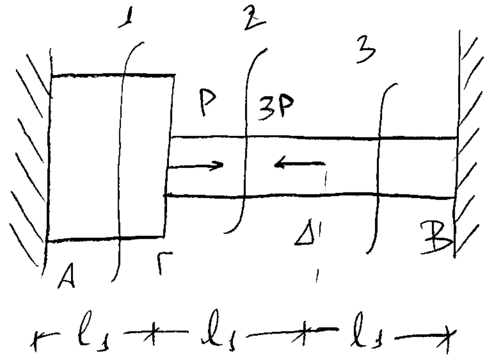
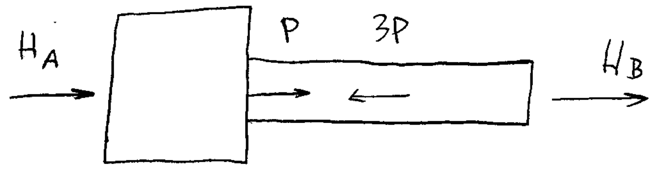
3)



$\rightsquigarrow$

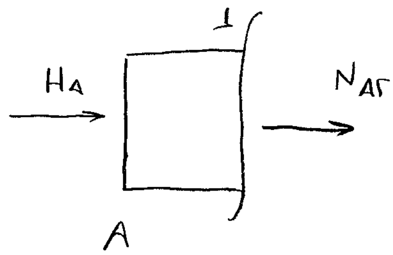


• $\Sigma F_x = 0 \Rightarrow H_A + P - 3P + H_B = 0 \Rightarrow H_A + H_B = 2 \cdot P \quad (1)$

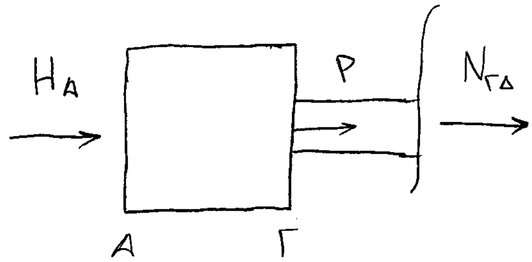
• Η ράβδος AB είναι αμφίπακτη, οπότε θα ισχύει ότι:

$$\Delta l_{AB} = 0 \Rightarrow \Delta l_{A\Gamma} + \Delta l_{\Gamma\Delta} + \Delta l_{\Delta B} = 0 \quad (2)$$

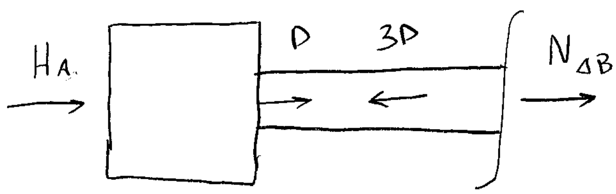
• Τομές:



$$N_{A\Gamma} = -H_A$$



$$N_{\Gamma\Delta} = -H_A - P$$



$$N_{\Delta B} = -H_A - P + 3P \Rightarrow$$

$$\Rightarrow N_{\Delta B} = 2P - H_A$$

• $(2) \xrightarrow{\varepsilon = \frac{\Delta l}{l}} \varepsilon_{A\Gamma} \cdot l_{A\Gamma} + \varepsilon_{\Gamma\Delta} \cdot l_{\Gamma\Delta} + \varepsilon_{\Delta B} \cdot l_{\Delta B} = 0 \xrightarrow{\varepsilon \cdot E = \sigma}$

$$\Rightarrow \frac{\sigma_{A\Gamma}}{\cancel{E}} \cdot \cancel{l_1} + \frac{\sigma_{\Gamma\Delta}}{\cancel{E}} \cdot \cancel{l_1} + \frac{\sigma_{\Delta B}}{\cancel{E}} \cdot \cancel{l_1} = 0 \xrightarrow{\sigma = \frac{N}{A}}$$

$$\Rightarrow \frac{N_{A\Gamma}}{A_{A\Gamma}} + \frac{N_{\Gamma\Delta}}{A_{\Gamma\Delta}} + \frac{N_{\Delta B}}{A_{\Delta B}} = 0 \Rightarrow$$

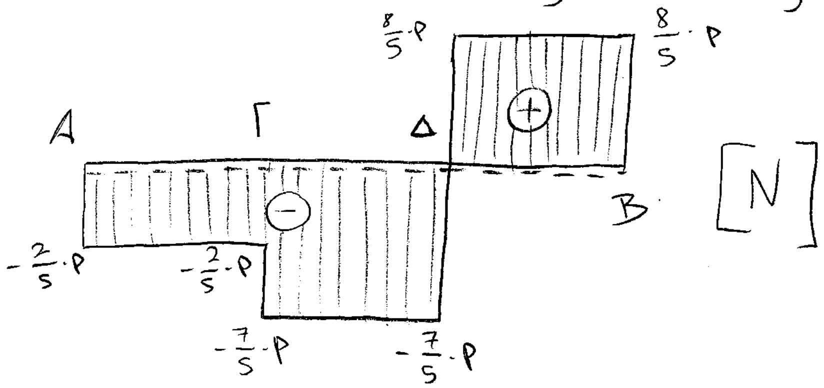
$$\Longrightarrow \frac{-H_A}{2\cdot \cancel{A_2}} + \frac{-H_A - P}{\cancel{A_2}} + \frac{2P - H_A}{\cancel{A_2}} = 0 \xrightarrow{\times 2}$$

$$\Longrightarrow -H_A - 2H_A - 2P + 4P - 2H_A = 0 \Longrightarrow$$

$$\Longrightarrow 5H_A = 2P \Longrightarrow \boxed{H_A = \frac{2}{5}\cdot P} \xrightarrow{(1)}$$

$$\Longrightarrow H_B + \frac{2}{5}\cdot P = 2P \Longrightarrow \boxed{H_B = \frac{8}{5}\cdot P}$$

- $N_{A\Gamma} = -\frac{2}{5}P$ και $N_{\Gamma\Delta} = -\frac{2}{5} - P = -\frac{7}{5}P$ και $N_{\Delta B} = 2P - \frac{2}{5}P = \frac{8}{5}\cdot P$



- $\Delta l = \varepsilon \cdot l = \frac{\sigma}{E}\cdot l = \frac{N\cdot l}{E\cdot A}$ το Δl έχει την φορά της N, και έχω πάρει $\xrightarrow{+}$

$$\Delta l_{A\Gamma} = \frac{-\frac{2}{5}\cdot P \cdot l_1}{E\cdot 2\cdot A_2} = -\frac{1}{5}\cdot\frac{P\cdot l_1}{E\cdot A_2}$$

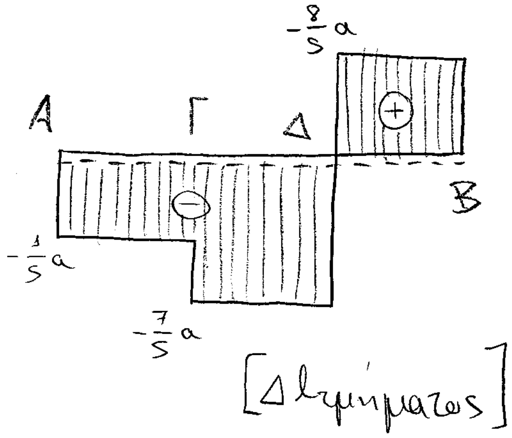
$$\Delta l_{\Gamma\Delta} = \frac{-\frac{7}{5}\cdot P \cdot l_1}{E\cdot A_2} = -\frac{7}{5}\cdot\frac{P\cdot l_1}{E\cdot A_2}$$

$$\Delta l_{\Delta B} = \frac{\frac{8}{5}\cdot P \cdot l_1}{E\cdot A_2} = \frac{8}{5}\cdot\frac{P\cdot l_1}{E\cdot A_2}$$

Ικανοποιούν τη σχέση $\Delta l_{AB} = 0$, αφού όντως:

$$\Delta l_{A\Gamma} + \Delta l_{\Gamma\Delta} + \Delta l_{\Delta B} = 0$$

Έστω: $a = \frac{P\cdot l_1}{E\cdot A_2}$ (όλα γνωστά)



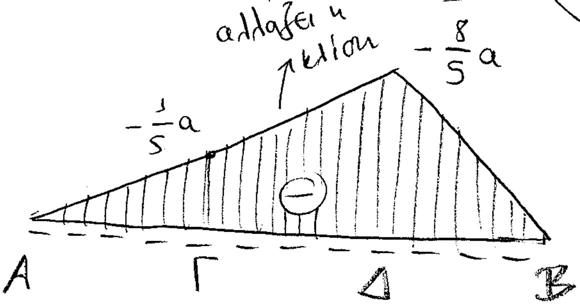
• Το σημείο Γ μετακινήθηκε $\frac{1}{5}a$ αριστερά, το Δ $\frac{8}{5}a$ αριστερά, και τα Α και Β έμειναν ακλόνητα.

$$\Delta_\Gamma = \cancel{\Delta_A}^{\,0} + \Delta l_{A\Gamma} = -\frac{1}{5}a$$

$$\Delta_\Delta = \Delta_\Gamma + \Delta l_{\Gamma\Delta} = \left[-\frac{8}{5}a\right] *$$

→ αρνητική μετακίνηση σημαίνει ότι πήγε προς τα αριστερά.

(αυτό κατά λάθος το έγραψα $\frac{8}{5}a$, αλλά στο διάγραμμα το έβαλα $-\frac{8}{5}a$)



[Δ]

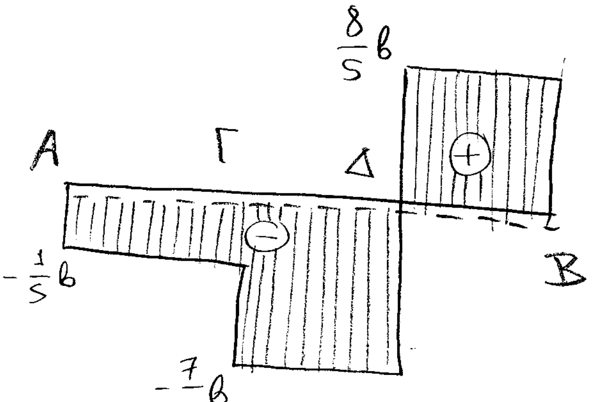
• $\varepsilon = \frac{\Delta l}{l}$

$$\varepsilon_{A\Gamma} = \frac{\Delta l_{A\Gamma}}{l_{A\Gamma}} = \frac{-\frac{1}{5}\cdot\frac{P\cdot \cancel{l_1}}{E\cdot A_2}}{\cancel{l_1}} = -\frac{1}{5}\cdot\frac{P}{E\cdot A_2}$$

$$\varepsilon_{\Gamma\Delta} = \frac{\Delta l_{\Gamma\Delta}}{l_{\Gamma\Delta}} = \frac{-\frac{7}{5}\cdot\frac{P\cdot \cancel{l_1}}{E\cdot A_2}}{\cancel{l_1}} = -\frac{7}{5}\cdot\frac{P}{E\cdot A_2}$$

$$\varepsilon_{\Delta B} = \frac{\Delta l_{\Delta B}}{l_{\Delta B}} = \frac{\frac{8}{5}\cdot\frac{P\cdot \cancel{l_1}}{E\cdot A_2}}{\cancel{l_1}} = \frac{8}{5}\cdot\frac{P}{E\cdot A_2}$$

Έστω $b = \frac{P}{E\cdot A_2}$ (όλα γνωστά)



[$\varepsilon_{\text{τμήματος}}$]