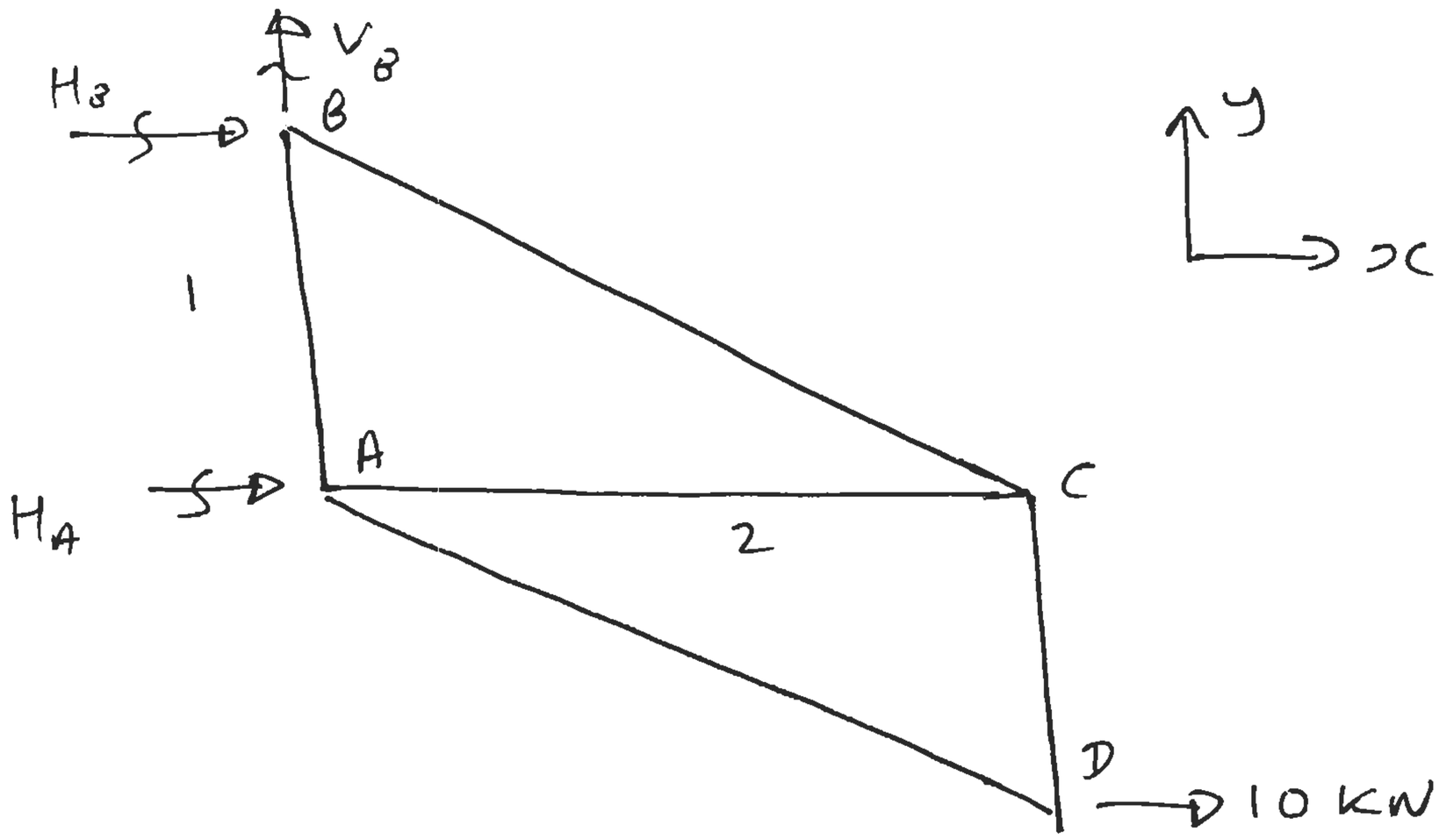
M9



$$\sum \vec{F_x} = 0: \quad 10 + H_B + H_A = 0 \qquad (1)$$

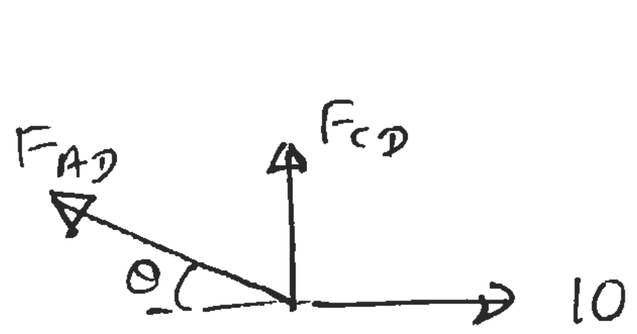
$$\sum F_y \uparrow = 0: \quad V_B + 0 = 0 \Rightarrow V_B = 0 \qquad (2)$$

$$\sum \circlearrowright M_B = 0: \quad H_A \cdot 1 + 10 \cdot 2 = 0 \Rightarrow H_A = -20\,kN\,(\leftarrow) \Leftarrow$$

Substitute in (1) $\quad H_B = +10\ KN \Leftarrow$

Bar Forces

M o J @ D



$$\cos\theta = \frac{2}{\sqrt{5}} \qquad \sin\theta = \frac{1}{\sqrt{5}}$$

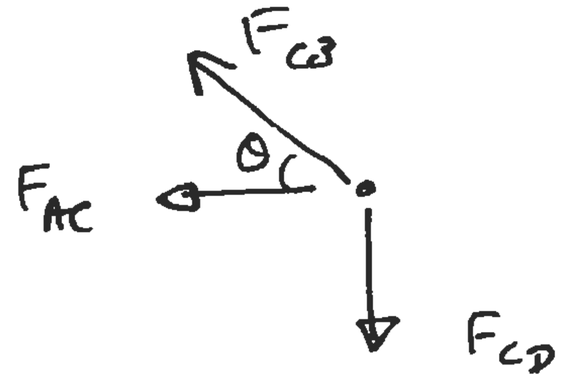
$$\sum \vec{F_x} = 0 \quad -F_{AD}\cos\theta + 10 = 0 \Rightarrow F_{AD} = \frac{10 \cdot \sqrt{5}}{2} = +11.2\,kN$$

$$\sum F_y \uparrow = 0 \quad F_{AD}\sin\theta + F_{CD} = 0$$

$$F_{CD} = -F_{AD}\sin\theta = -\frac{10 \cdot \sqrt{5}}{2} \cdot \frac{1}{\sqrt{5}} = -5\,kN \Leftarrow$$

Mo J @ C .

Σ



$\sin\theta = \frac{1}{\sqrt{5}}$

$\cos\theta = \frac{2}{\sqrt{5}}$

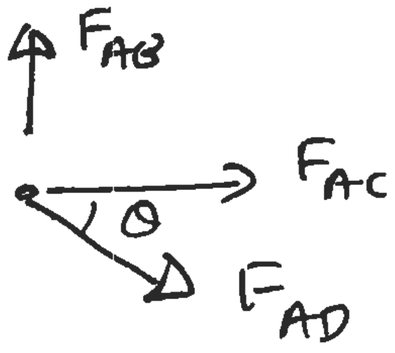
$\Sigma F_y \uparrow = 0$ $\quad F_{CB}\sin\theta - F_{CD} = 0$

$F_{CB} = +\cancel{5}\, F_{CD} = \frac{-5\sqrt{5}}{\sin\theta}$ KN ∈

$\Sigma \overrightarrow{F_x} = 0$: $-F_{AC} - F_{CD}\cos\theta = 0$

$F_{AC} = -F_{CD}\cos\theta = +5\cancel{\sqrt{5}} \cdot \frac{2}{\cancel{\sqrt{5}}} = +10$KN ∈

Mo J @ A



$\cos\theta = \frac{2}{\sqrt{5}}$

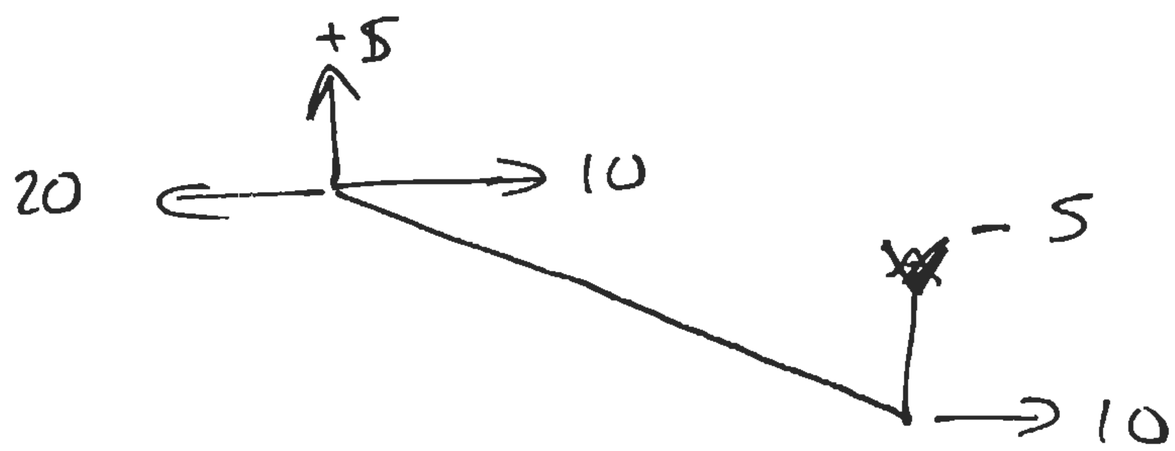
$\sin\theta = \frac{1}{\sqrt{5}}$

$\Sigma F_y \uparrow = 0$ $\quad F_{AB} - F_{AD}\sin\theta = 0$

$\Sigma \overrightarrow{F_x} = 0$ $\quad F_{AB} = F_{AD}\sin\theta$

$= 1\cancel{2} + 5\sqrt{5} \cdot \frac{1}{\sqrt{5}} = +5$ KN ∈

check MOS



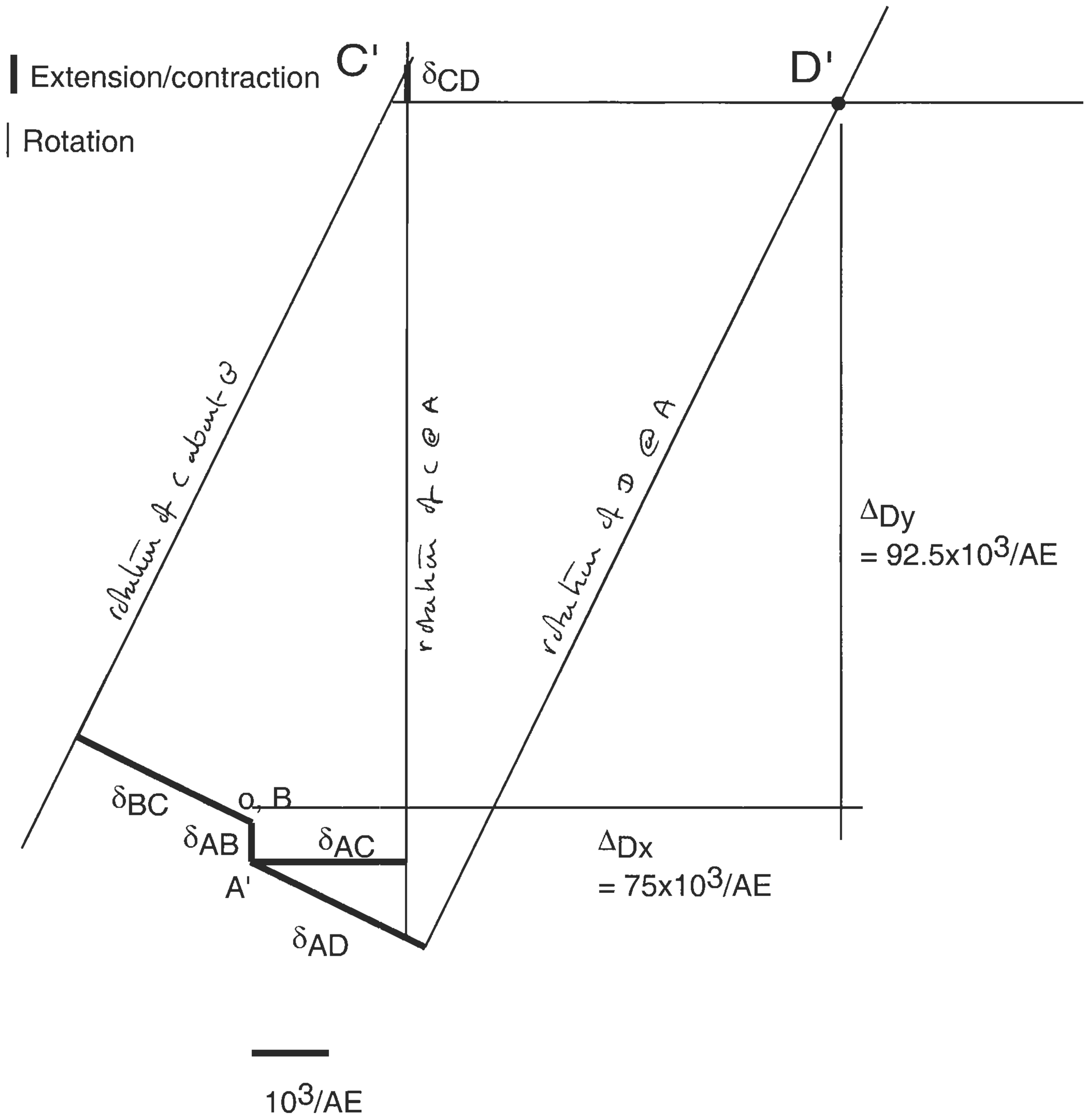
OK !

Bar	Force (kN)	F/P	Length	Length/l	$\delta / PL/AE$	$\frac{\delta}{AE} \times 10^3$
AB	+5	$+\frac{1}{2}$	1	1	$+\frac{1}{2}$	+5
AC	+10	+1	2	2	+2	+20
BC	$-5\sqrt{5}$	$-\sqrt{5}/2$	$\sqrt{5}$	$\sqrt{5}$	$-\frac{5}{2}$	-25
AD	$+5\sqrt{5}$	$+\sqrt{5}/2$	$\sqrt{5}$	$\sqrt{5}$	$+\frac{5}{2}$	+25
CD	-5	$-\frac{1}{2}$	1	1	$-\frac{1}{2}$	-5

Draw displacement diagram (see attached)

$$\text{Vertical deflection} = \frac{92.5 \times 10^3}{AE} = 2.64 \times 10^{-3}\ m$$
$$= 2.64\ mm$$

$$\text{Horizontal deflection} = \frac{75 \times 10^3}{AE} = 2.14 \times 10^{-3}\ m$$
$$= 2.14\ mm$$


Extension/contraction
Rotation
C'
δ_{CD}
D'
rotation of c about-B
rotation of c @ A
rotation of D @ A
Δ_{Dy}
$= 92.5x10^3/AE$
δ_{BC}
o, B
δ_{AB}
δ_{AC}
A'
δ_{AD}
Δ_{Dx}
$= 75x10^3/AE$
$10^3/AE$