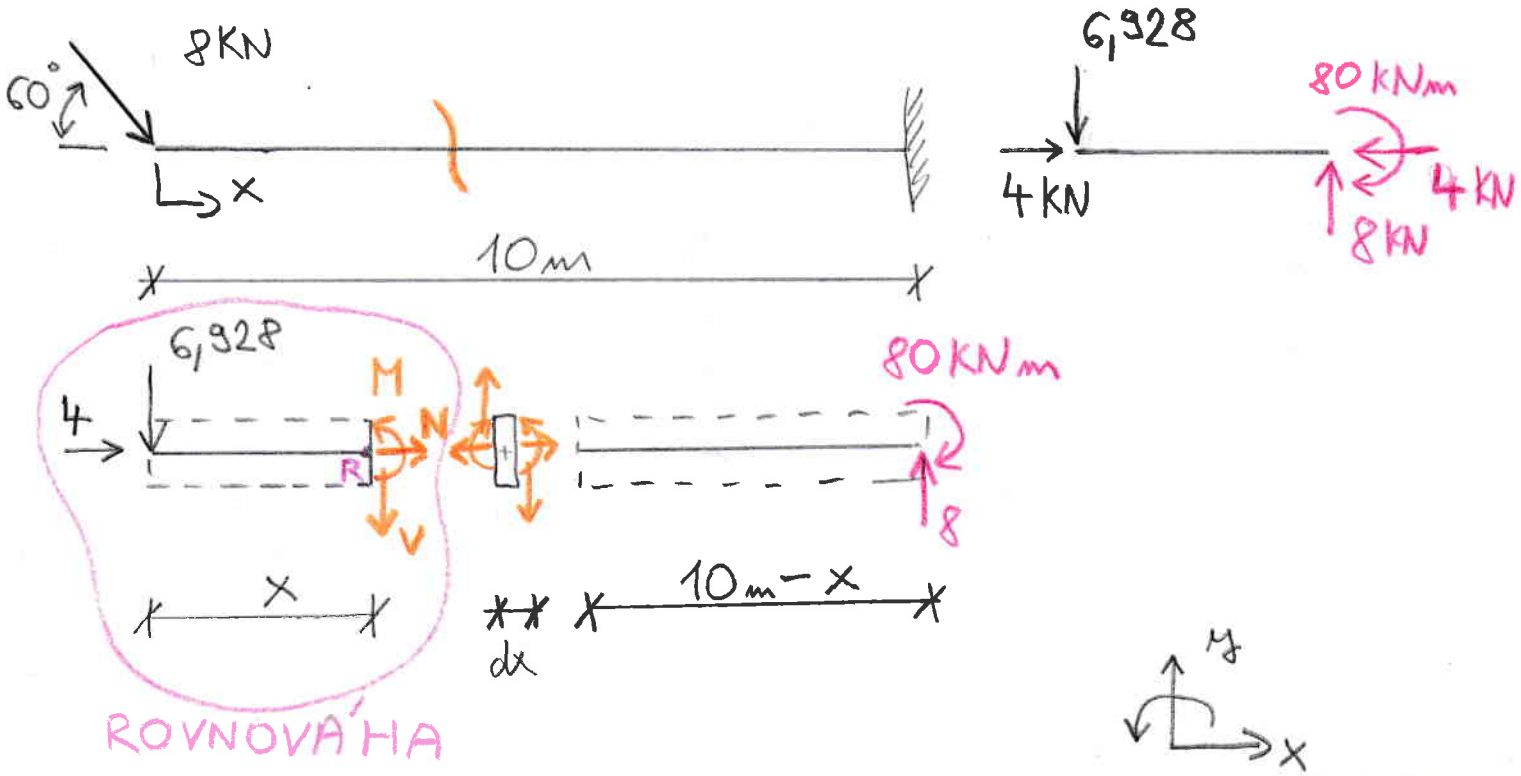
ZÁKLADY STAVEBNÍ MECHANIKY

BDA001

Rovinné přímé nosníky zatížené libovolným rovnoměrným zatížením, výpočet reakcí ve vazbách, výpočet a vykreslení diagramů vnitřních sil.

Zdeněk Kala



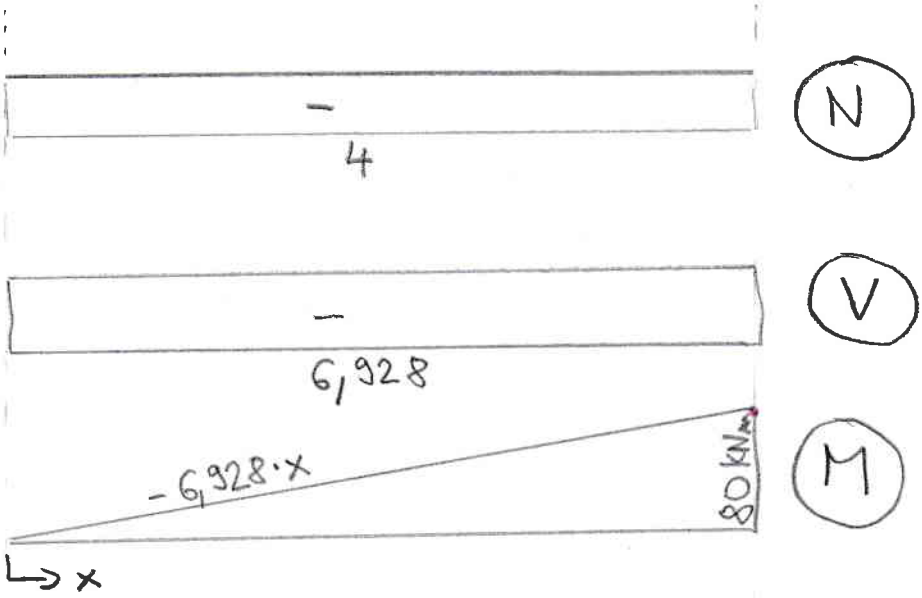
ROVNOVÁHA

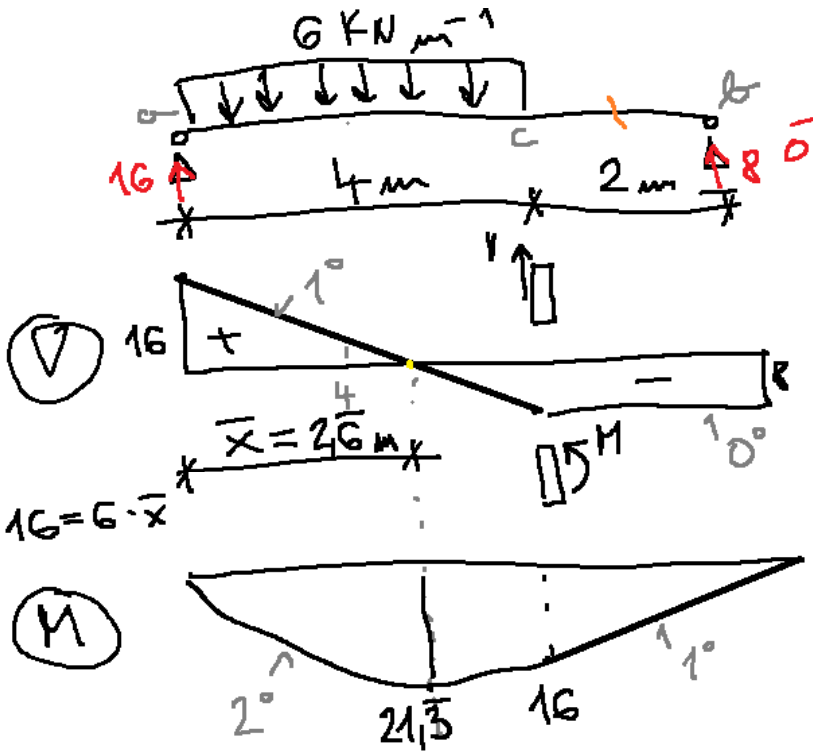
$\Sigma F_x = 0 \quad 4 + N = 0 \Rightarrow N = -4$

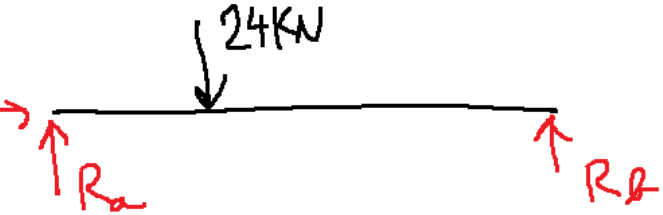
$\Sigma F_y = 0 \quad -6{,}928 - V = 0 \Rightarrow V = -6{,}928$

$\Sigma M_R = 0 \quad 6{,}928 \cdot x + M = 0 \Rightarrow M = -6{,}928 \cdot x$

$V = \frac{dM}{dx}$





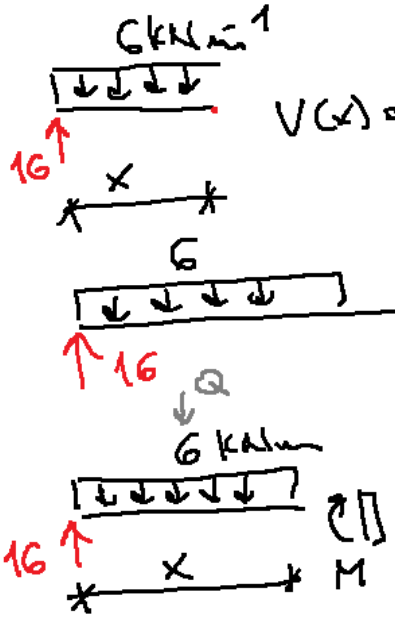


$\Sigma M_a = 0 \quad -24 \cdot 2 + R_b \cdot 6 = 0$

$R_b = 8\ kN$

$\Sigma M_b = 0 \quad 24 \cdot 4 - R_a \cdot 6 = 0$

$R_a = 16\ kN$



$V(x) = 16 - 6 \cdot x \qquad x \in \langle 0; 4\ m \rangle$

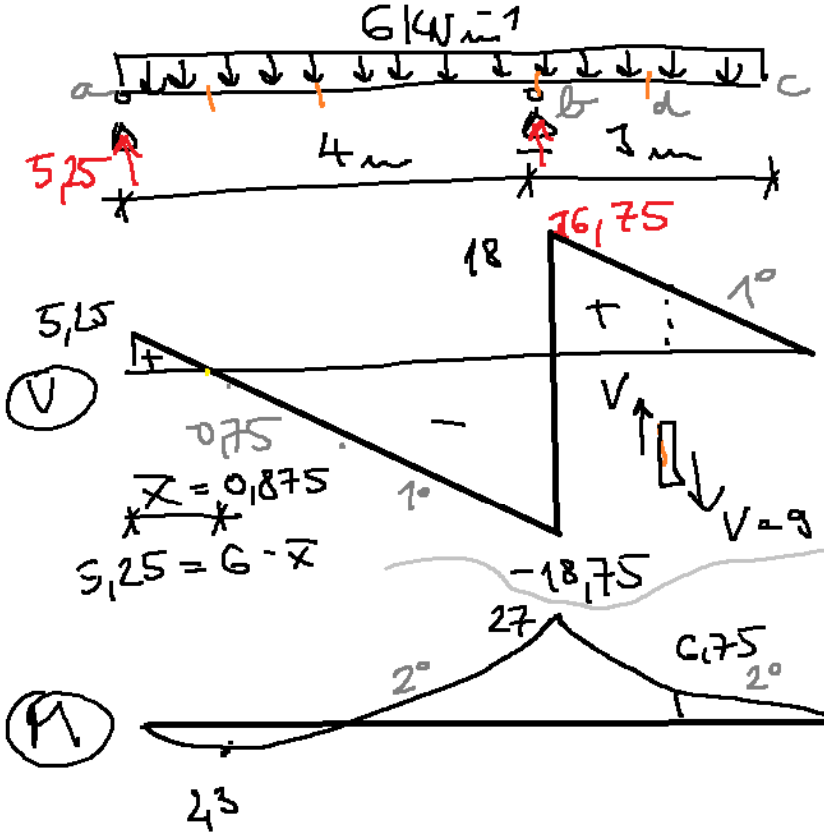
$V(x) = 16 - 6 \cdot 4 \qquad x \in \langle 4; 6\ m \rangle$

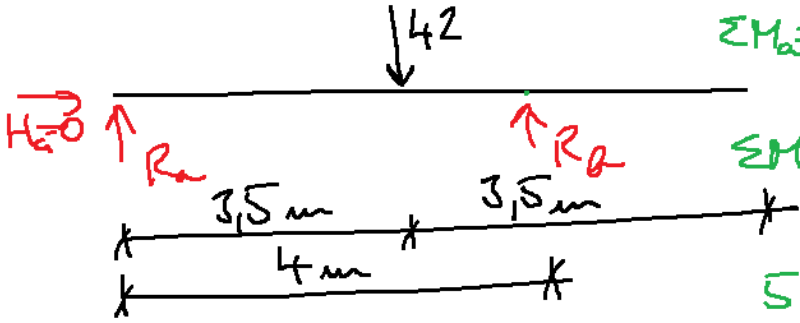
$= -8\ kN$

$M(x) = 16 \cdot x - \underbrace{6 \cdot x}_{q} \cdot \frac{x}{2} = 16 \cdot x - 3x^2$

$\max M = 16 \cdot 2\bar{6} - 3 \cdot (2\bar{6})^2 = 21,\bar{3}\ kNm$

$V(x) = \frac{dM}{dx} = \frac{d(16 \cdot x - 3x^2)}{dx} = 16 - 6 \cdot x$





$\Sigma M_a = 0 \quad -42 \cdot 3{,}5 + R_b \cdot 4 = 0$

$R_b = 36{,}75\ \text{kN}$

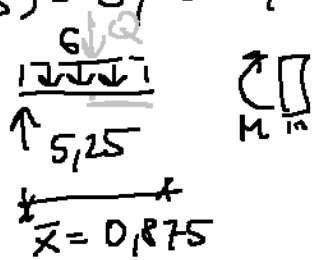
$\Sigma M_b = 0 \quad -R_a \cdot 4 + 42 \cdot 3{,}5 = 0$

$R_a = 5{,}25\ \text{kN}$

$5{,}25 - 42 + 36{,}75 = 0$ ✓

$M_a = 0$

$M(0{,}875) = 5{,}25 \cdot 0{,}875 - 6 \cdot \bar{x} \cdot \frac{\bar{x}}{2} = 2{,}3\ \text{kN m}$

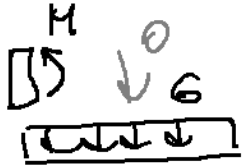


Q RAMENO

[kN] [m]

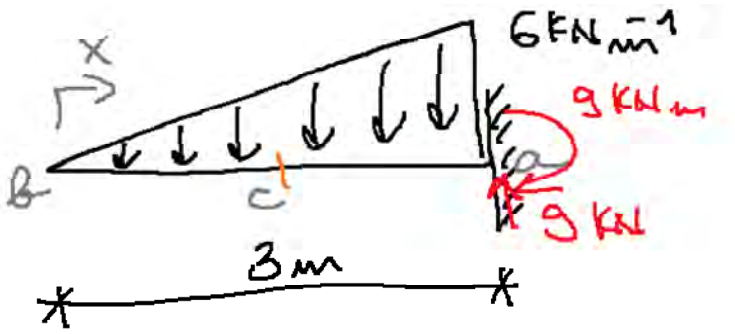
$M_d = -6 \cdot 1{,}5 \cdot \frac{1{,}5}{2} =$

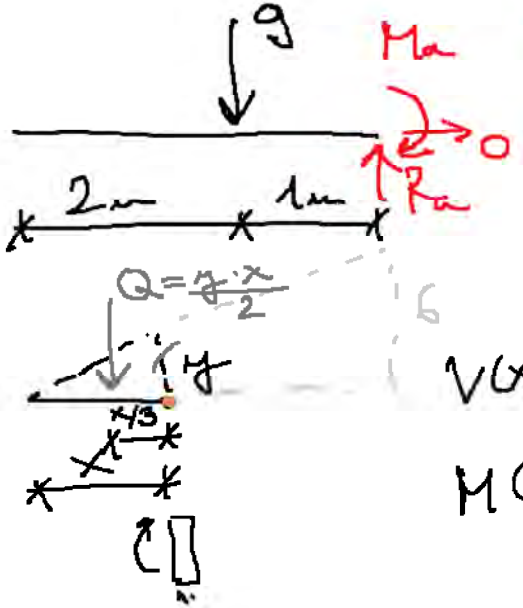
$= -6{,}75\ \text{kN m}$



$M_b = -6 \cdot 3 \cdot 1{,}5 =$

$= -27\ \text{kN m}$





$\Sigma F_y = 0 \quad -9 + R_a = 0 \quad R_a = 9\ kN$

$\Sigma M_a = 0 \quad 9 \cdot 1 - M_a = 0 \quad M_a = 9\ kNm$

$\frac{6}{3} = \frac{y}{x} \Rightarrow y = 2 \cdot x$

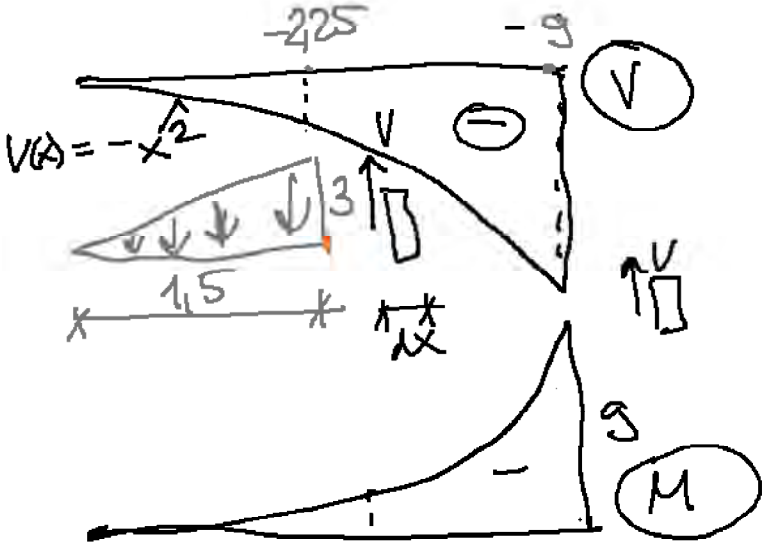
$V(x) = Q = \frac{y \cdot x}{2} = \frac{2 \cdot x \cdot x}{2} = -x^2$

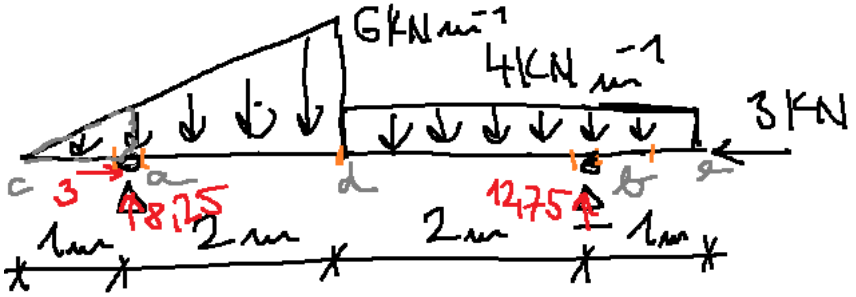
$M(x) = -Q \cdot \frac{x}{3} = -\frac{y \cdot x}{2} \cdot \frac{x}{3} =$

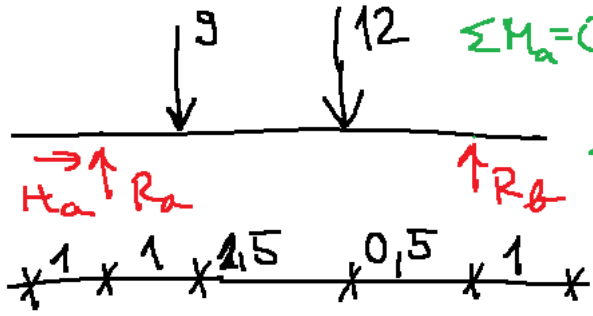
$= -\frac{2 \cdot x \cdot x}{2} \cdot \frac{x}{3} = -\frac{x^3}{3}$

$V = \frac{dM}{dx} = \frac{d(-x^3/3)}{dx} = -x^2$

$\max M = -\frac{3^3}{3} = -9\ kNm$







$\Sigma M_a = 0 \quad -9 \cdot 1 - 12 \cdot 3{,}5 + R_B \cdot 4 = 0$

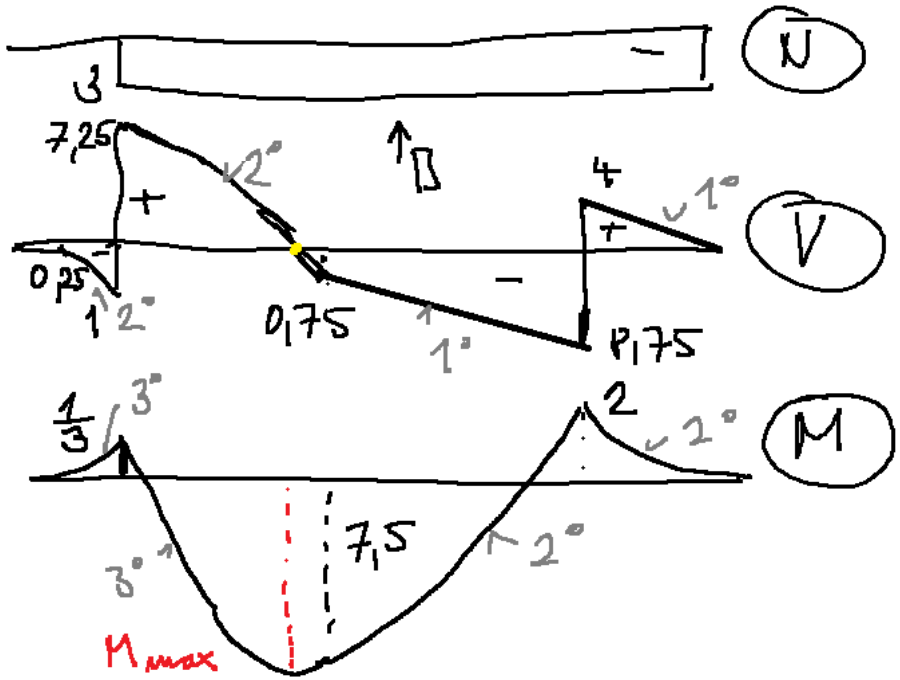
$R_B = 12{,}75\ \text{kN}$

$\Sigma M_B = 0 \quad -R_a \cdot 4 + 9 \cdot 3 + 12 \cdot 0{,}5$

$R_a = 8{,}25\ \text{kN}$

$\Sigma F_y = 0 \quad 8{,}25 - 9 - 12 + 12{,}75 = 0$ ✓

$\Sigma F_x = 0 \quad H_a - 3 = 0 \quad H_a = 3$ ✓



$^{L}V_a = -\frac{2 \cdot 1}{2} = -1\ \text{kN}$

$^{R}V_a = {}^{L}V_a + 8{,}25 = 7{,}25$

$V_d = 8{,}25 - 9 = -0{,}75$

$^{R}V_b = 4 \cdot 1 = 4$

$^{L}V = 4 \cdot 1 - 12{,}75 = -8{,}75$

$-0{,}75 - 4 \cdot 2 = -8{,}75$

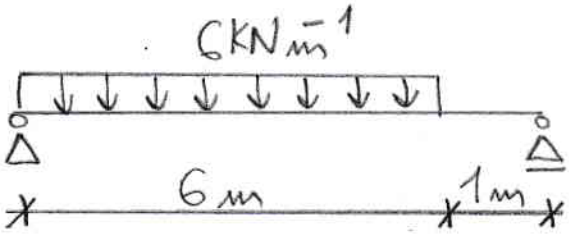
$V_d - 4 \cdot 2 = -8{,}75$

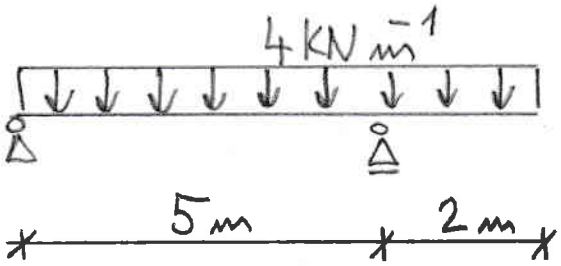
$M_a = -1 \cdot \frac{1}{3} = -\frac{1}{3}$

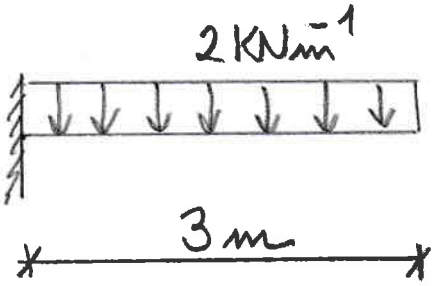
$M_B = -4 \cdot 1 \cdot 0{,}5 = -2\ \text{kNm}$

$M_d = 8{,}25 \cdot 2 - 9 \cdot 1 =$

$= 7{,}5\ \text{kNm}$







VLOŽIT DO TEAMS DO 13.3. VEČER