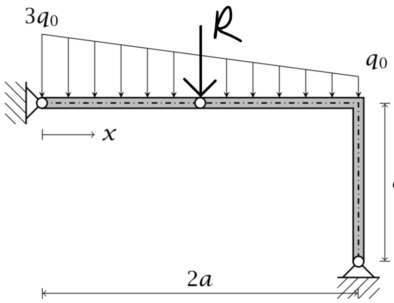
2. **Rahmen**
Auf den Riegel des skizzierten Rahmens mit Gelenk bei $x = a$ wirkt eine verteilte Last $q(x)$. Man ermittle die (verallgemeinerten) Auflager- und Schnittkräfte für $0 < x < a$.



Geg : a, q_0.

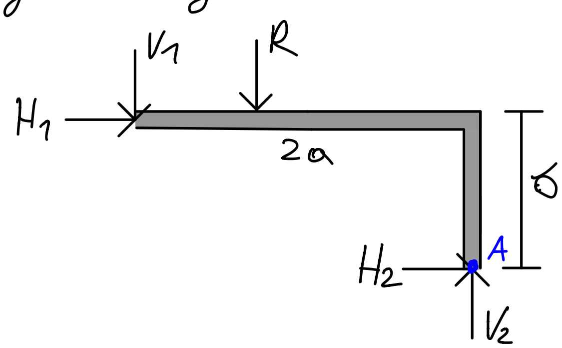
Ges.: (a) Auflagerkräfte,
(b) Schnittkräfte (N, Q und M) im Abschnitt $x \in (0, a)$.

a) $q(x) = q_0\left(3 - \frac{x}{a}\right)$

$$R = \int_0^{2a} q(x)\,dx = \int_0^{2a} q_0\left(3 - \frac{x}{a}\right)dx = q_0\left(3x - \frac{x^2}{2a}\right) = 4aq_0$$

bzw.: $R = \frac{2q_0 \cdot \cancel{2}a}{\cancel{2}} + q_0 \cdot 2a = 4aq_0$ ✓

ganzes System:



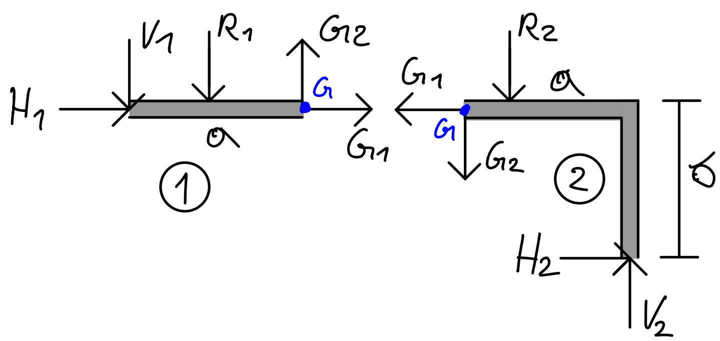
$$M_R = \int_0^{2a} x \cdot q(x)\,dx = q_0\left(\frac{3x^2}{2} - \frac{x^3}{3a}\right)\Bigg|_0^{2a}$$

$$\rightarrow M_R = q_0\left(\frac{3 \cdot \cancel{4}^{2} a^2}{\cancel{2}} - \frac{8\cancel{a^3}^{2}}{3\cancel{a}}\right) = \frac{10}{3}a^2 q_0$$

$\overset{+}{\rightarrow}$: $H_1 + H_2 = 0 \longrightarrow H_2 = -H_1$

$+\uparrow$: $V_2 - V_1 - R = 0 \longrightarrow V_2 = V_1 + 4aq_0$

$\overset{\curvearrowleft}{A}$: $M_R + V_1 \cdot 2a - H_1 \cdot a = 0 \longrightarrow H_1 = 2V_1 + \frac{10}{3}aq_0$



$$R_1 = \int_0^a q(x)\,dx = \frac{5}{2} a q_0$$

$$M_{R_1} = \int_0^a (a-x)\,q(x)\,dx = \frac{4}{3} a^2 q_0$$

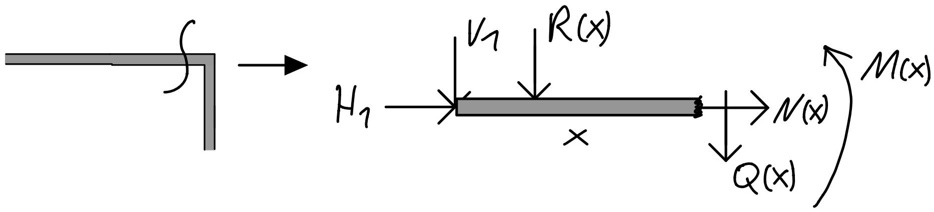
①: $\overset{+}{\rightarrow}$: $H_1 + G_1 = 0 \longrightarrow G_1 = -H_1 = -\{V_1 - \frac{10}{3} a q_0 = H_2$

$+\uparrow$: $G_2 - V_1 - R_1 = 0 \longrightarrow G_2 = V_1 + \frac{5}{2} a q_0$

$(G)\circlearrowleft$: $V_1 \cdot a + M_{R_1} = 0 \longrightarrow \boxed{V_1 = -\frac{4}{3} a q_0}$

$\longrightarrow \boxed{V_2 = \frac{8}{3} a q_0}$; $\boxed{H_2 = -2 a q_0}$; $\boxed{H_1 = 2 a q_0}$

b)



$$R(x) = \int_0^x q(x)\,dx = q_0\left(3x - \frac{x^2}{2a}\right) \; ; \; M_{R(x)} = \int_0^x\!\!\int_0^x q(x)\,dx = q_0\left(\frac{3}{2}x^2 - \frac{x^3}{6a}\right)$$

$\overset{+}{\rightarrow}$: $H_1 + N(x) = 0 \longrightarrow \boxed{N(x) = -2 a q_0}$

$+\uparrow$: $-V_1 - R(x) - Q(x) = 0 \longrightarrow \boxed{Q(x) = \frac{4}{3} a q_0 - q_0\left(3x - \frac{x^2}{2a}\right)}$

$\circlearrowleft$: $M(x) + V_1 \cdot x + M_{R(x)} = 0 \longrightarrow \boxed{M(x) = \frac{4}{3} a q_0 - q_0\left(\frac{3}{2}x^2 - \frac{x^3}{6a}\right)}$