

eg 65a)

$$\rightarrow \sum F_x = 0; H_A = 0$$

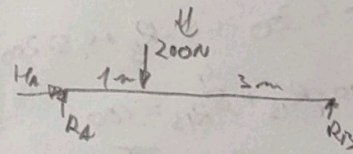
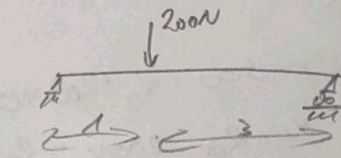
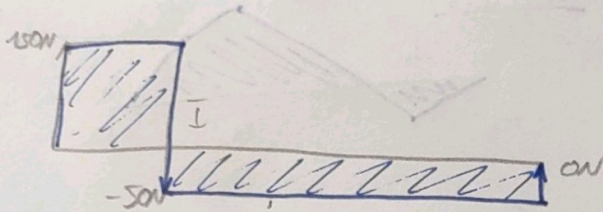
$$\uparrow \sum F_y = 0: R_A + R_B = 200N$$

$$\rightarrow \sum M_A = 0: -200 \cdot 1 + 4 \cdot R_B = 0$$

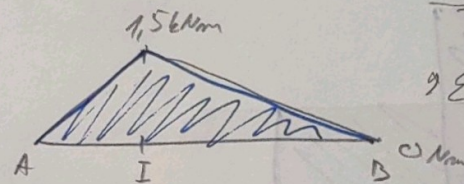
$$R_B = +50N$$

$$R_A = 150N$$

Shear force diagram



Bending moment diagram



$$\begin{aligned} \sum M_A &= 0 \\ -200 \cdot 1 + 4 \cdot R_B &= 0 \\ R_B &= 50 \\ R_A &= 150 \end{aligned}$$

65c)

$$\rightarrow \sum F_x = 0; H_A = 0$$

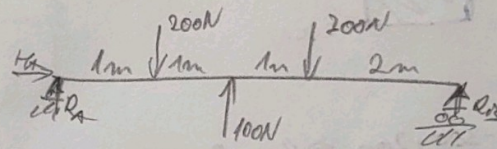
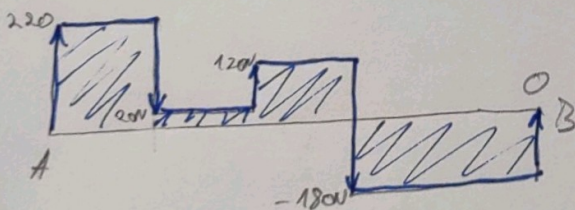
$$\uparrow \sum F_y = 0: R_A + 100 + R_B = 200 + 300$$

$$R_A + R_B = 400N$$

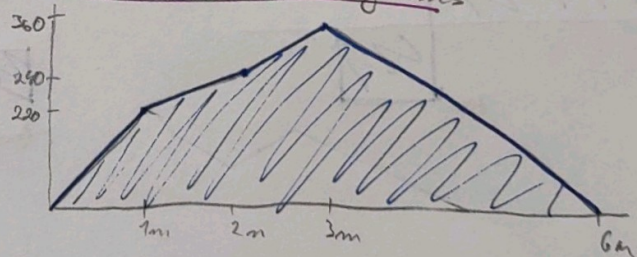
$$\rightarrow \sum M_A = 0: -200 \cdot 1 + 2 \cdot 100 + -300 \cdot 3 + 5 \cdot R_B = 0$$

$$R_B = 180N \Rightarrow R_A = 220N$$

Shear force diagram



Bending moment diagrams



65d) $\rightarrow \sum F_x = 0; H_A = 0$

$\uparrow \sum F_y = 0: 100 + R_A - 500 + R_B + 200 = 0$

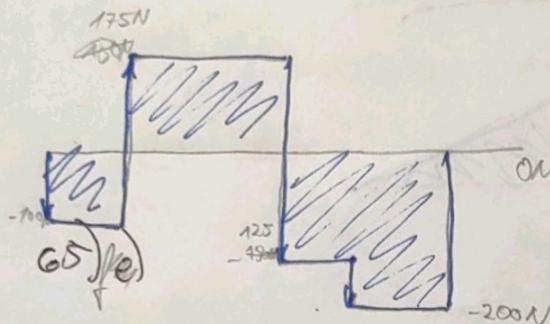
$R_A + R_B = 200 \text{ N} \Rightarrow R_A = 200 - R_B$

$\sum M_A = 0: R_B \cdot 1 - 4 \cdot 300 + 5 \cdot R_B + 6.5 \cdot 200 = 0$

$200 - R_B + 5R_B = 100$

$R_B = -75 \text{ N} \rightarrow R_A = 275 \text{ N}$

Shear force diagram

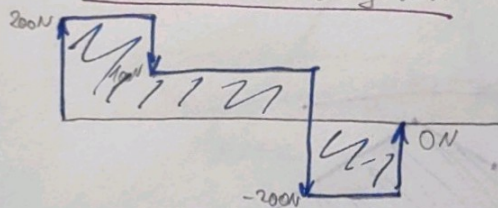


$H_A = 0$

$\uparrow \sum F_y = 0: R_A - 100 - 300 + 200 \Rightarrow R_A = 200 \text{ N}$

$\sum M_A = 0: -1 \cdot 100 - 3 \cdot 300 + 4 \cdot 200 - M_A = 0$
 $M_A = 200 \text{ Nm}$

Shear force diagram



65) 4e

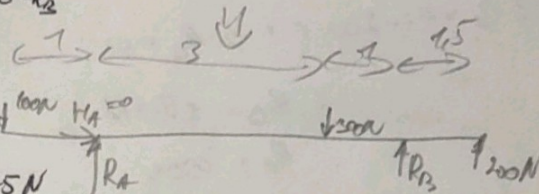
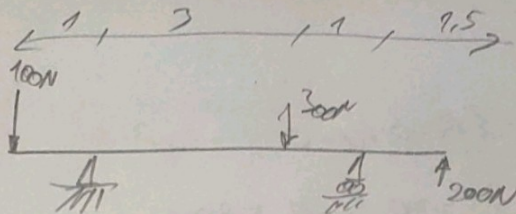
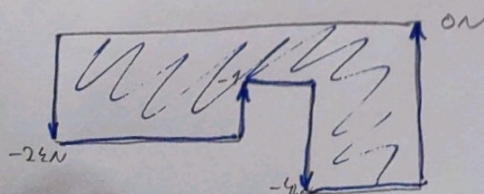
$H_A = 0$

$R_A = 4 \text{ kN}$

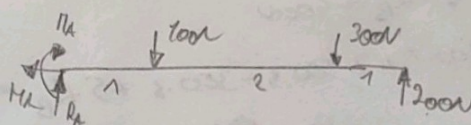
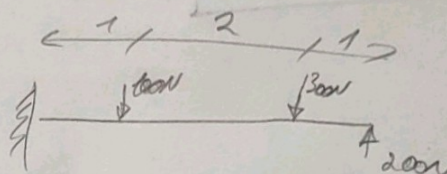
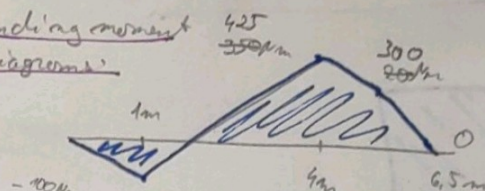
$M_A = 3 \cdot 1 - 2 \cdot 1 + 2 \cdot 4$

$M_A = -9 \text{ kNm}$

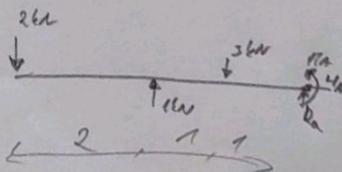
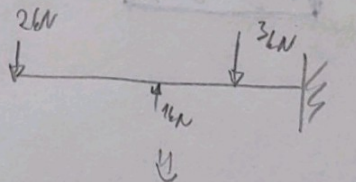
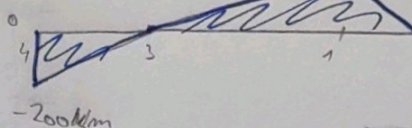
Shear force diagram



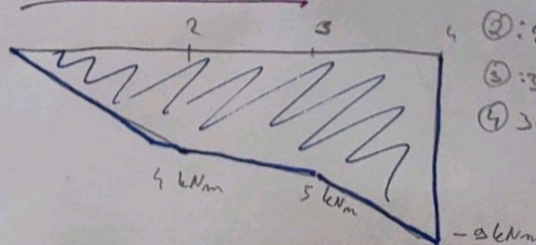
Bending moment diagram



Bending moment diagram



Bending moment diagram



Calculations done in head.

②: $2 \cdot 2 = 4$

③: $3 \cdot 2 - 1 \cdot 1 = 5$

④: $3 \cdot 1 - 1 \cdot 2 + 2 \cdot 4 = 9$

eg 65h)

$$H_A = 0$$

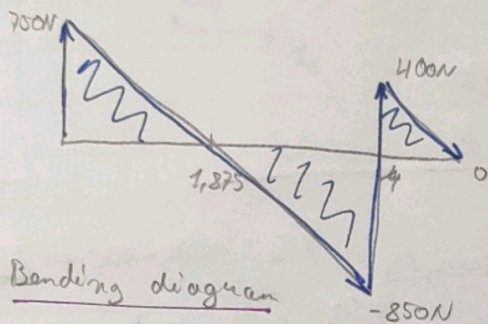
$$\uparrow \sum F_y = R_A + R_B = 2000 \text{ N}$$

$$\circlearrowleft \sum M_A = 0: 1 \cdot 2000 \cdot 2.5 + 4 \cdot R_B = 0$$

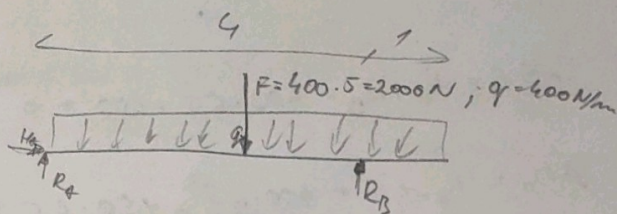
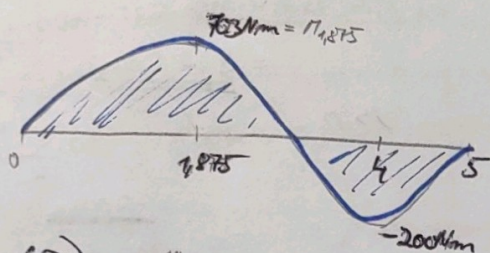
$$R_B = 1250 \text{ N}$$

$$R_A = 750 \text{ N}$$

Shear force diagram



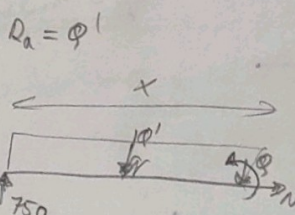
Bending moment diagram



$$F' = 400 \cdot 2.5 = 1000 \text{ N}$$

$$M_A = 0: 2.5 \cdot 750 + 1.25 \cdot 1000 = \frac{M_A}{2}$$

$$M_A = -625 \text{ Nm}$$



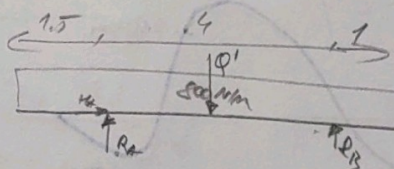
$$\sum F_y = 0: 750 - q \cdot x = 0$$

$$750 - 400 \cdot x = 0$$

$$x = 1.875$$

$$\circlearrowleft \sum M_{1.875} = 750 \cdot 1.875 - 400 \cdot 1.875 \cdot \frac{1.875}{2} = 703 \text{ Nm}$$

$$\circlearrowleft \sum M_5 = 750 \cdot 5 - 400 \cdot 5 \cdot 2.5 = -200 \text{ Nm}$$



eg 65i) $H_A = 0$

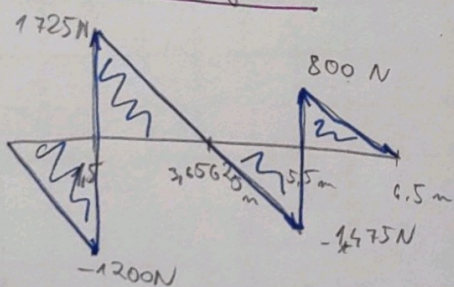
$$R_A + R_B = 5200$$

$$\circlearrowleft \sum M_A = 0: 1.5 \cdot R_A - 800 \cdot 6.5 \cdot \frac{6.5}{2} + 5.5 R_B = 0$$

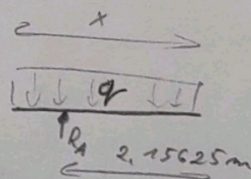
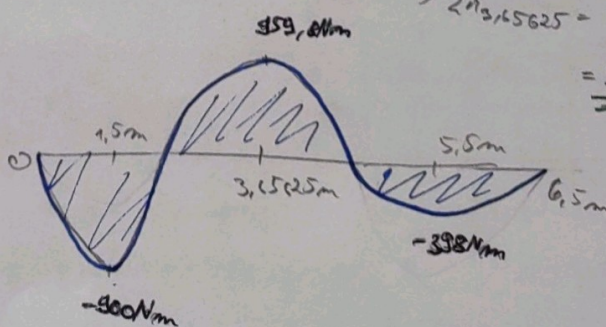
$$1.5 \cdot 5200 - 1.5 R_B - 16200 + 5.5 R_B = 0$$

$$2275 R_B \rightarrow R_A = +2925 \text{ N}$$

Shear moment diagram



Bending moment diagram



$$\uparrow \sum F_y = 2925 - q \cdot x = 0$$

$$x = 3.65625 \text{ m}$$

$$\circlearrowleft \sum M_{3.65625} = -800 \cdot 1.5 \cdot \frac{1.5}{2} = -900 \text{ Nm}$$

$$\circlearrowleft \sum M_{3.65625} = 2925 \cdot 2.15625 - 800 \cdot \frac{3.65625^2}{2} = 959.8 \text{ Nm}$$

$$\circlearrowleft \sum M_{6.5} = 2925 \cdot 4 - 800 \cdot \frac{5.5^2}{2}$$

$$\circlearrowleft \sum M_{6.5} = -398 \text{ Nm}$$

655)

$$\sum F_x = R_A + R_B = 400 \cdot 6.5 + 150 = 0$$

$$\sum M_0 = R_A \cdot 1.5 - 400 \cdot \frac{6.5^2}{2} - 150 \cdot 4.5 = 0$$

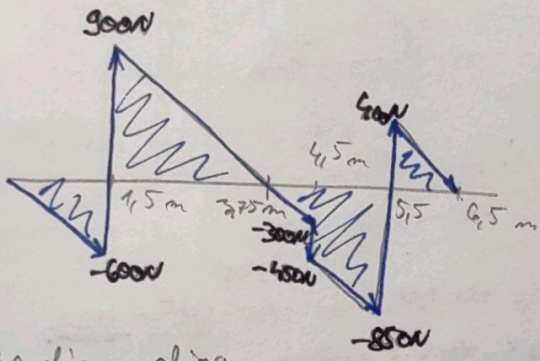
$$+ R_B \cdot 5.5$$

$$R_A = 2750 - R_B$$

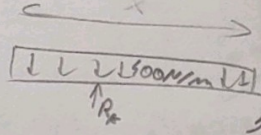
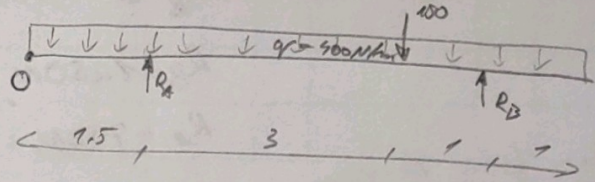
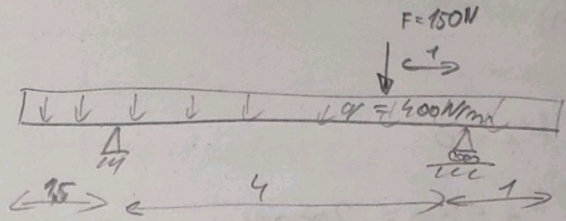
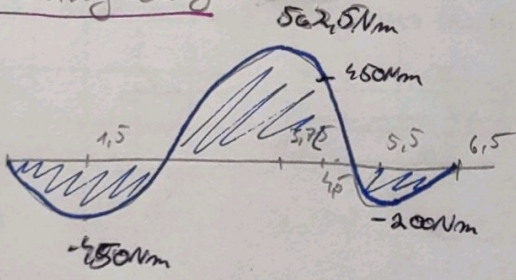
$$4125 - 1.5R_B - 8450 - 675 + 5.5R_B = 0$$

$$R_B = 1250N \Rightarrow R_A = 1500N$$

Shear force diagram



Bending moment diagram



$$\sum F_y = 1500 - 400 \cdot x = 375m$$

$$\sum M_{1.5} = -400 \cdot \frac{1.5^2}{2} = -450Nm$$

$$\sum M_{3.75} = 1500 \cdot 2.25 - 400 \cdot \frac{3.75^2}{2} = 562.5Nm$$

$$\sum M_{4.5} = 1500 \cdot 4 - 400 \cdot \frac{5.5^2}{2} - 150 \cdot 1 = -200Nm$$

$$\sum M_{6.5} = 1500 \cdot 3 - 400 \cdot \frac{6.5^2}{2} = 450Nm$$