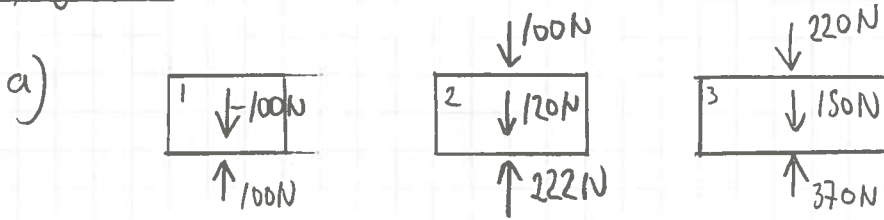


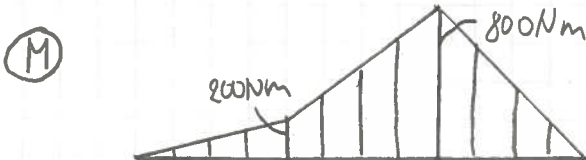
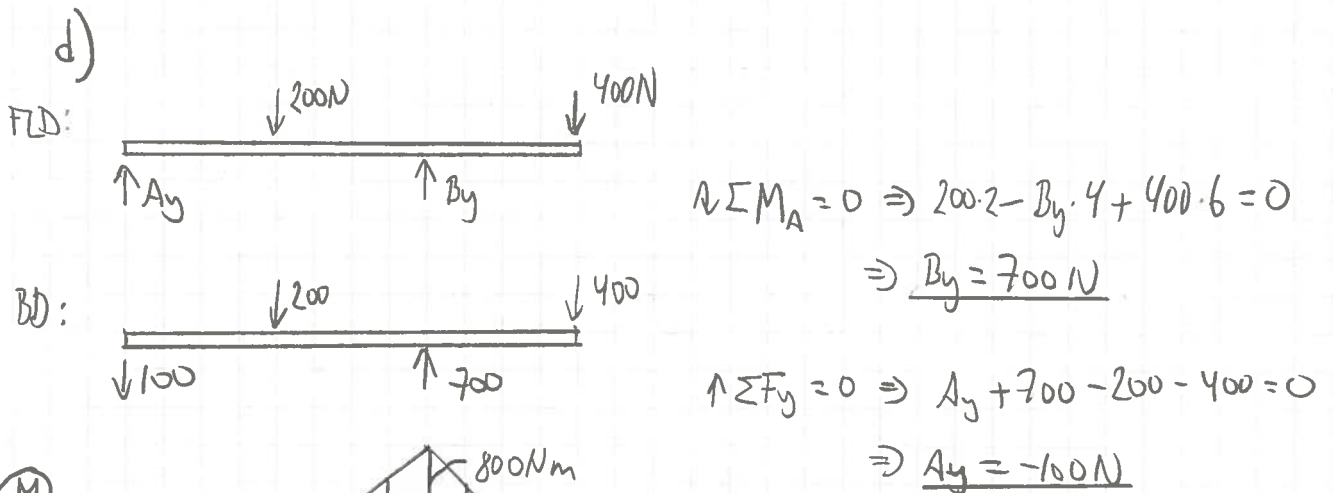
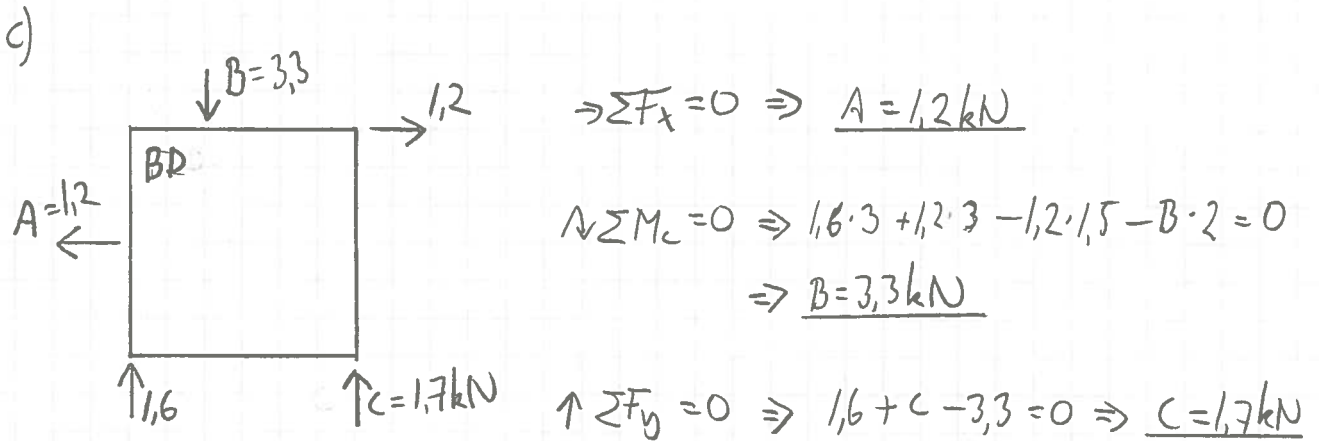
LØSNING

Oppgave 1



b)

$$\sum M_c = 0 \Rightarrow 24 \cdot 2 - 18 \cdot 2 - 10 \cdot x = 0 \Rightarrow \underline{x = 1,2 \text{ m}}$$



e)

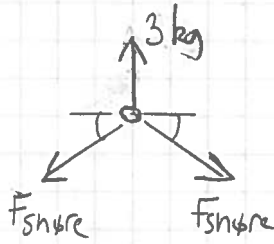
$$M_A = 0,5 \cdot 15 = 7,5 \text{ Nm}$$

$$M_B = 0,5 \cdot 30 = 15 \text{ Nm}$$

$$M_C = 0,5 \cdot 15 = 7,5 \text{ Nm}$$

## Oppgave 2

a)



$$\tan \varphi = \frac{8}{15} \Rightarrow \varphi = 28,1^\circ$$

$$\sum F_y = 0 \Rightarrow 3 - 2 \cdot F_{snore} \cdot \sin 28,1^\circ = 0$$

$$F_{snore} = 3,18 \text{ kg}$$

$$n_{snore} = \frac{25}{3,18} = \underline{\underline{7,9}}$$

b)

$$A_{snore} = \frac{\pi}{4} 0,60^2 = 0,283 \text{ mm}^2$$

$$L_{snore} = 2 \cdot \sqrt{8^2 + 15^2} = 340 \text{ mm}$$

$$E_{nylon} = 3000 \text{ N/mm}^2$$

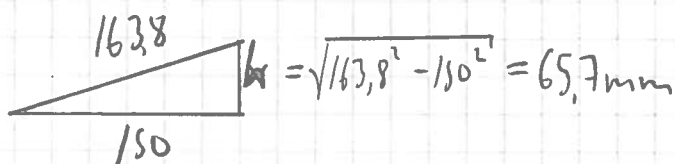
$$F = 3,18 \cdot 9,81 = 31,2 \text{ N}$$

$$\underline{\underline{\Delta L}} = \frac{FL}{EA} = \frac{31,2 \cdot 340}{3000 \cdot 0,283} = \underline{\underline{12,5 \text{ mm}}}$$

c)

Snørets opprinnelige lengde:  $L = 340 - 12,5 = 327,5 \text{ mm}$

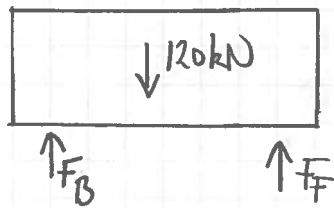
$$\frac{L}{2} = 163,8 \text{ mm}$$



$$\Delta h = 80 - 65,7 = 14,3 \text{ mm}$$

### Oppgave 3

a) Kraft på hvert hjul:



Moment om bakre hjulaksling:

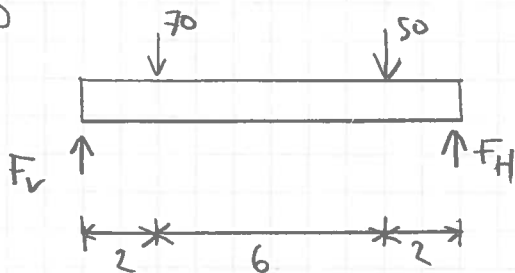
$$\sum M_B = 0 \Rightarrow 120 \cdot 2,5 - F_F \cdot 6 = 0$$

$$\Rightarrow \underline{F_F = 50 \text{ kN}}$$

$$\sum F_y = 0 \Rightarrow F_B + 50 - 120 = 0$$

$$\Rightarrow \underline{F_B = 70 \text{ kN}}$$

FLD



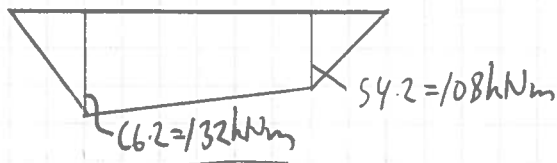
$$\sum M_V = 0 \Rightarrow 70 \cdot 2 + 50 \cdot 8 - F_H \cdot 10 = 0$$

$$\Rightarrow \underline{F_H = 54 \text{ kN}}$$

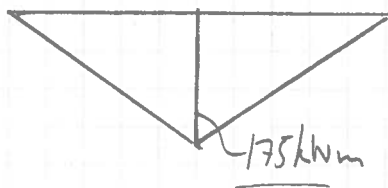
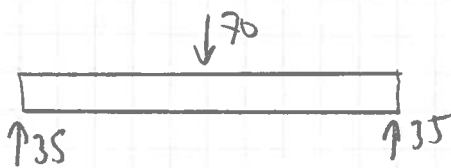
$$\sum F_y = 0 \Rightarrow F_V + 54 - 120 = 0$$

$$\underline{F_V = 66 \text{ kN}}$$

M



b) BD:



$$c) I_{Gem} = I_{Steg} + 2 \cdot I_{Flans} = 9 \cdot \frac{1}{12} \cdot 12 \cdot 100^3 + 2 \cdot 2400 \cdot 12 \cdot 56^2$$

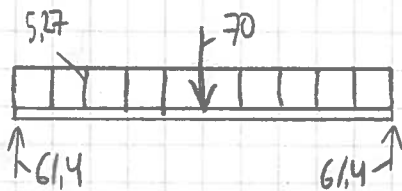
$$= 9 \cdot 10^6 + 181 \cdot 10^6 = 190 \cdot 10^6 \text{ mm}^4$$

$$G_{Gem} = (9 \cdot 0,1 + 2 \cdot 2,4) \cdot 6,012 \cdot 10 \cdot 7,85 \cdot 9,81 = 52,7 \text{ kN}$$

d)

$$q = \frac{G}{L} = 5,27 \frac{\text{kN}}{\text{m}}$$

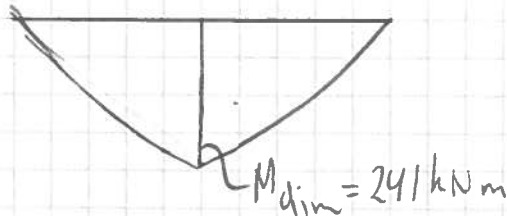
BD:



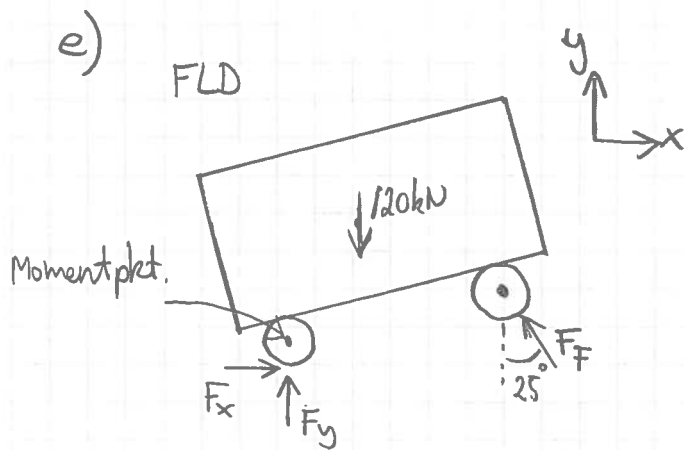
Symmetrie zur oss  $A_y = B_y = 35 + \frac{52,7}{2} = 61,4 \text{ kN}$

$$M_C = 61,4 \cdot 5 - 5,27 \cdot 5 \cdot 2,5 = 241 \text{ kNm}$$

(M)



$$\sigma_{max} = \frac{M}{I} y = \frac{241 \cdot 10^6}{190 \cdot 10^6} \cdot 62 = \underline{\underline{78,6 \text{ MPa}}}$$



Moment om bakre hjulaksling:  $(25^\circ - 12^\circ = 13^\circ)$

$$\curvearrowright \sum M_B = 0 \Rightarrow 120 \cdot 2,5 \cdot \cos 12^\circ - F_F \cdot 6 \cdot \cos 13^\circ - F_x \cdot 0,75 = 0$$

$$\sum F_x = 0 \Rightarrow F_x = F_F \cdot \sin 25^\circ$$

$$\Rightarrow 120 \cdot 2,5 \cdot \cos 12^\circ = F_F (6 \cos 13^\circ + 0,75 \sin 25^\circ) \Rightarrow \underline{F_F = 47,6 \text{ kN}}$$

$$\Rightarrow F_x = 47,6 \cdot \sin 25^\circ = 20,1 \text{ kN}$$

$$\uparrow \sum F_y = 0 \Rightarrow F_y - 120 + 47,6 \cdot \cos 25^\circ = 0 \Rightarrow F_y = 76,9 \text{ kN}$$

$$F_{\text{bak}} = \sqrt{20,1^2 + 76,9^2} = \underline{79,4 \text{ kN}}$$

$$\tan \varphi = \frac{F_y}{F_x} = \frac{76,9}{20,1} = 3,82 \Rightarrow \underline{\varphi = 75,3^\circ}$$

