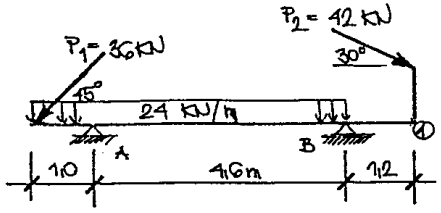
V./1. | TÖRTVONALÚ TARTÓK N, T, M – ÁBRÁI



$P_{1x} = P_{1y} = 25{,}4$ kN

$P_{2x} = 36{,}4$ kN

$P_{2y} = 21{,}0$ kN

$$B = \frac{-25{,}4 \cdot 1 + 24 \cdot 5{,}6 \cdot 1{,}8 + 36{,}4 \cdot 0{,}8 + 21 \cdot 5{,}8}{4{,}6}$$

$$B = \frac{-25{,}4 + 241{,}9 + 29{,}1 + 121{,}8}{4{,}6}$$

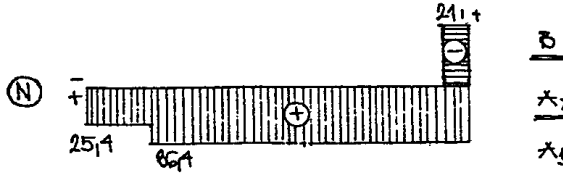
$B = 79{,}9$ kN ↑

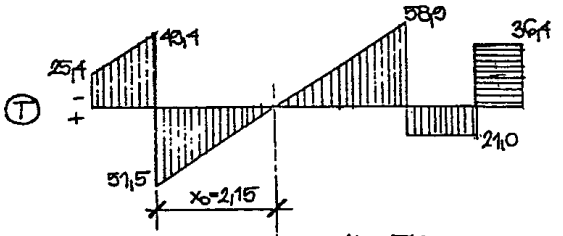
$A_x = -36{,}4 + 25{,}4 = -11$ kN ←

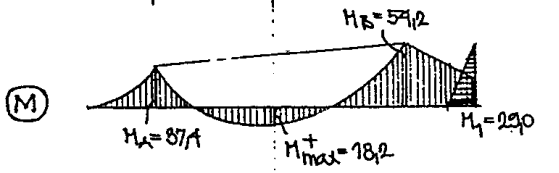
$A_y = 25{,}4 + 24 \cdot 5{,}6 + 21{,}0 - 79{,}9$

$A_y = 100{,}9$ kN ↑

$x_0 = \frac{51{,}5}{24} = 2{,}15$ m







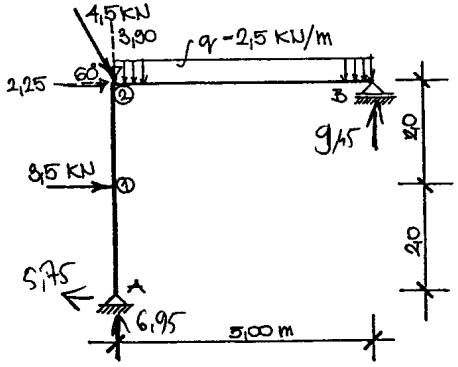
$M_A = -25{,}4 \cdot 1 - 24 \cdot 1 \cdot 0{,}5 = -37{,}4$ kN m

$M^+_{max} = -25{,}4 \cdot 3{,}15 - 24 \cdot 3{,}15 \cdot 1{,}57 + 100{,}9 \cdot 2{,}15 = +18{,}2$ kN m

$M_B = -36{,}4 \cdot 0{,}8 - 21 \cdot 1{,}2 = -54{,}2$ kN m

$M_1 = -36{,}4 \cdot 0{,}8 = -29{,}0$ kN m

V./2. | TÖRTVONALÚ TARTÓK N, T, M – ÁBRÁI



$$B = \frac{35 \cdot 2 + 2{,}25 \cdot 4 + 2{,}5 \cdot 5 \cdot 2{,}5}{5}$$

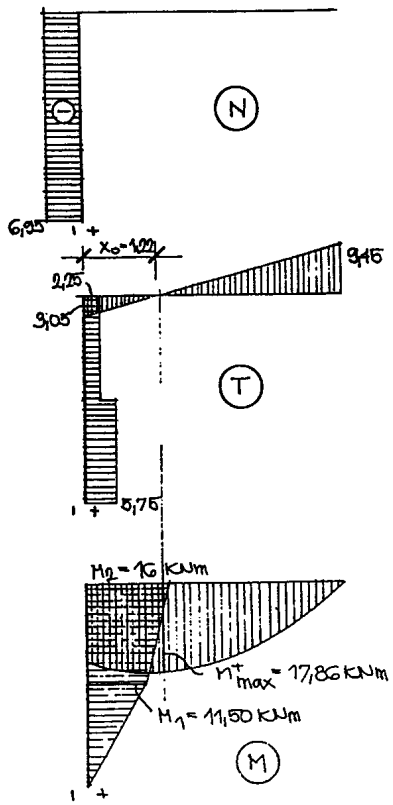
$$B = \frac{70 + 90 + 31{,}25}{5} = \frac{47{,}25}{5}$$

$B = 9{,}45$ kN

$A_x = 2{,}25 + 3{,}5 = 5{,}75$ kN ←

$A_y = 3{,}9 + 2{,}5 \cdot 5 - 9{,}45$

$A_y = 6{,}95$ kN ↑



$M_1 = 5{,}75 \cdot 2 = 11{,}50$ kNm

$M_2 = 5{,}75 \cdot 4 - 3{,}50 \cdot 2$

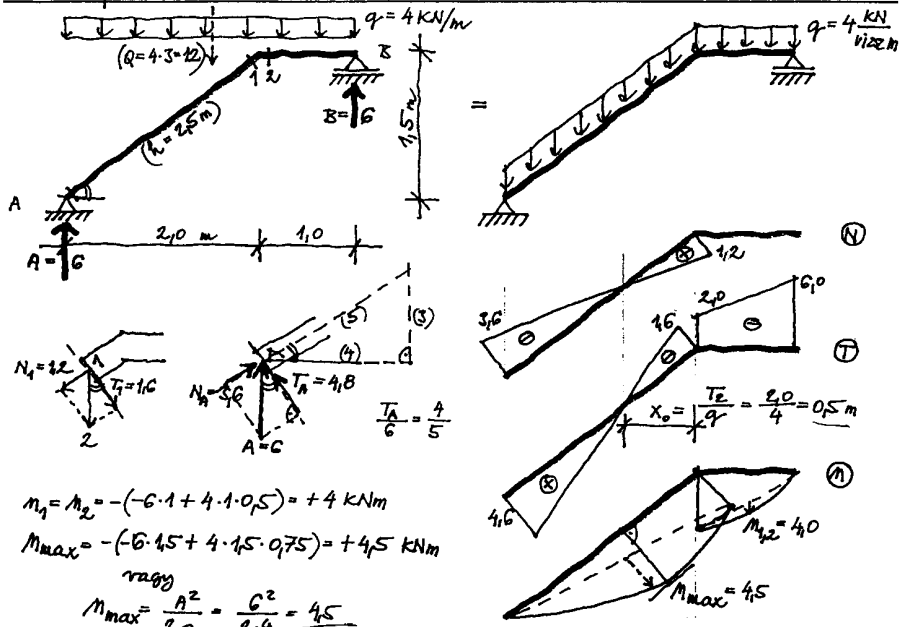
$M_2 = 16{,}00$ kNm

$x_0 = \frac{3{,}05}{2{,}5} = 1{,}22$ m

$M^+_{max} = 9{,}45 \cdot 3{,}78 - 2{,}5 \cdot 3{,}78 \cdot 1{,}89$

$M^+_{max} = 17{,}86$ kNm

V./3.-4. FERDE ÉS TÖRTTOMÁLÚ TARTÓ N, T, M – ÁBRÁI

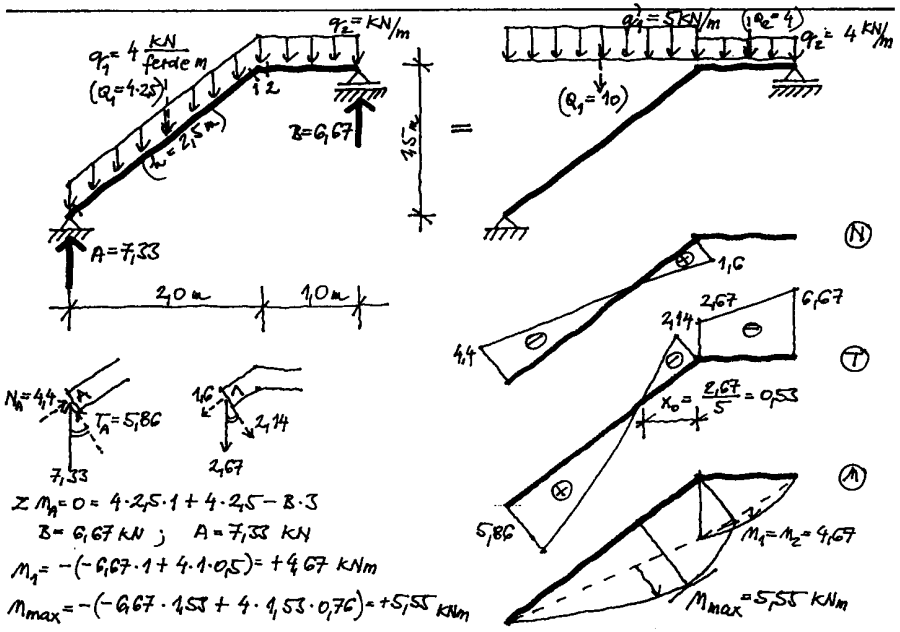


$M_1 = M_2 = -(-6 \cdot 1 + 4 \cdot 1 \cdot 0,5) = +4$ kNm

$M_{max} = -(-6 \cdot 1,5 + 4 \cdot 1,5 \cdot 0,75) = +4,5$ kNm

vagy

$M_{max} = \frac{A^2}{2q} = \frac{6^2}{2 \cdot 4} = 4,5$



$\sum M_B = 0 = 4 \cdot 2,5 \cdot 1 + 4 \cdot 2,5 - B \cdot 3$

$B = 6,67$ kN ; $A = 7,33$ kN

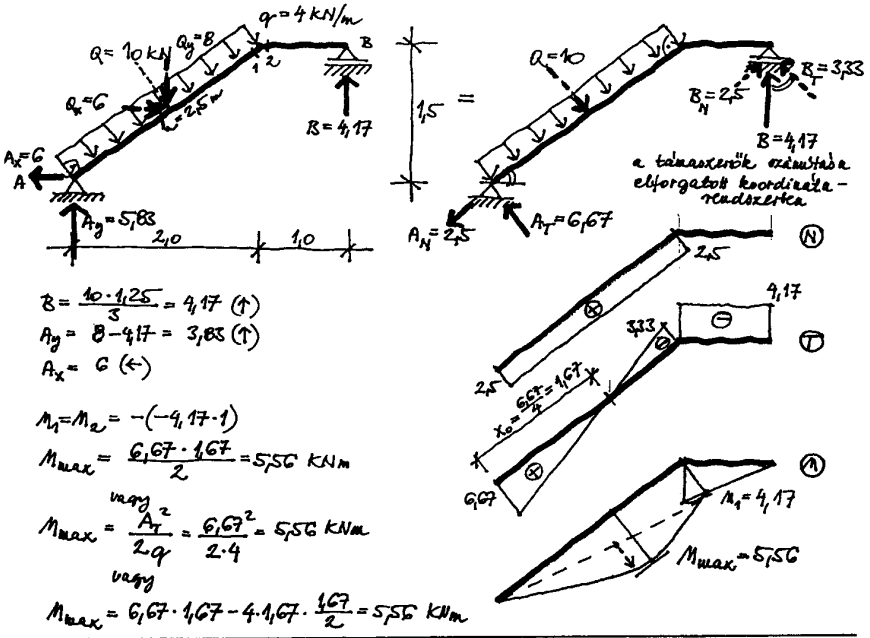
$M_1 = -(-6,67 \cdot 1 + 4 \cdot 1 \cdot 0,5) = +4,67$ kNm

$M_{max} = -(-6,67 \cdot 1,53 + 4 \cdot 1,53 \cdot 0,76) = +5,55$ kNm

vagy

$M_{max} = \frac{A^2}{2q_1} = \frac{7,33^2}{2,5} = 5,38$ (kerekítés miatt más!)

V./5.-6. FERDE ÉS TÖRTTOMÁLÚ TARTÓ N, T, M – ÁBRÁI



$B = \frac{10 \cdot 1,25}{3} = 4,17$ (↑)

$A_y = 8 - 4,17 = 3,83$ (↑)

$A_x = 6$ (←)

$M_1 = M_2 = -(-4,17 \cdot 1)$

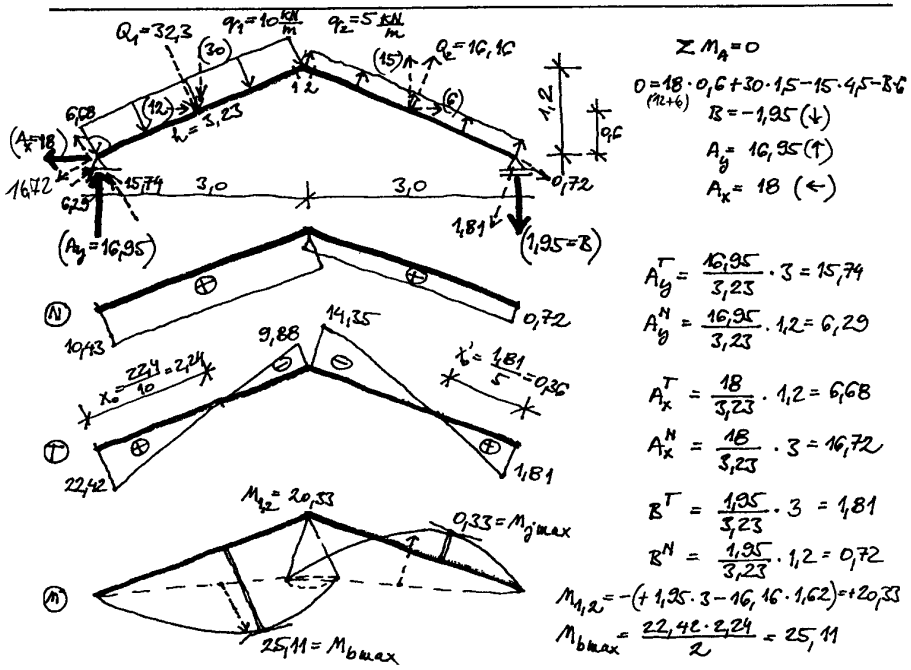
$M_{max} = \frac{6,67 \cdot 1,67}{2} = 5,56$ kNm

vagy

$M_{max} = \frac{A_T^2}{2q} = \frac{6,67^2}{2 \cdot 4} = 5,56$ kNm

vagy

$M_{max} = 6,67 \cdot 1,67 - 4 \cdot 1,67 \cdot \frac{1,67}{2} = 5,56$ kNm



$\sum M_A = 0$

$0 = 18 \cdot 0,6 + 30 \cdot 1,5 - 15 \cdot 4,5 - B \cdot 6$ (M=6)

$B = -1,95$ (↓)

$A_y = 16,95$ (↑)

$A_x = 18$ (←)

$A_y^T = \frac{16,95}{3,23} \cdot 3 = 15,74$

$A_y^N = \frac{16,95}{3,23} \cdot 1,2 = 6,29$

$A_x^T = \frac{18}{3,23} \cdot 1,2 = 6,68$

$A_x^N = \frac{18}{3,23} \cdot 3 = 16,72$

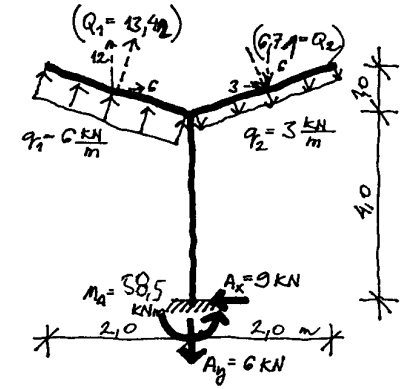
$B^T = \frac{1,95}{3,23} \cdot 3 = 1,81$

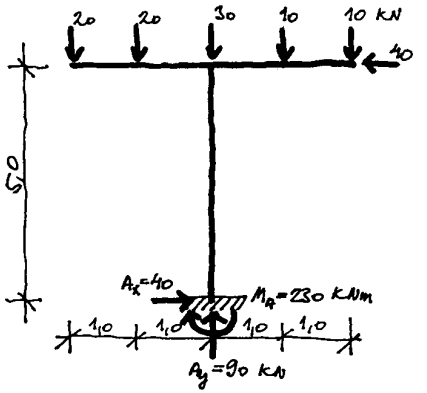
$B^N = \frac{1,95}{3,23} \cdot 1,2 = 0,72$

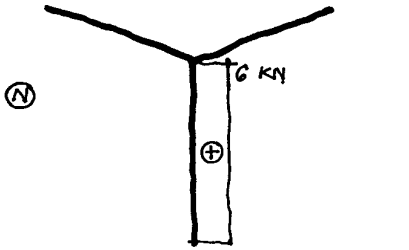
$M_{1,2} = -(+1,95 \cdot 3 - 16,16 \cdot 1,62) = +20,33$

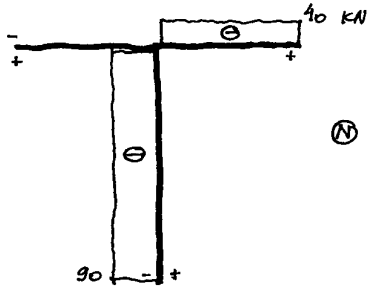
$M_{bmax} = \frac{22,42 \cdot 2,24}{2} = 25,11$

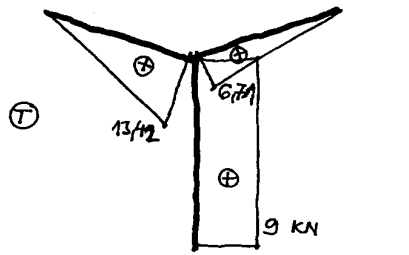
V./7-8 | A'GAS TARTÓ BELSŐERŐ- A'BRÁI

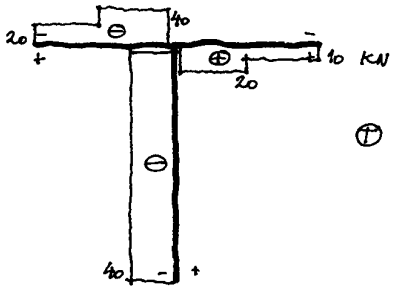


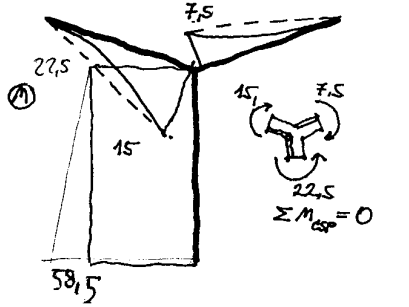


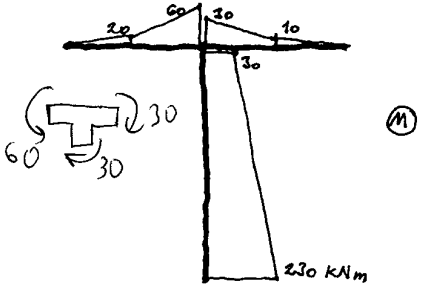




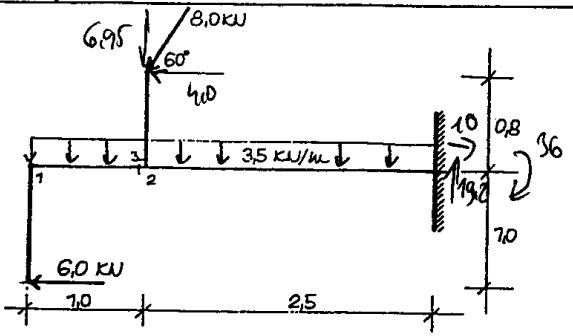


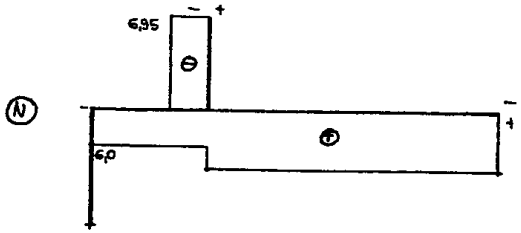


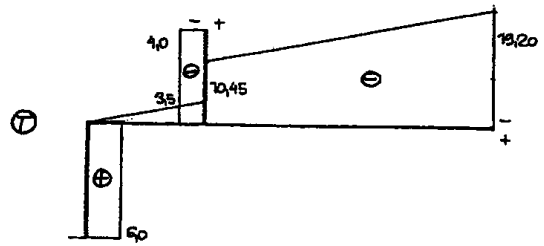


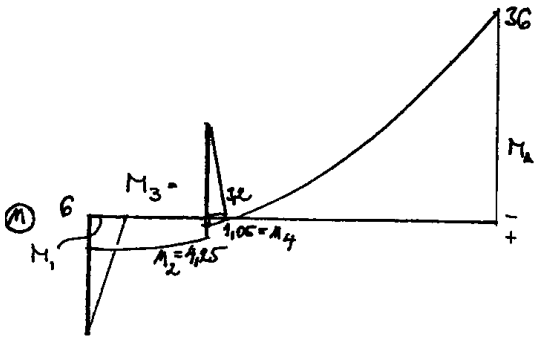


V./9. | A'GAS TARTÓ BELSŐERŐ –A'BRÁI









$P_{ix} = -4{,}0$ kN

$P_{iy} = 6{,}95$ kN

$A_x = 4{,}0 + 6{,}0 = 10{,}0$ kN →

$A_y = 6{,}95 + 3{,}5 \cdot 3{,}5 = 19{,}2$ kN

$M_1 = 6{,}0 \cdot 1{,}0 = 6$ kNm

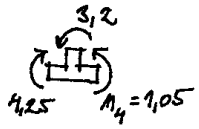
$M_2 = 6{,}0 \cdot 1{,}0 - 3{,}5 \cdot 1{,}0 \cdot 0{,}5$

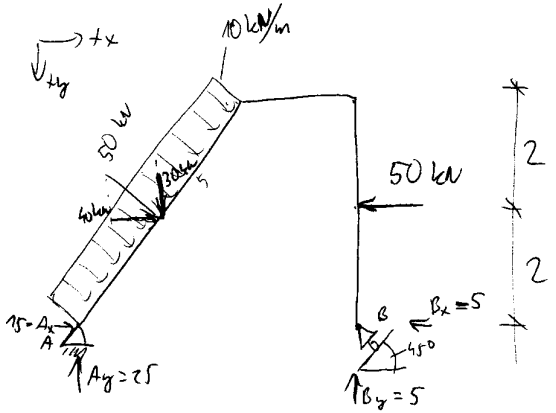
$M_2 = 4{,}25$ kNm

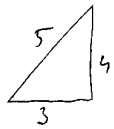
$M_3 = -4{,}0 \cdot 0{,}8 = -3{,}2$

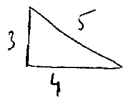
$M_A = 6{,}0 \cdot 1{,}0 - 3{,}5 \cdot 1{,}0 \cdot 3{,}0$
$- 4{,}0 \cdot 0{,}8 - 6{,}95 \cdot 2{,}5$
$- 3{,}5 \cdot 2{,}5 \cdot 1{,}25$

$M_A = 36{,}0$ kNm







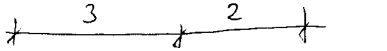


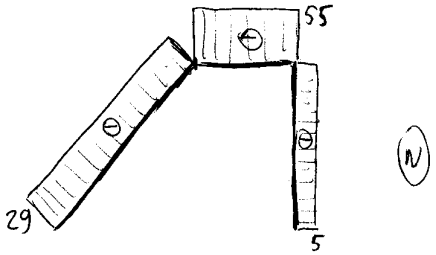
$\Sigma M_A = 0 = 5 \cdot 10 \cdot 2{,}5 - 50 \cdot 2 - B_y \cdot 5 = 0$

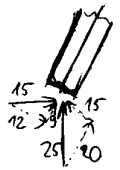
$B_y = \frac{50 \cdot 0{,}5}{5} = \underline{5\ kN} = B_x$

$\Sigma F_{iy} = 0 = -A_y + 30 - 5 - 0 \Rightarrow A_y = \underline{25 kN}$

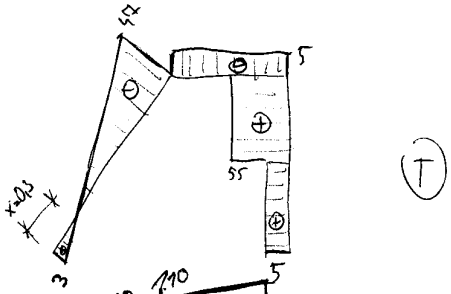
$\Sigma F_{ix} = 0 = A_x + 40 - 50 - 5 = 0 \Rightarrow A_x = \underline{15 kN}$



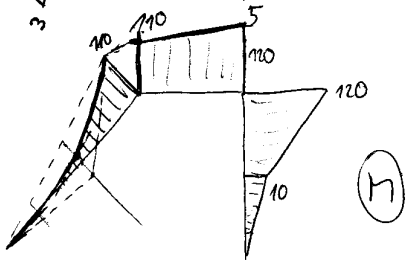


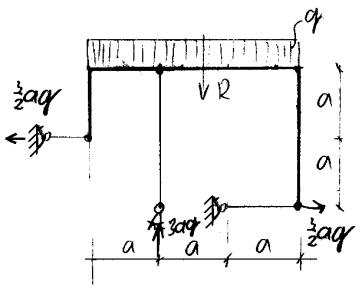


$\frac{q \cdot l^2}{8} = \frac{10 \cdot 5^2}{8} = \underline{31{,}25}$



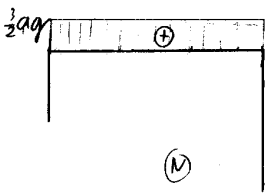
$M_{max} = \frac{3 \cdot 0{,}3}{2} = \underline{0{,}45\ kNm}$

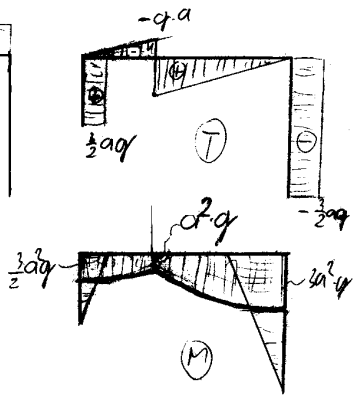




$3aq \cdot \frac{a}{2} = F \cdot a$

$F = \frac{3}{2}aq$





$\frac{1}{2}a^2 \cdot q - \frac{a^2 q}{2}$