_{43} = M_{12} + 24 \rightarrow$$

$$\rightarrow 7\left(\frac{-M_{21} - M_{12}}{4}\right) - M_{12} = 8 \rightarrow$$

$$M_{12} + 1,75 M_{21} + 1,75 M_{12} + 8 = 0$$

$$a - 0,225b + 0,6a + 0,12b = 0$$

$$0,5a - 0,225b + [1,75(a - 0,225b)] + [1,75(0,5a - 0,225b)] + 8 = 0$$

$$1,6a - 0,105b = 0$$

$$0,5a - 0,225b + 1,75a - 0,39375b + 0,875a - 0,39375b + 8 = 0$$

$$1,6a - 0,105b = 0$$

$$3,125a - 1,012b + 8 = 0 \quad \left. \begin{array}{l} 1,6a - 0,105b = 0 \\ 3,125a - 1,012b + 8 = 0 \end{array} \right\} 3,125a - 1,02b = -8$$

Att! No don equal

cal mantener abans el sentit (+) en M12 !!!