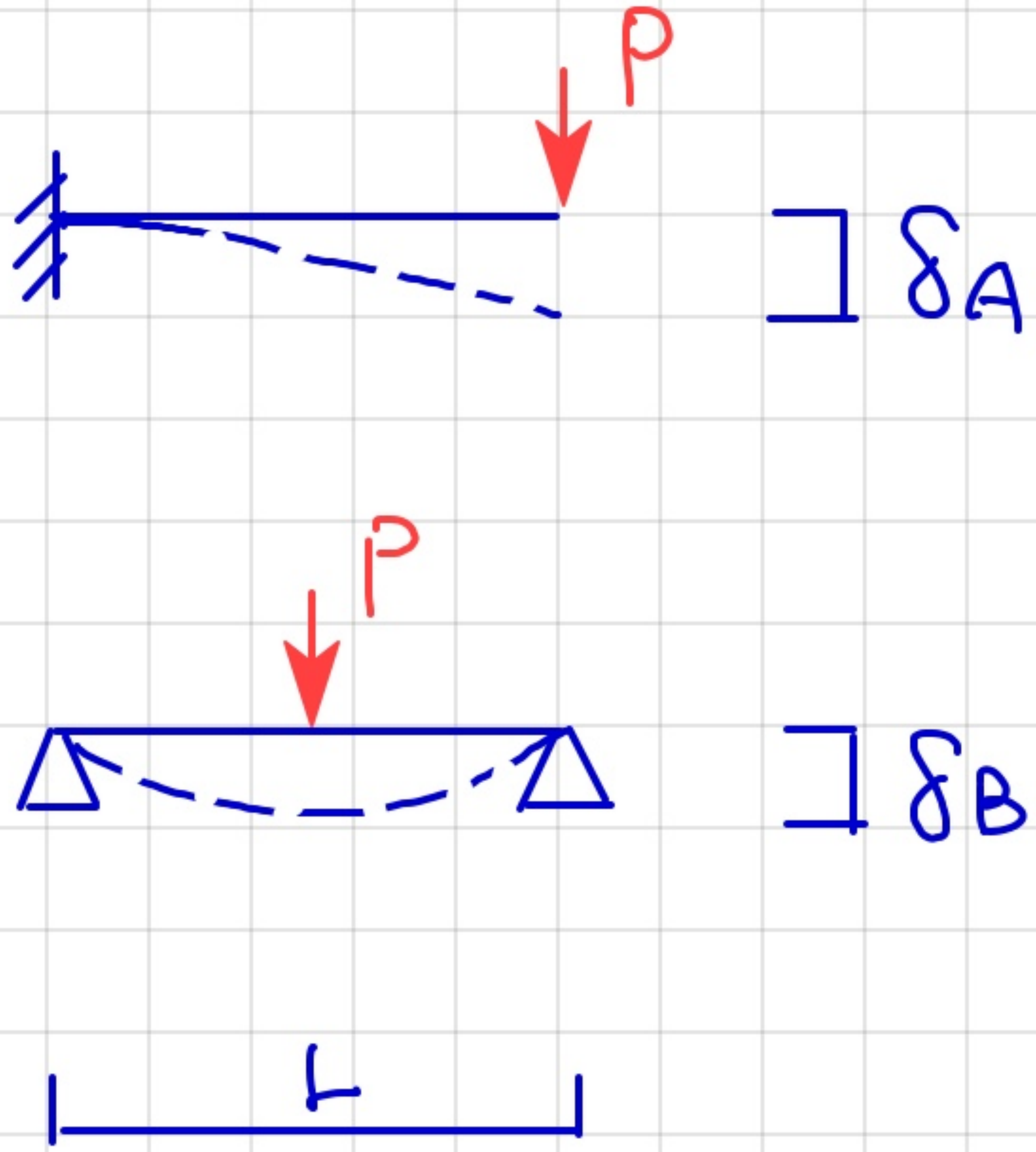
NO.1 たわみ問題 (H30年の類似)

δA:δB を求める



公式に代入して求める

$$\delta_A = \frac{PL^3}{3EI}$$

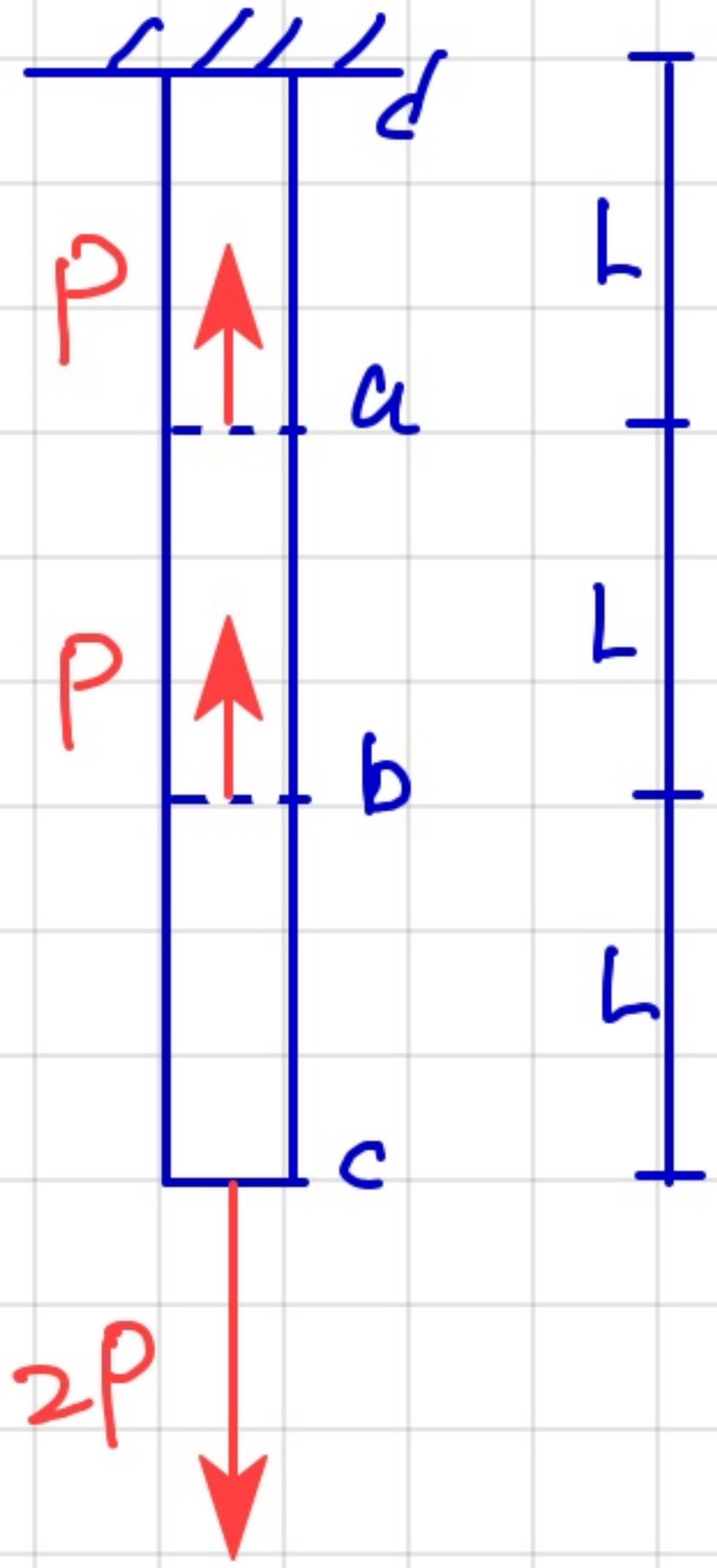
$$\delta_B = \frac{PL^3}{48EI}$$

$$\delta_A : \delta_B = \frac{\cancel{PL^3}}{\underset{1}{\cancel{3}}\cancel{EI}} \times 16 : \frac{\cancel{PL^3}}{\underset{16}{\cancel{48}}\cancel{EI}} \times 16$$

$$= 16 : 1$$

No2，変位の問題

a−b 間の軸力，Cの軸方向変位



$\Delta ad = 0$

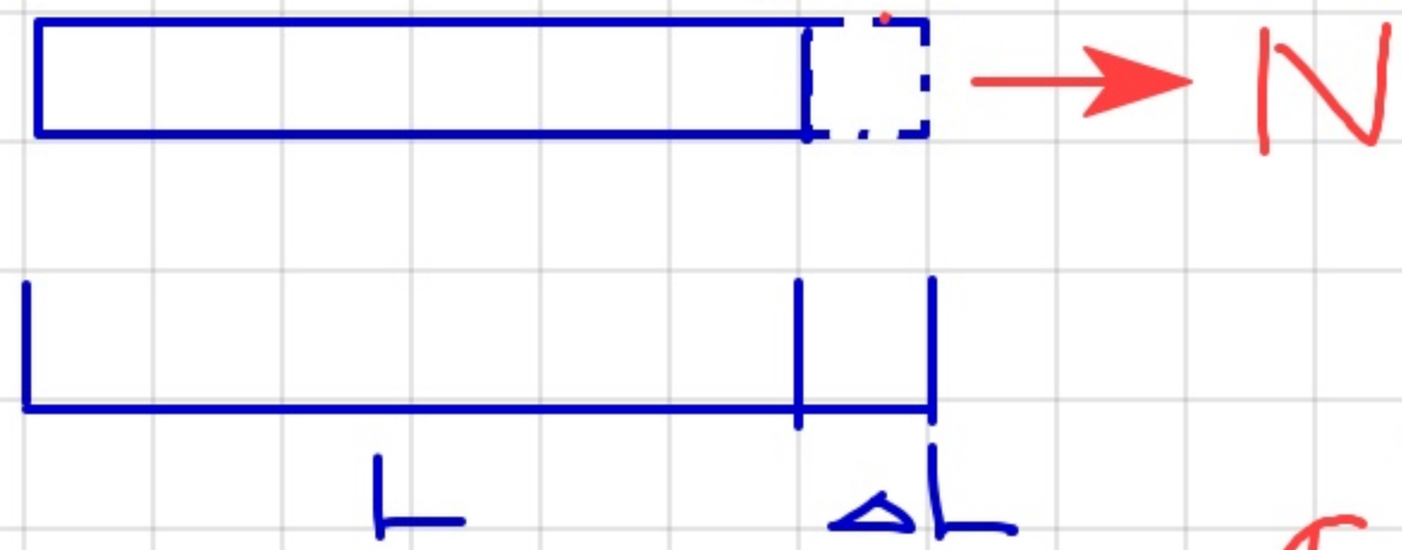
$\Delta ab = \dfrac{PL}{AE}$

$\Delta bc = \dfrac{2PL}{AE}$

$= \dfrac{3PL}{AE}$

変位の公式

断面積 A

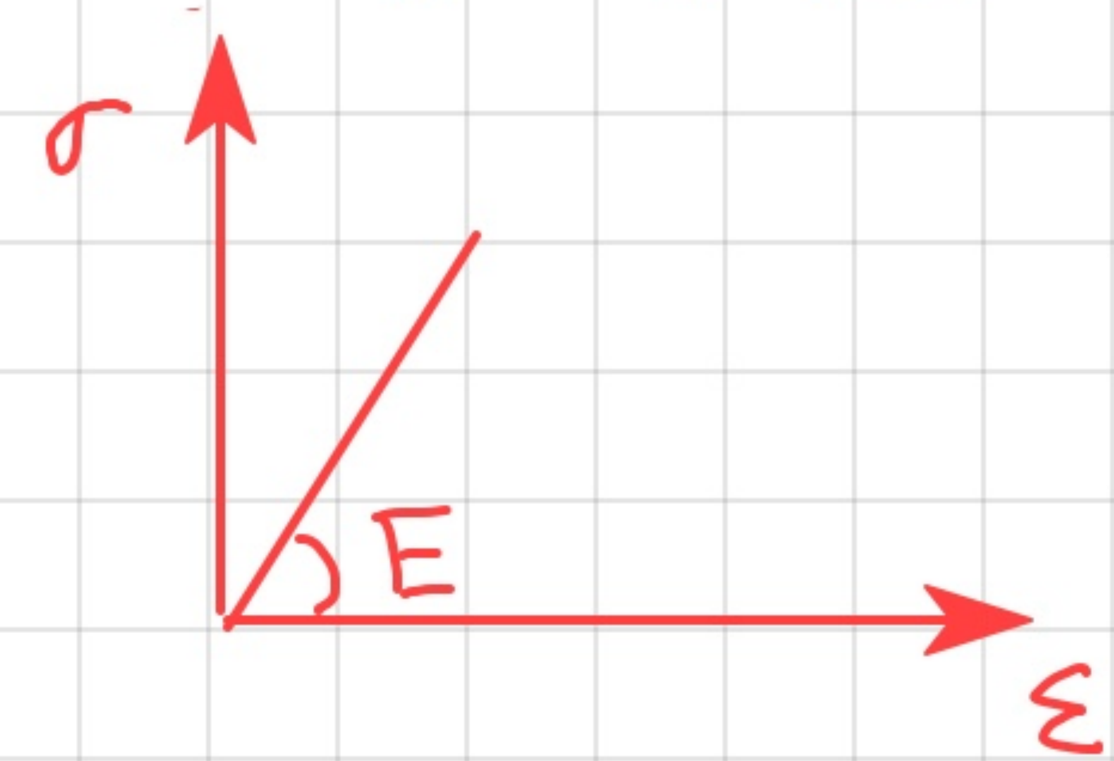


$\dfrac{N}{A} = E \cdot \dfrac{\Delta L}{L}$

$\Delta L = \dfrac{N \cdot L}{A \cdot E}$

力 = 硬さ × 変形

$\sigma = E\varepsilon$

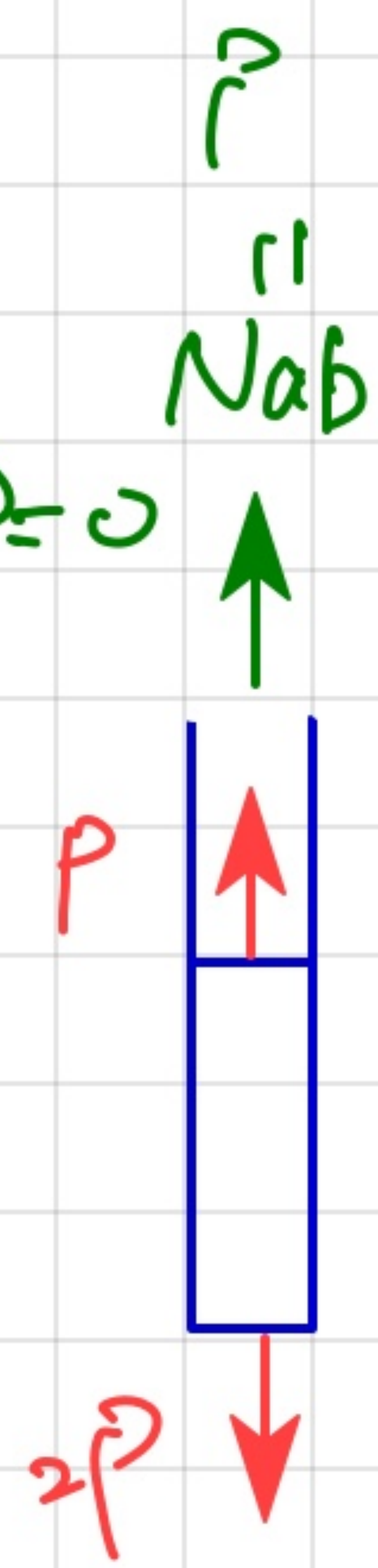


$\sigma = \dfrac{N}{A}$ ，$\varepsilon = \dfrac{\Delta L}{L}$

ΣY=0より

$N_{ad} + P + P - 2P = 0$

$N_{ad} = 0$



ΣY=0より

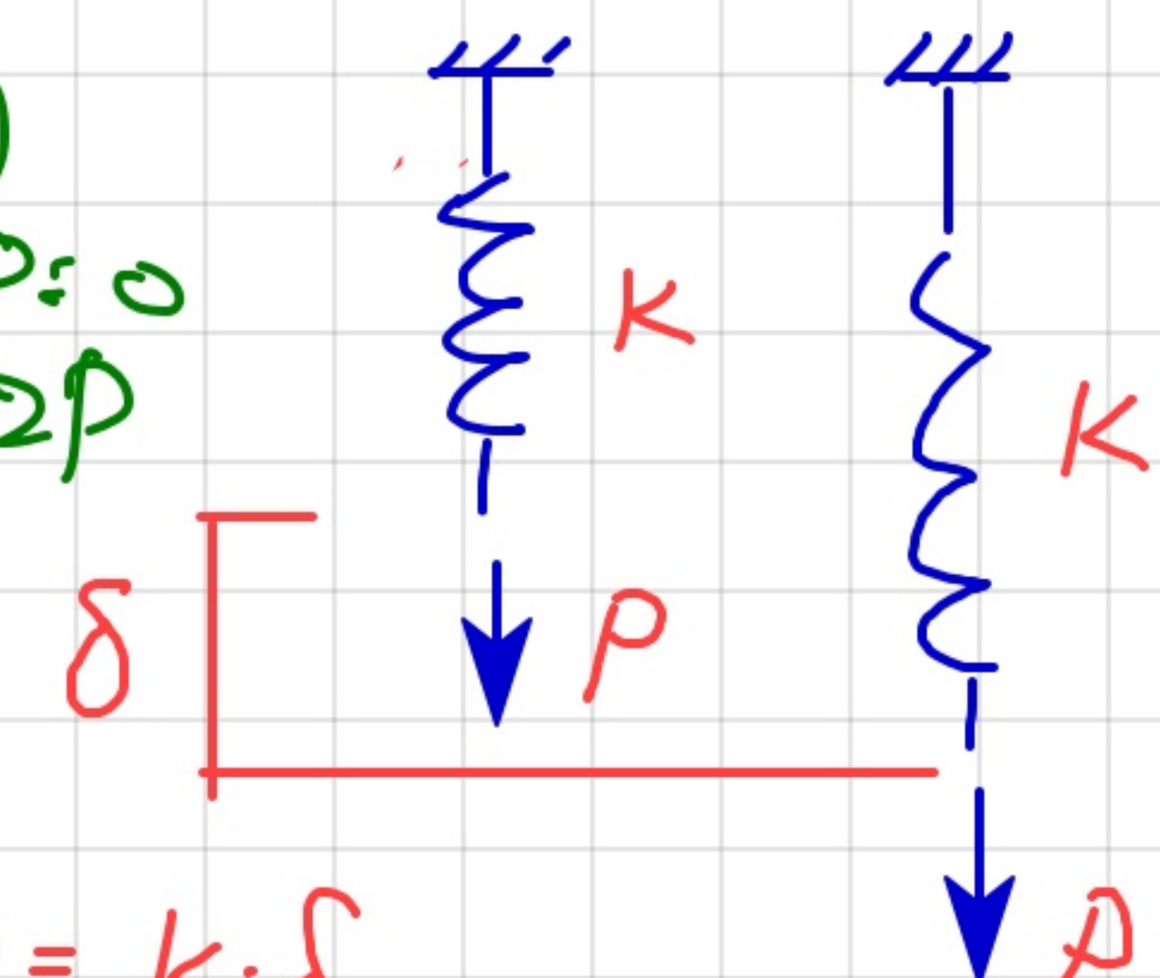
$N_{ab} + P - 2P = 0$

$N_{ab} = P$

ΣY=0より

$N_{bc} - 2P = 0$

$N_{bc} = 2P$

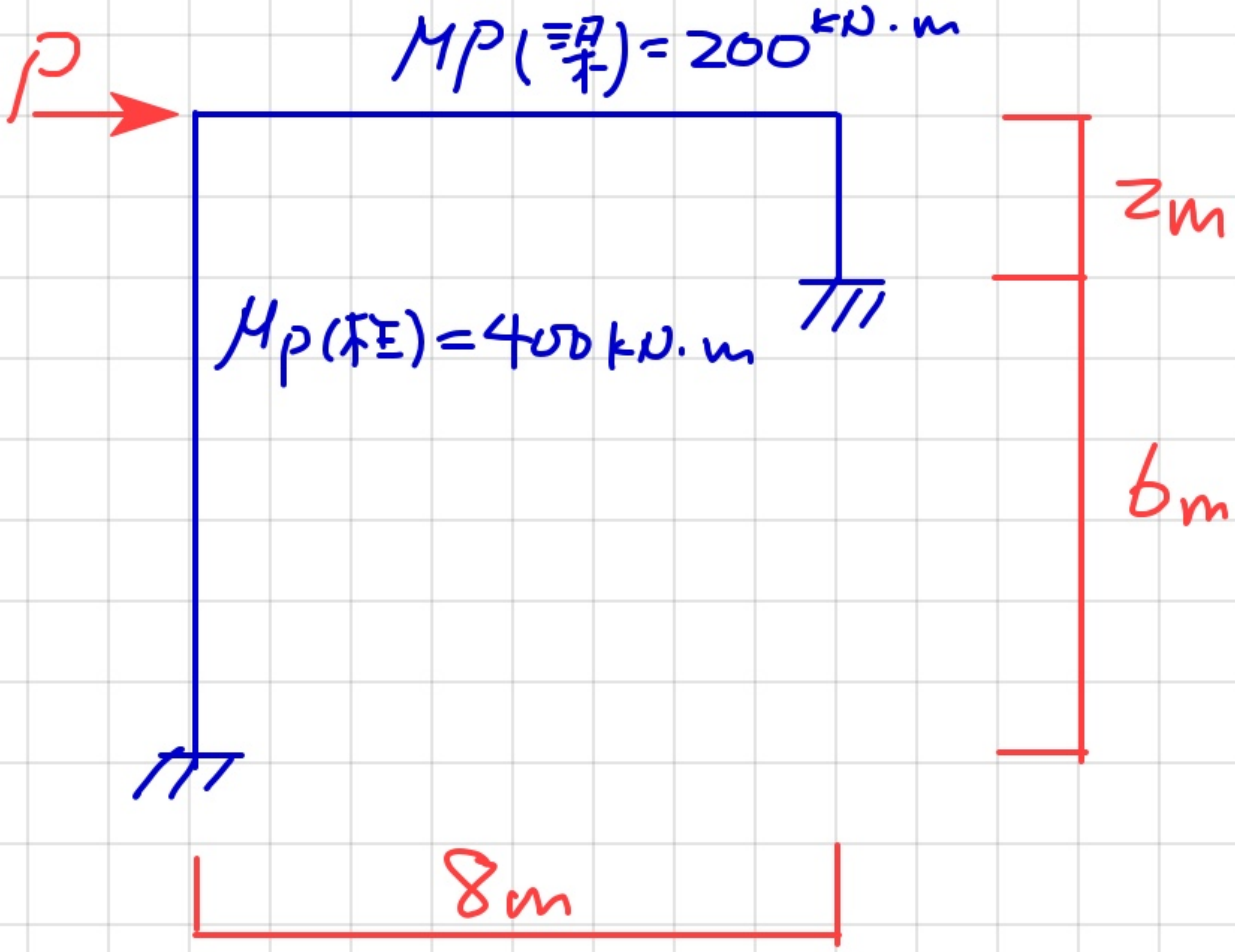


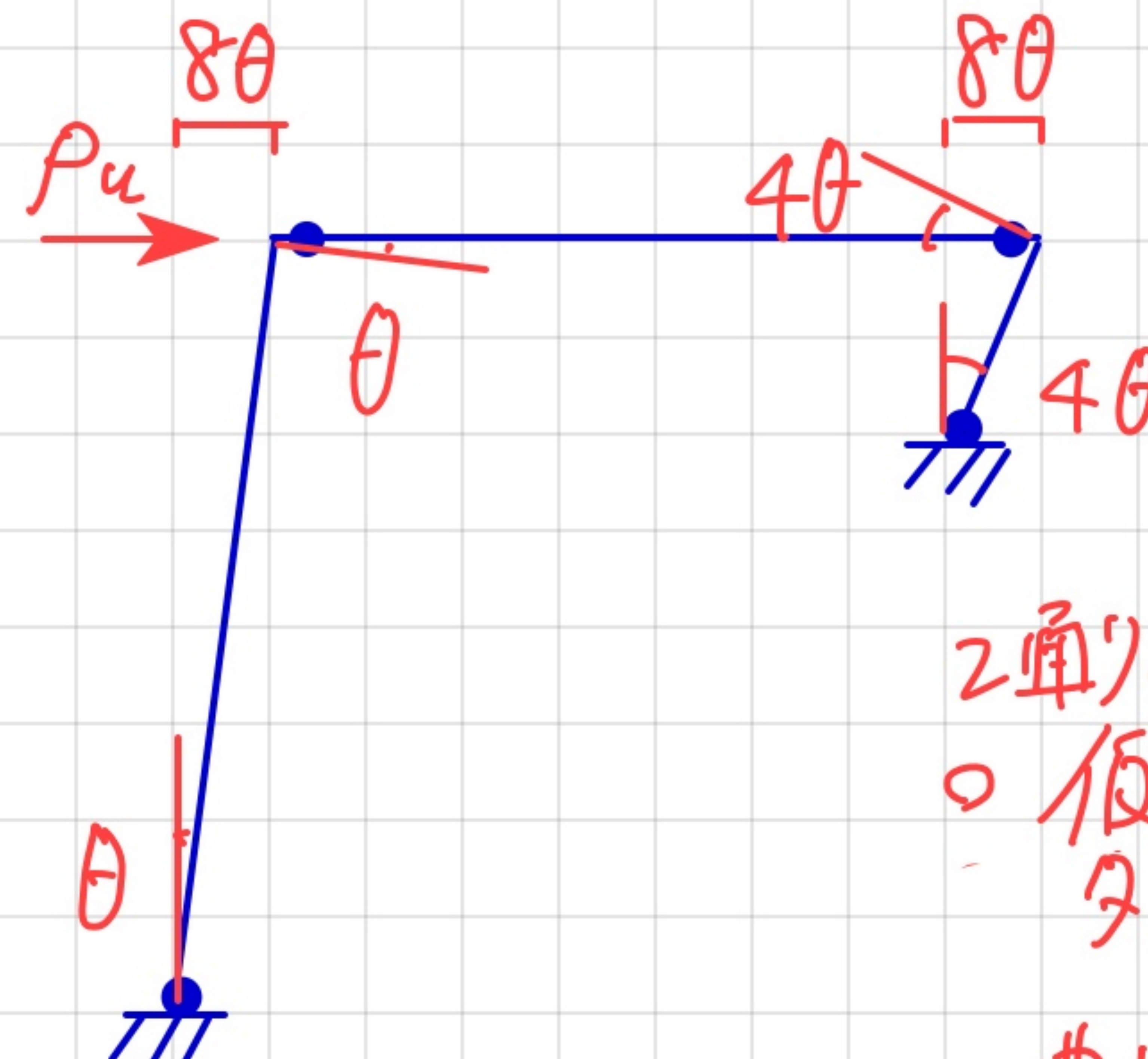
$P = k \cdot \delta$

力 = 硬さ × 変形

whiteboardApp.org

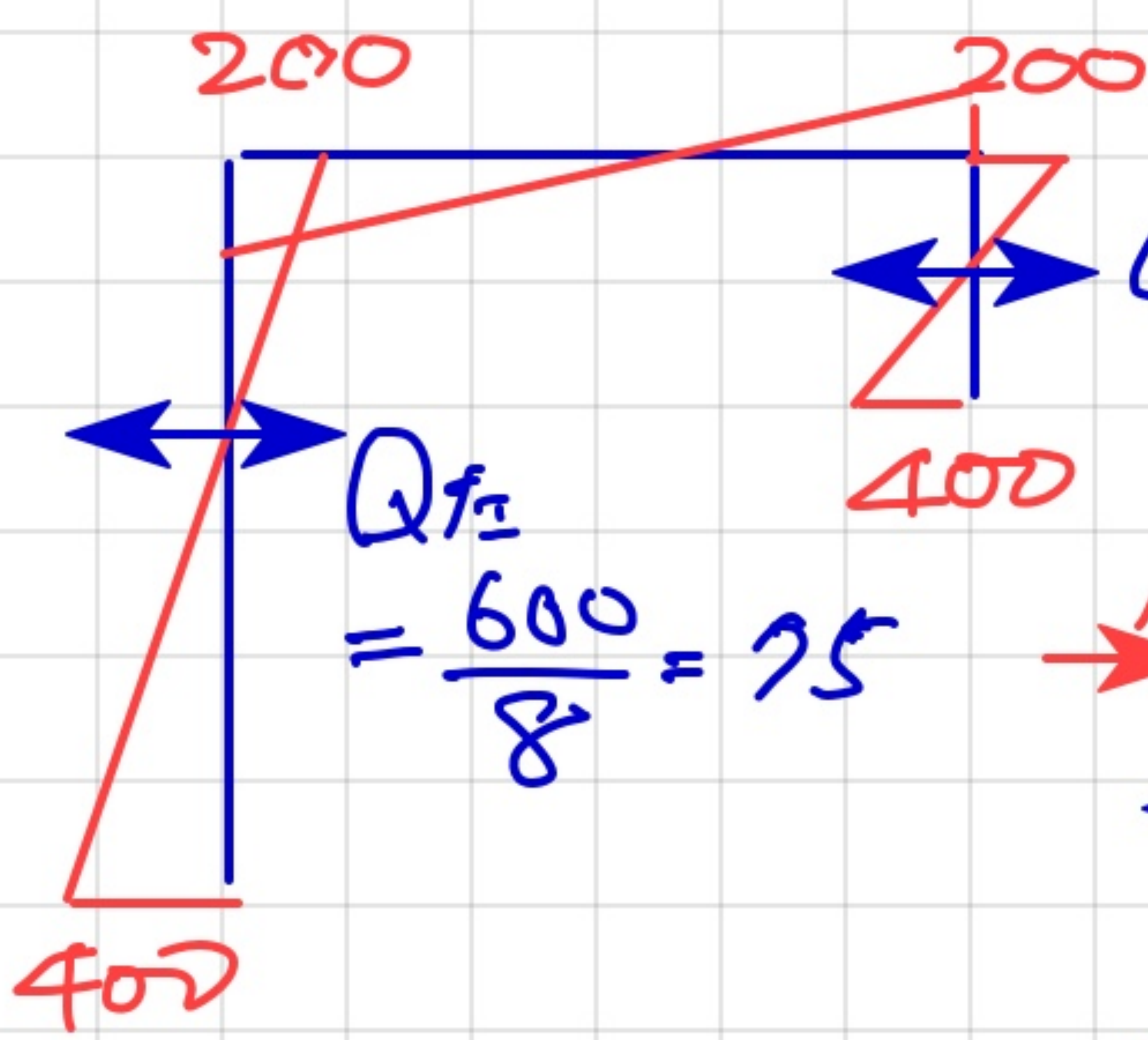
No3 崩壊荷重を求める問題（H27-4の類似）





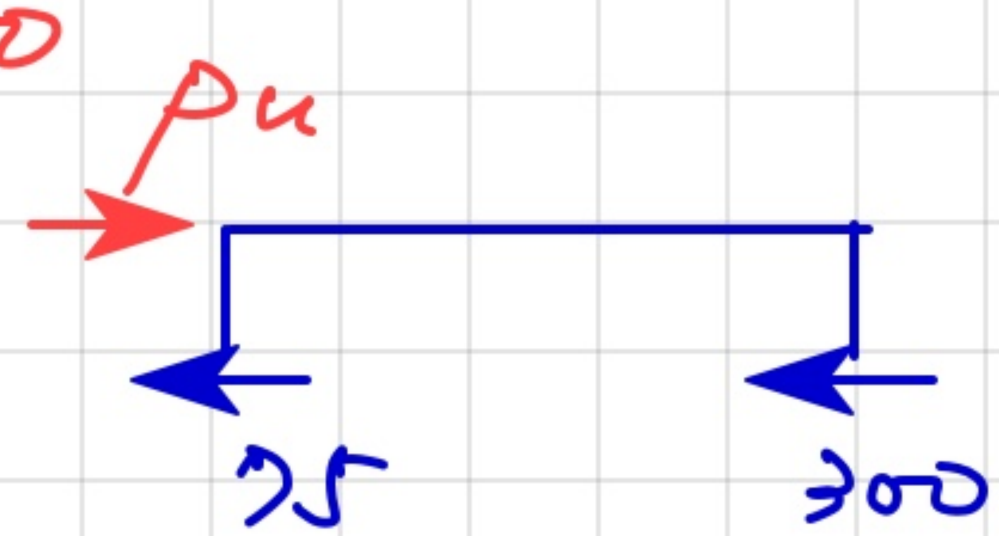
2通りの解き方

- 仮想仕事の原理
  外力の仕事 = 内力の仕事
- 曲げモーメントとせん断力の関係



$Q_{右} = \frac{600}{2} = 300$

$Q_{左} = \frac{600}{8} = 75$

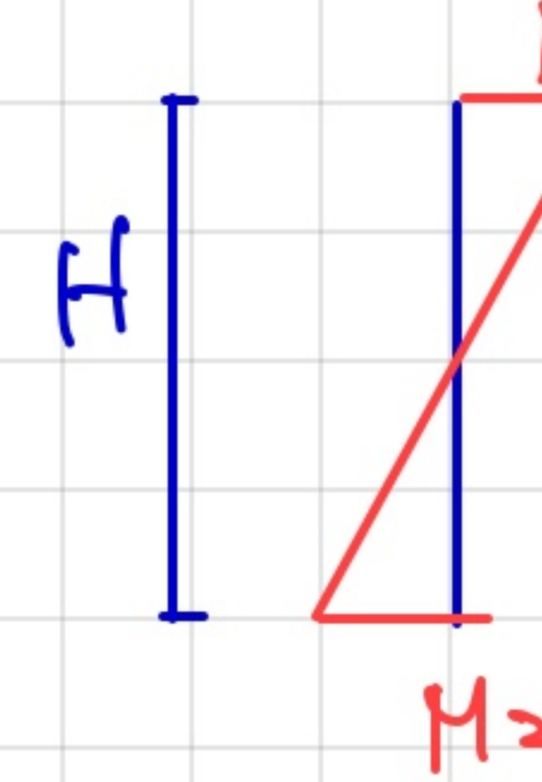


$P_u = 75 + 300$
$= 375$

$\Sigma P\delta = P_u 8\theta$

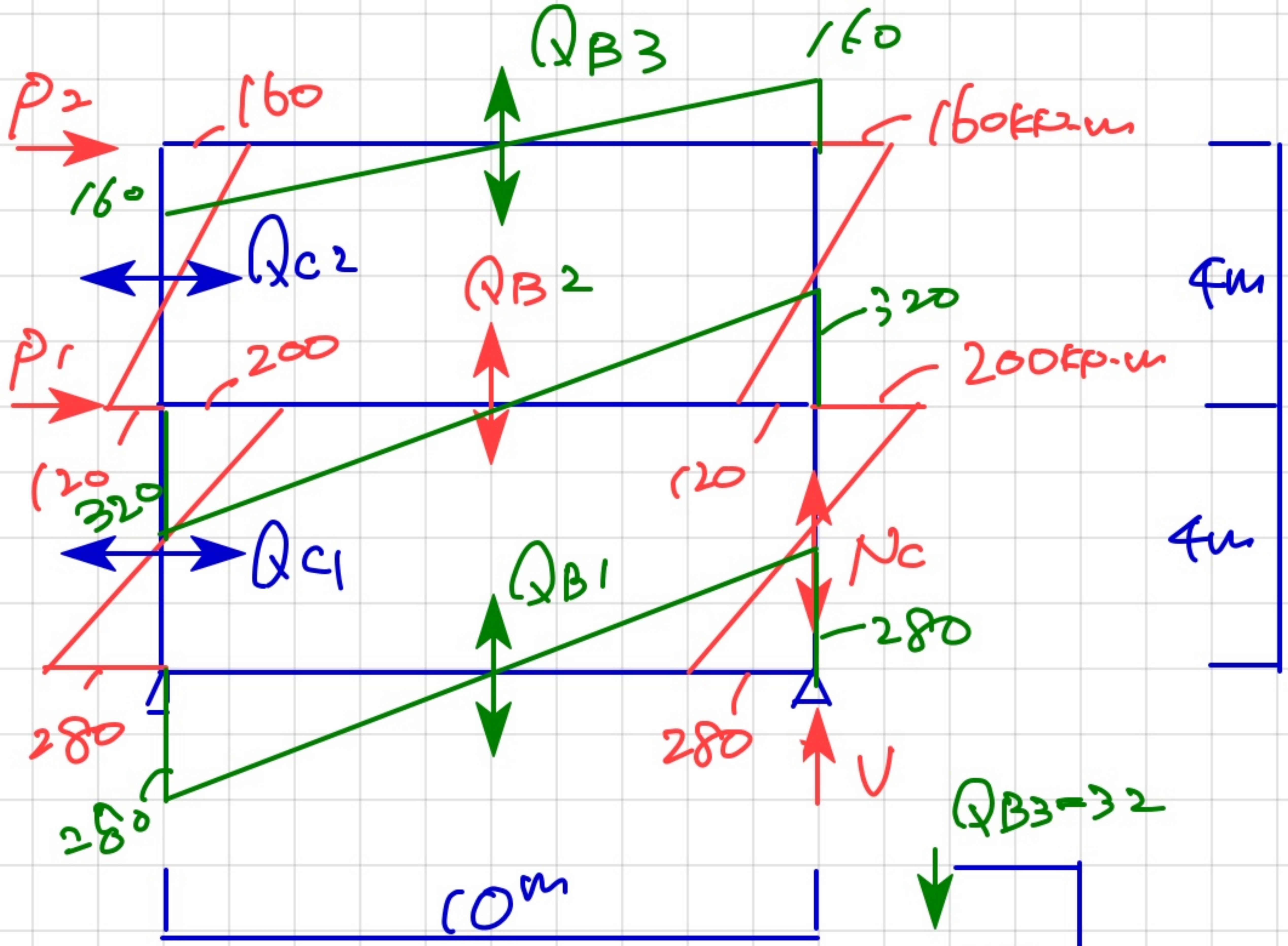
$\Sigma M\theta = 400\theta + 200\theta$
$+ 200\times4\theta + 400\times4\theta$
$= 3000\theta$

$8P_u\theta = 3000\theta$ $\quad P_u = 375$

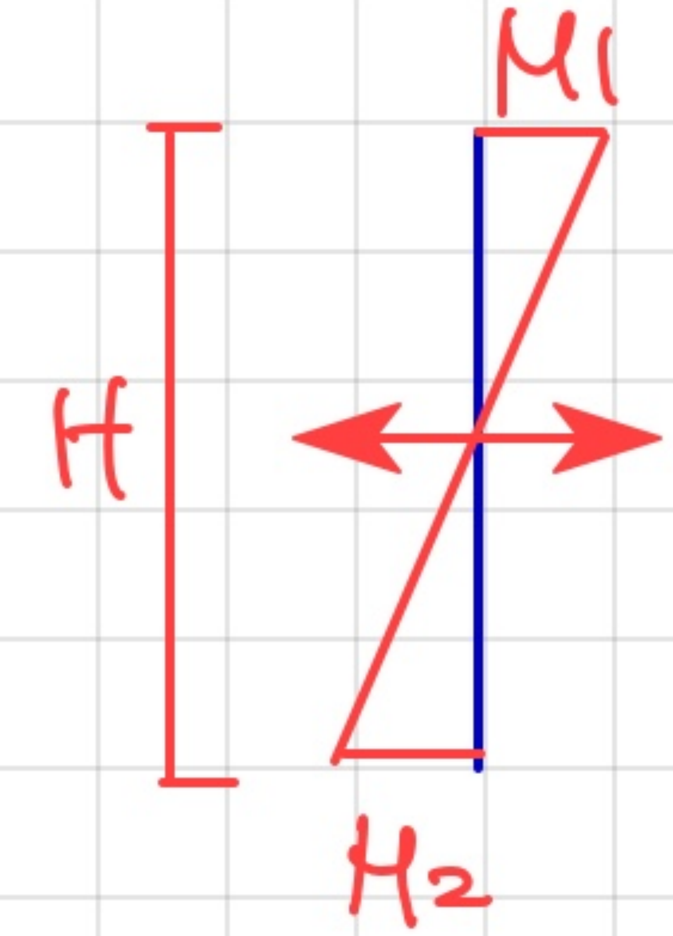


$Q = \frac{M_1 + M_2}{H}$

NO4. 多層ラーメンの応力・反力を求める問題 (H30-4の類似)



曲げモーメントとせん断力の関係



$$Q = \frac{M_1 + M_2}{H}$$

$Q_{C2} = 280/4 = 70$

$Q_{C1} = 480/4 = 120$

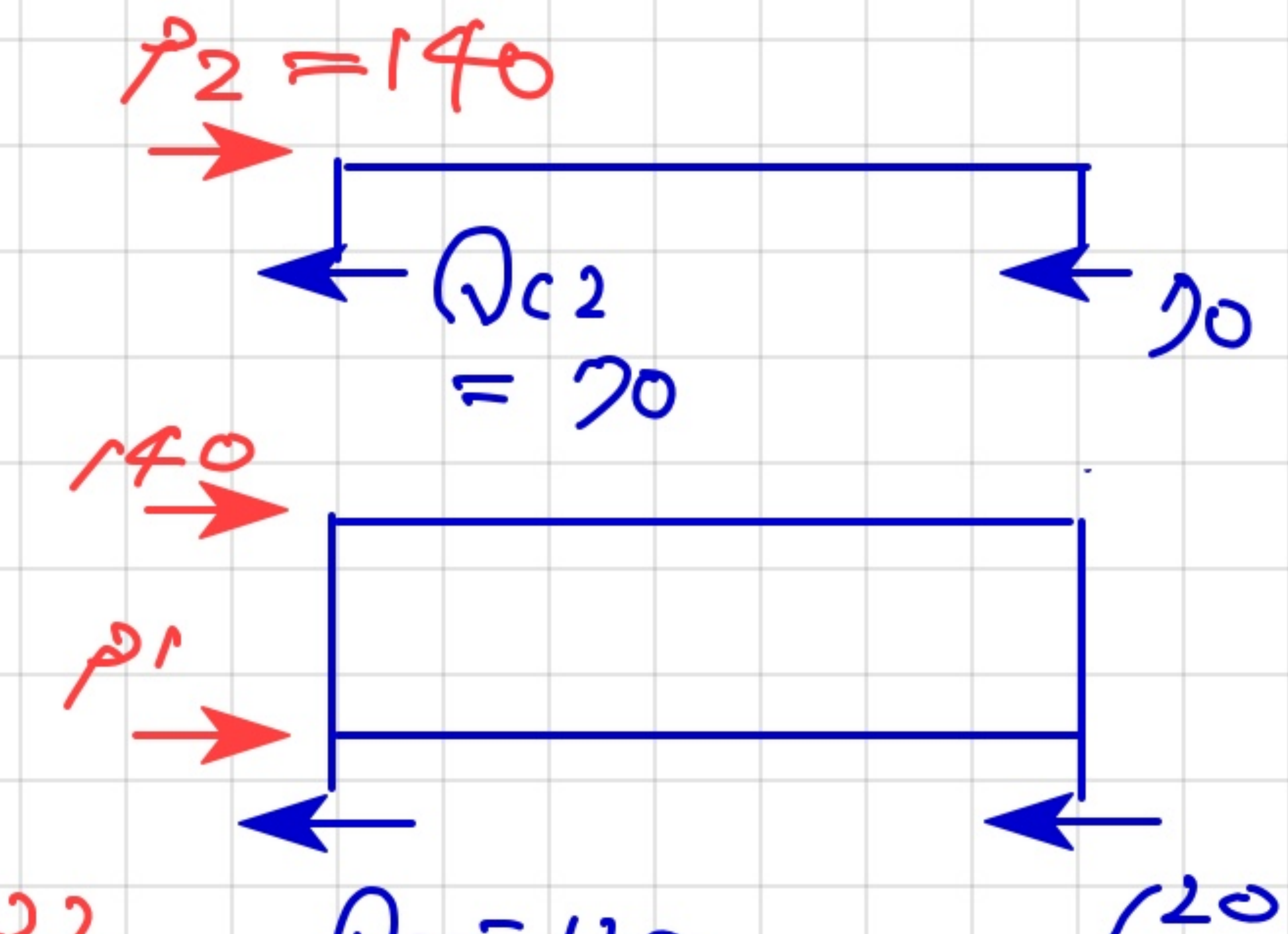
$Q_{B3} = 320/10 = 32$ ②

$Q_{B2} = 640/10 = 64$

$Q_{B3} = 560/10 = 56$

$N_C = 64 + 32$
$= 96$ ③

$V = 32 + 64 + 56 = 152$ ④



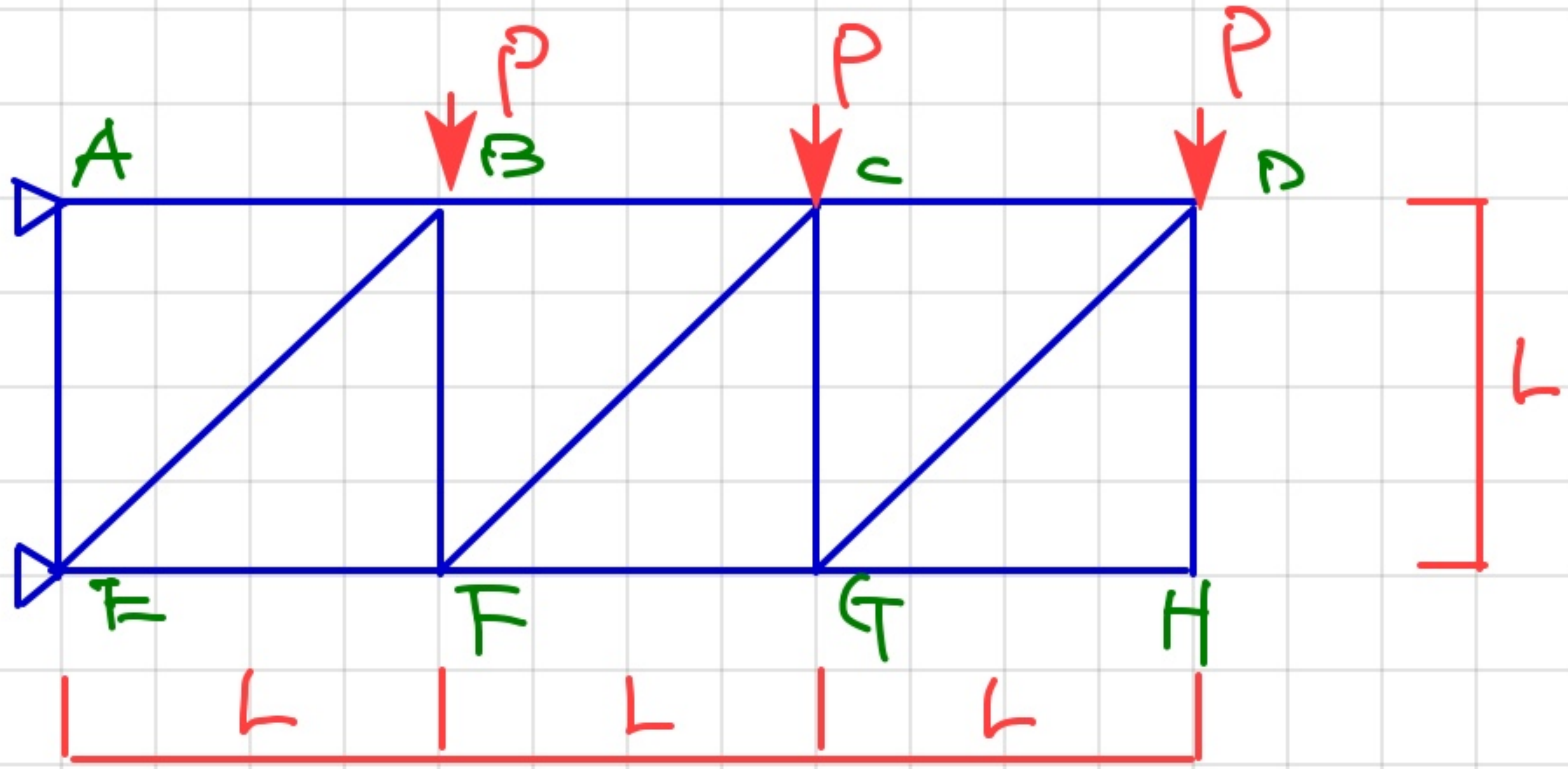
$Q_{C1} = 120$

$\Sigma X = 0$より

$P_1 + 140 - 120 - 120 = 0$

$P_1 = 100$ ①

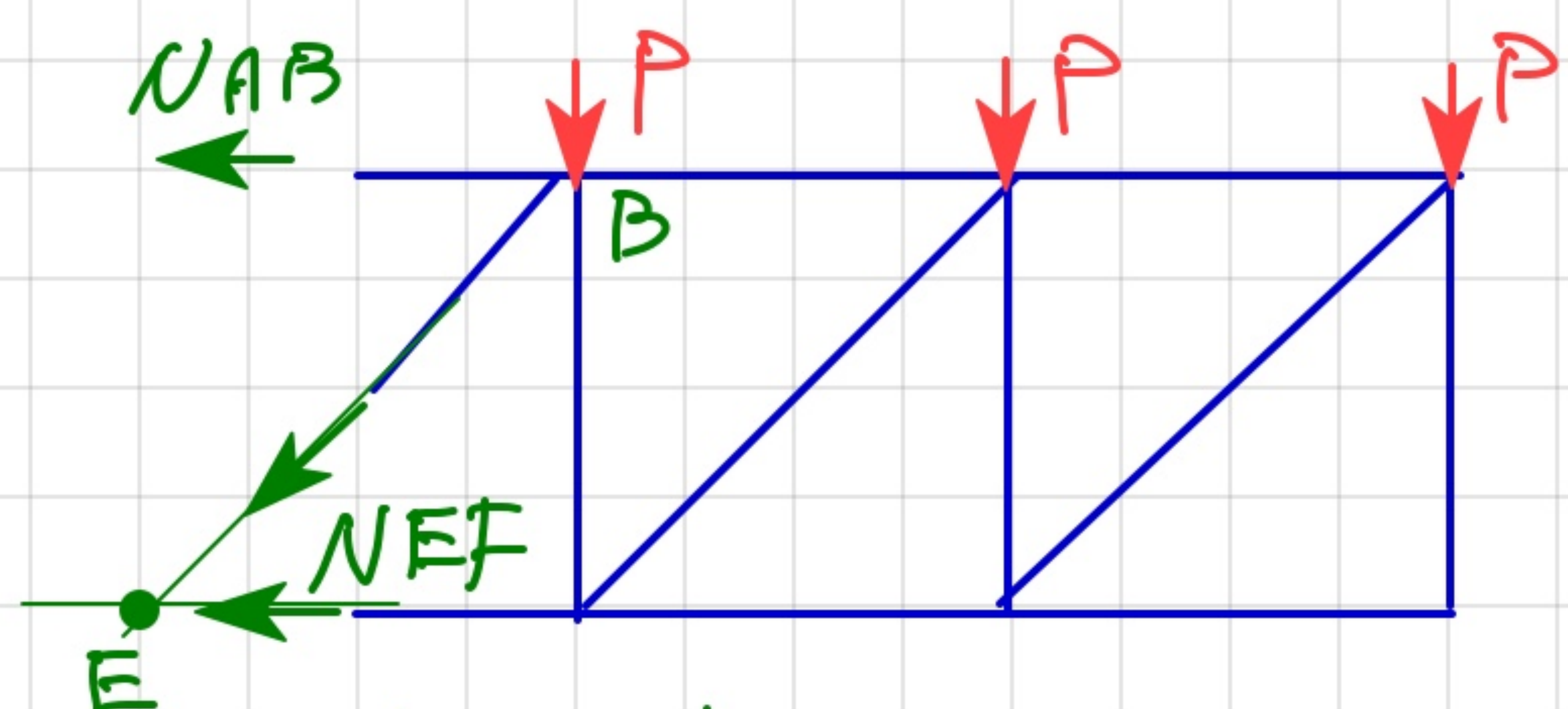
No5 トラスの塑性崩壊荷重の問題 (H22-05の類似)

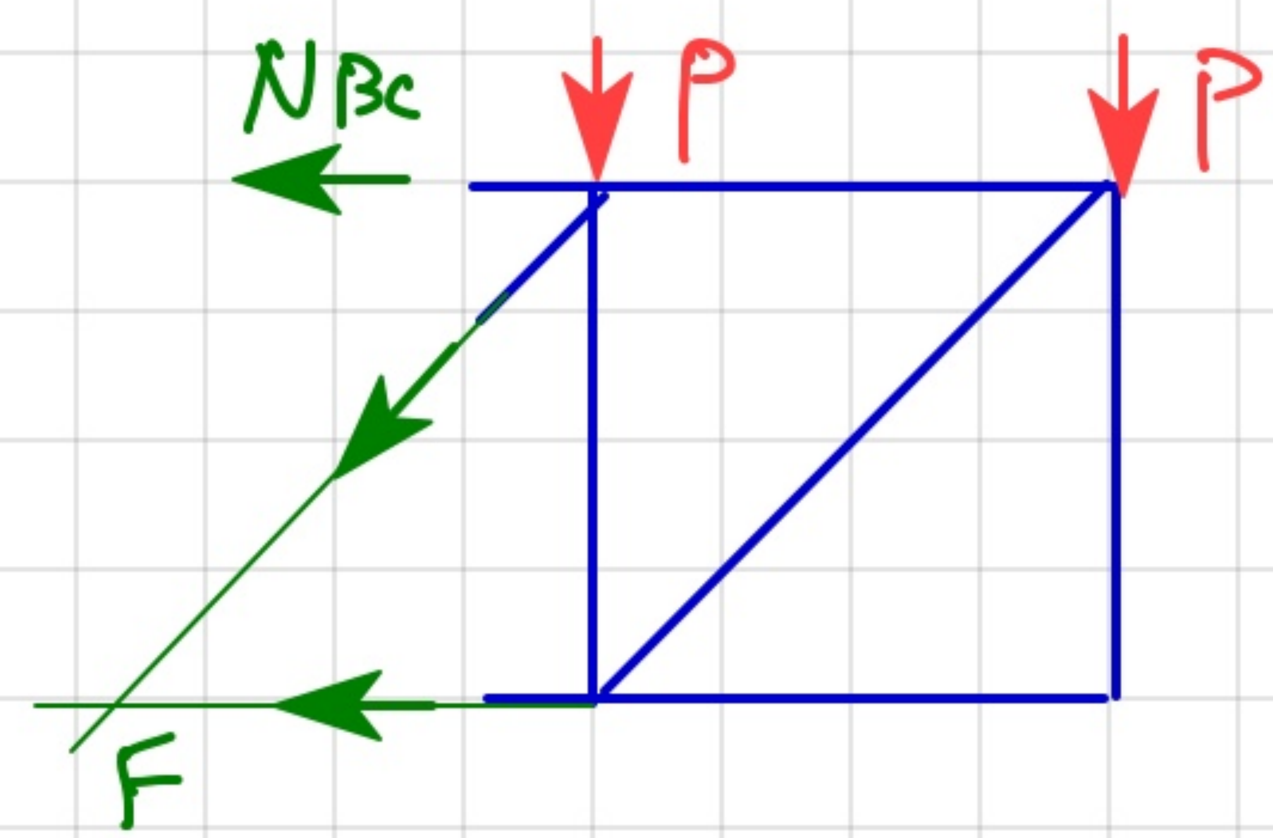


一つの部材が
降伏応力度 σ_y に達した時が
塑性崩壊

応力度 = N/A (単位面積あたりの応力)

最大応力の箇所が最初に降伏する
↓
最大応力の箇所のNを求める





ΣME=0より

$$-N_{AB} \times L + P \times L + P \times 2L + P \times 3L = 0$$

$$N_{AB} = 6P$$

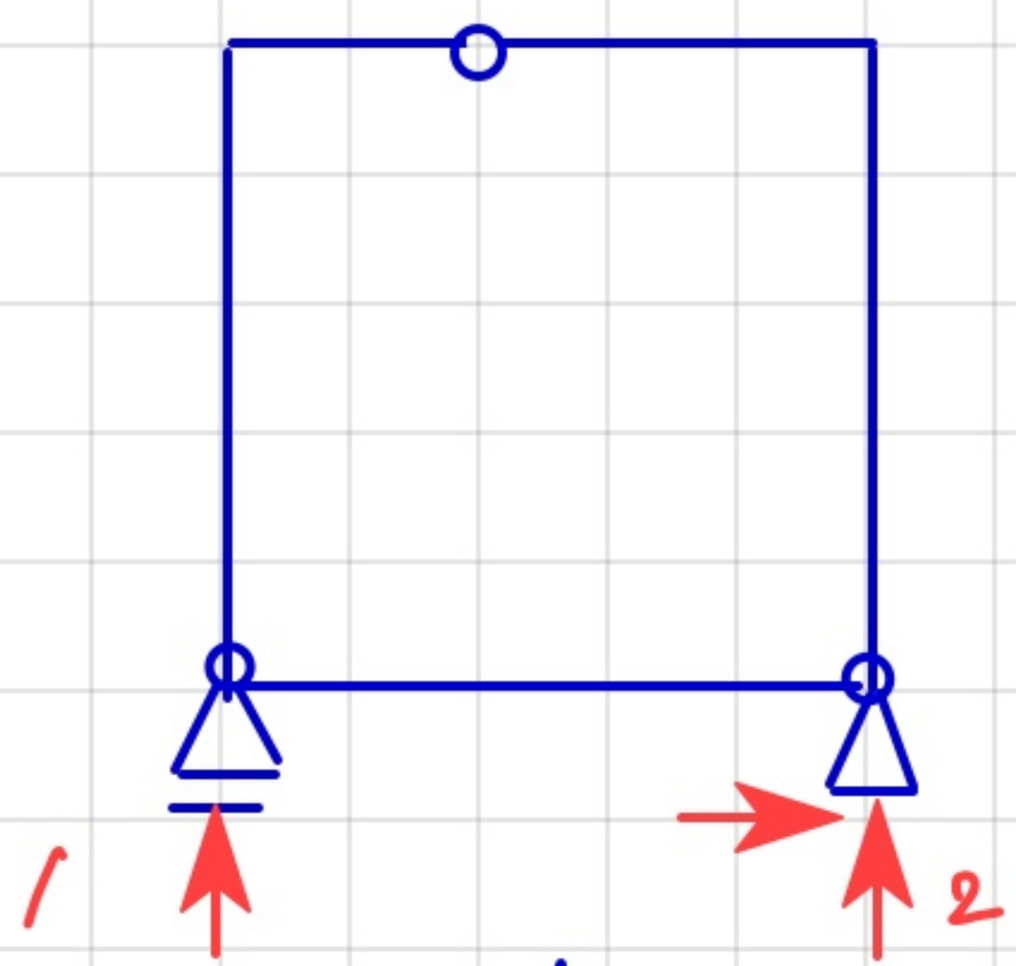
ΣMB=0より

$$N_{EF} \times L + P \times L + P \times 2L = 0$$

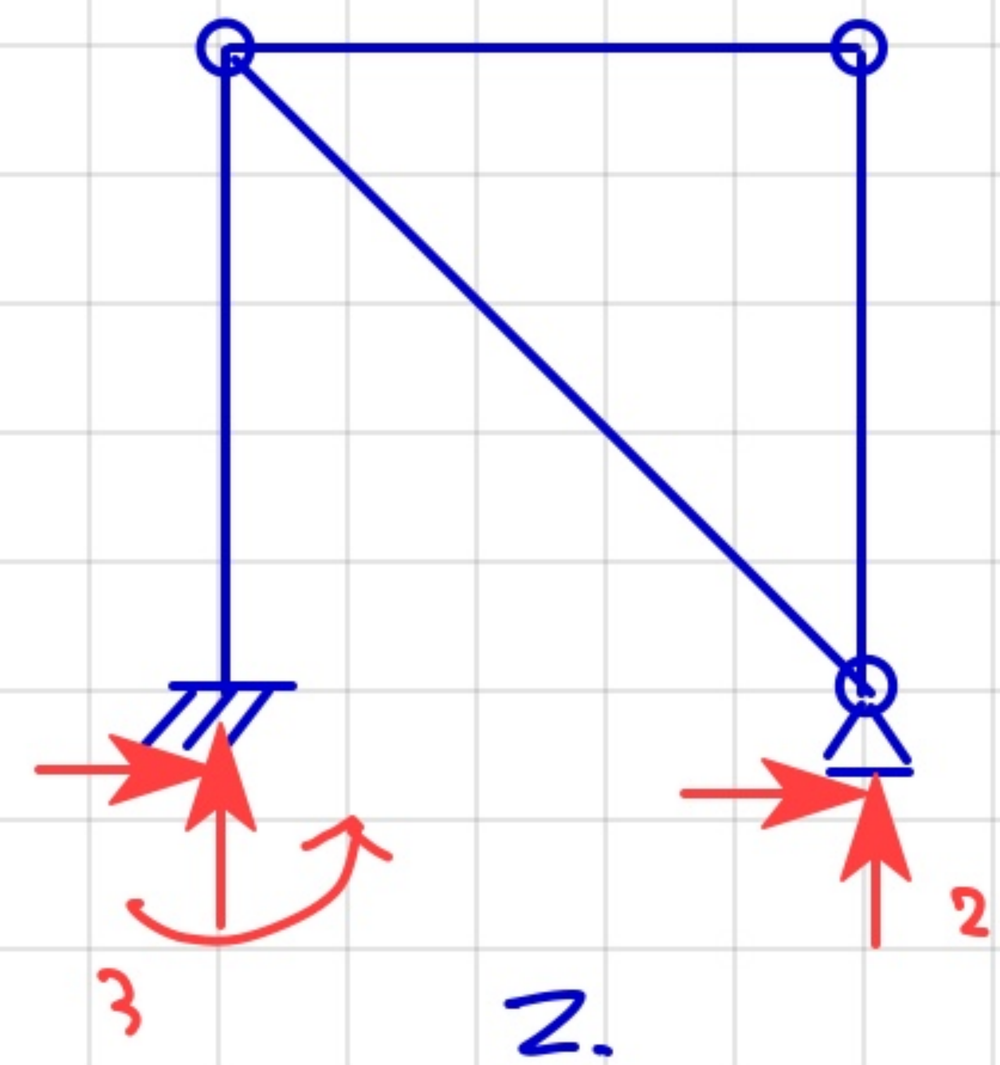
$$N_{EF} = -3P$$

$$\sigma_y = \frac{N}{A} = \frac{6P}{A} \Rightarrow P = \frac{A \cdot \sigma_y}{6}$$

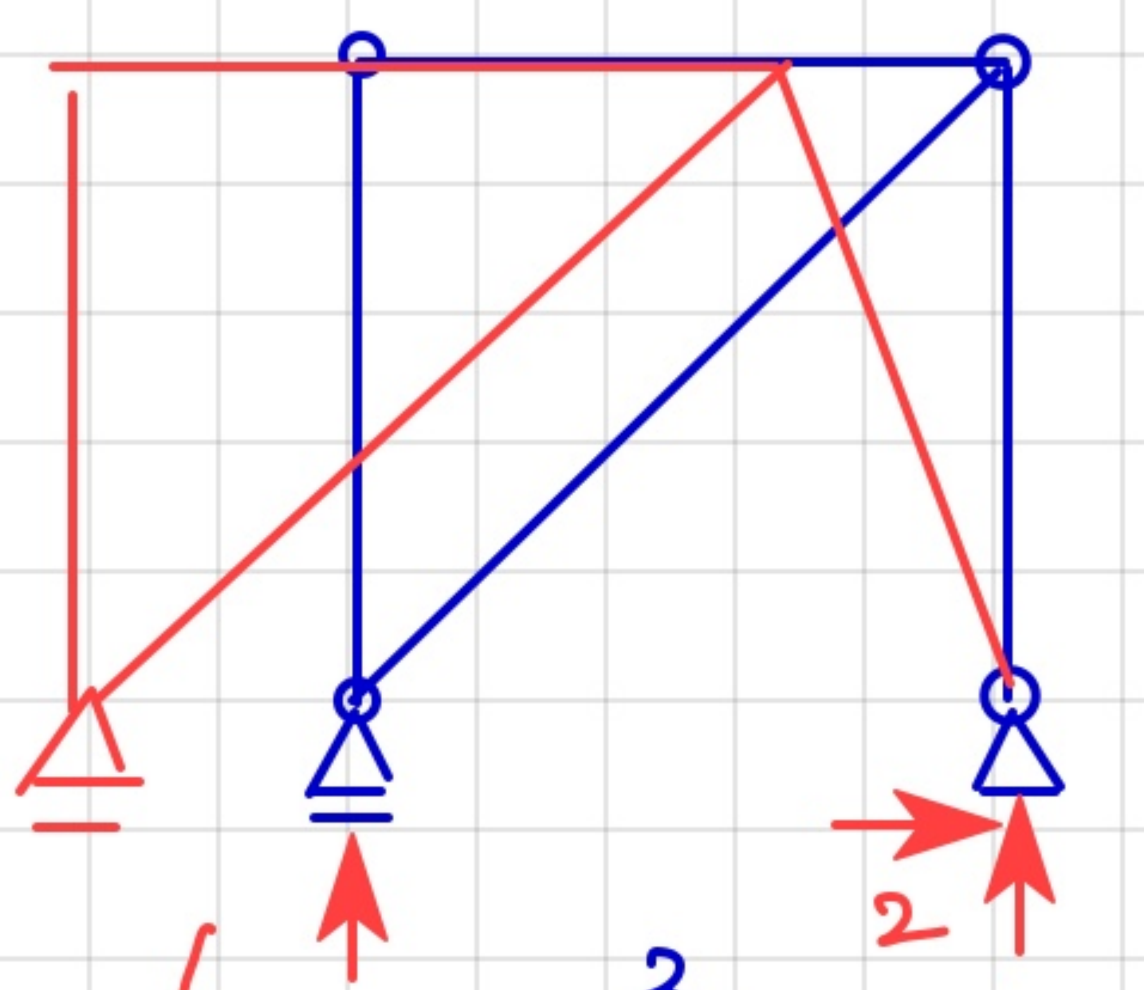
No6　静定構造を選ぶ問題（R01-06の類似）



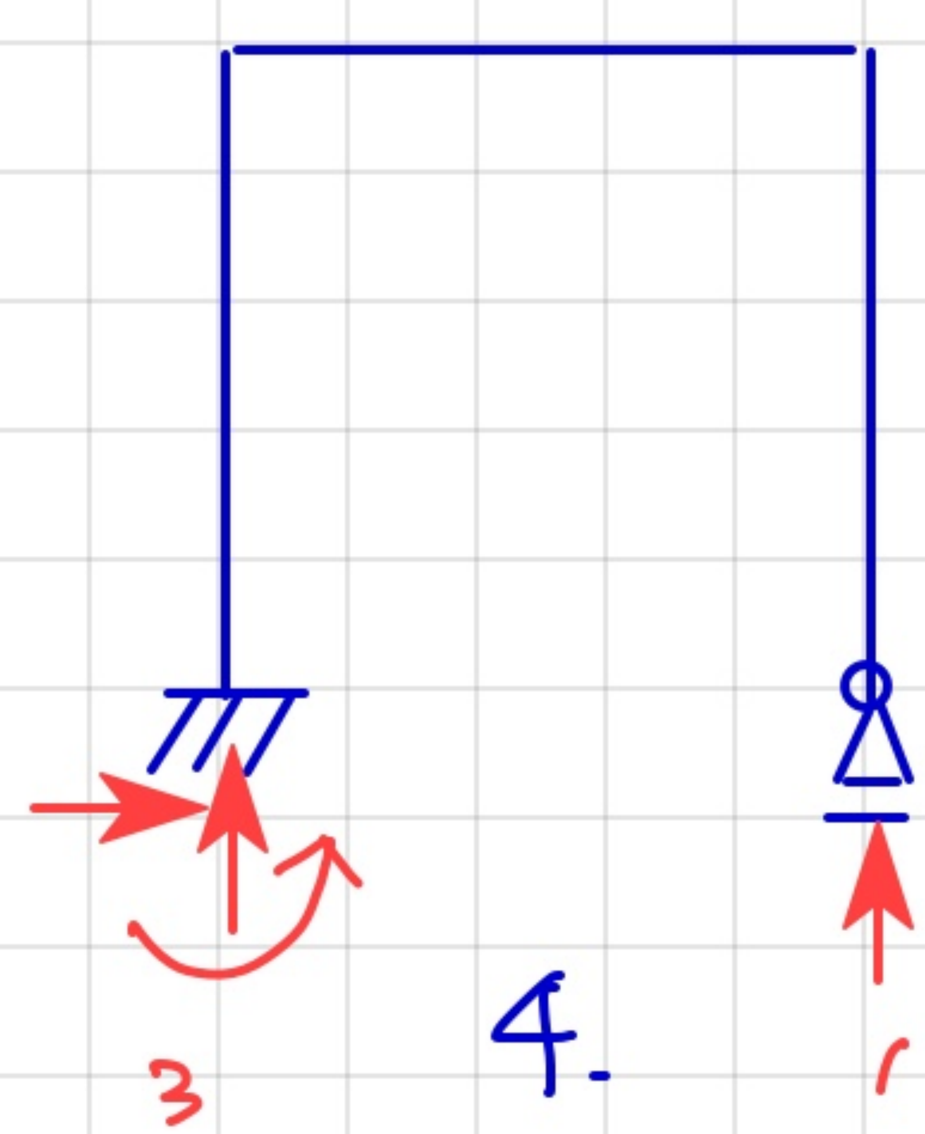
1.



2.



3.



4.

判別式　$m+s+r-2k$

m：反力数
s：部材数
r：剛節接合部材数
k：節点数

判別式　0：静定
>0：不静定
<0：不安定

	$m+s+r-2k$
1	$3+5+2-10=0$
2	$5+4+0-8=1$
3	$3+4+0-8=-1$
4	$4+3+2-8=1$