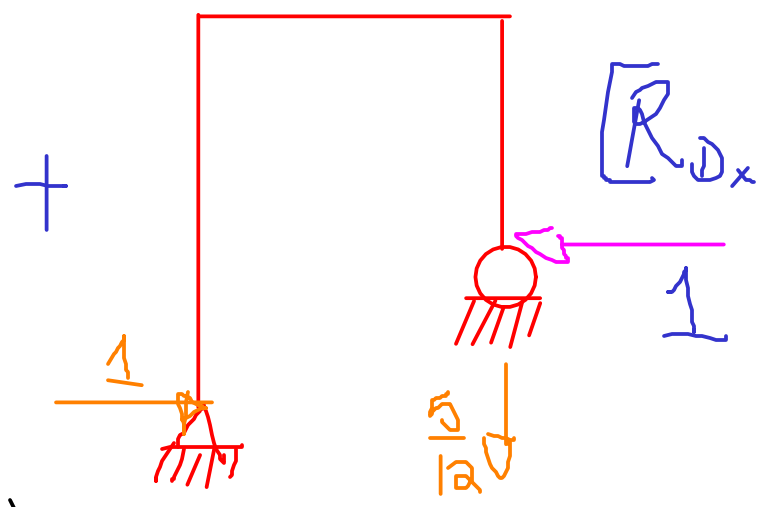


$$\sum M_A = 12(9) + 24(6) - R_D(12) = 0$$

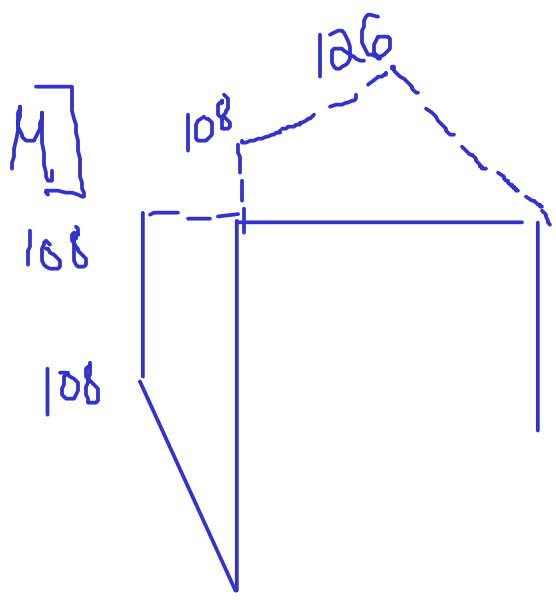
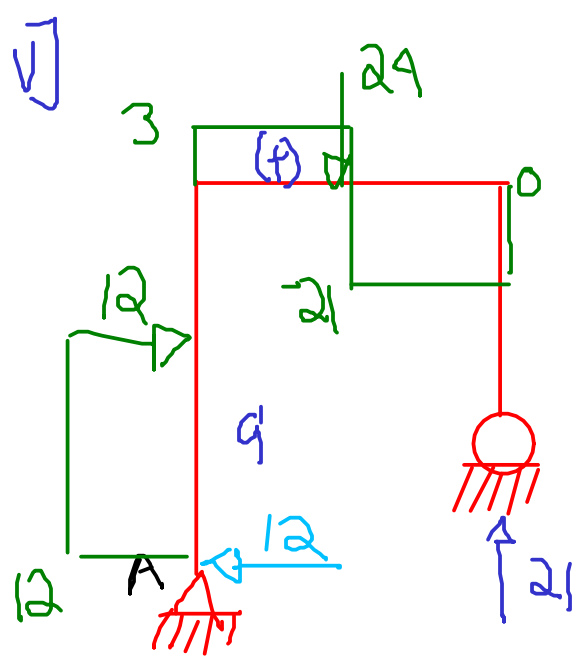
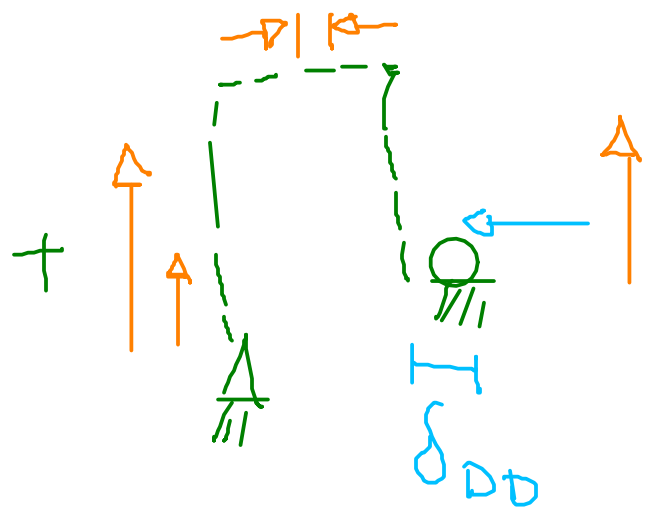
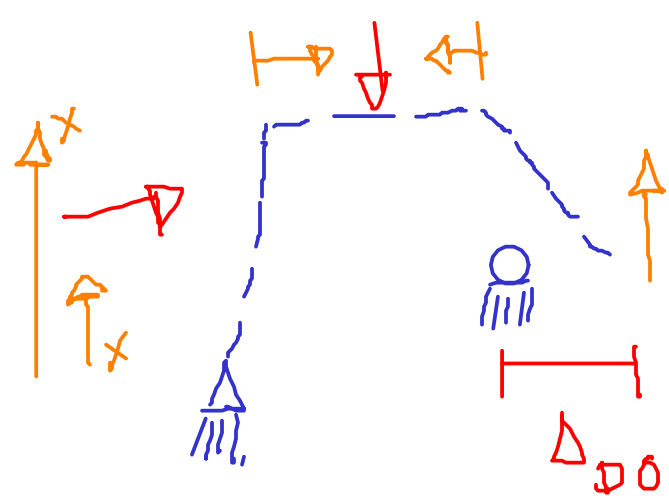
$$R_D = 21$$

$$\sum F_y = 24 + 21 + R_A = 0 \rightarrow R_A = 3$$



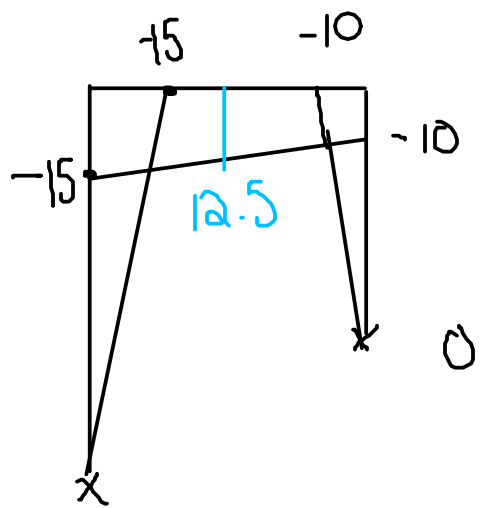
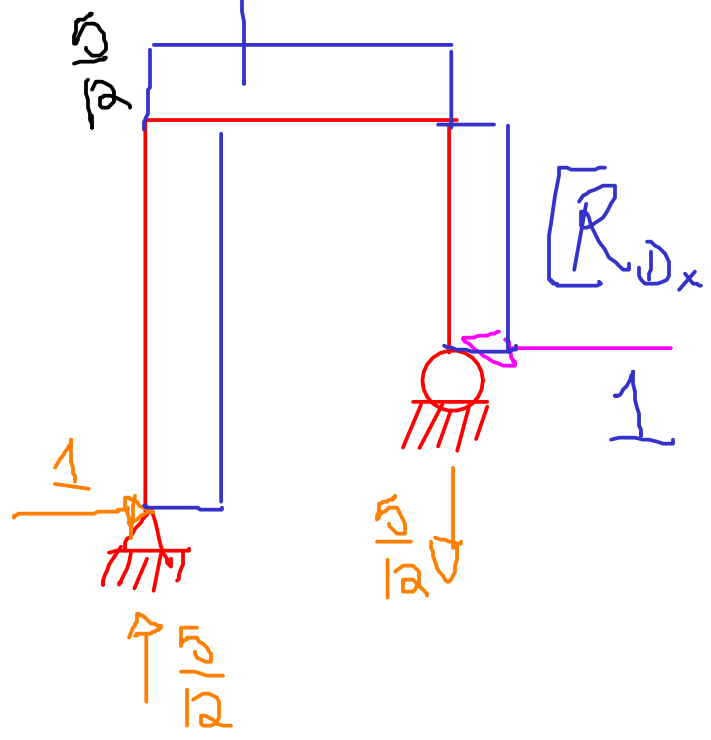
$$\sum M_A = (1)(5) - R_D(12) = 0$$

$$R_D = \frac{5}{12}$$



$$108 + 3(6) = 126$$

$$126 - 21(6) = 0$$



Tramos	Origen	Límites	$M_p$	$M_q$
AE	A	0-9	$12x$	$-x$
EB	A	9-15	108	$-x$
2I {	BF	B	$108+3x$	$-15+\frac{5}{12}x$
	FC	C	$21x$	$-10-\frac{5}{12}x$
CD	D	0-10	0	$-x$

$$\Delta_{DD} + \int_{DD} R_D = 0$$

$$\int \frac{M_p M_q dx}{EI} \quad \Delta_{DD} = \int_0^9 \frac{12x(-x) dx}{EI} + \int_9^{15} \frac{108(-x) dx}{EI}$$

$$+ \int_0^6 \frac{(108+3x)(-15+\frac{5}{12}x) dx}{2EI} + \int_0^6 \frac{21x(-10-\frac{5}{12}x) dx}{2EI}$$

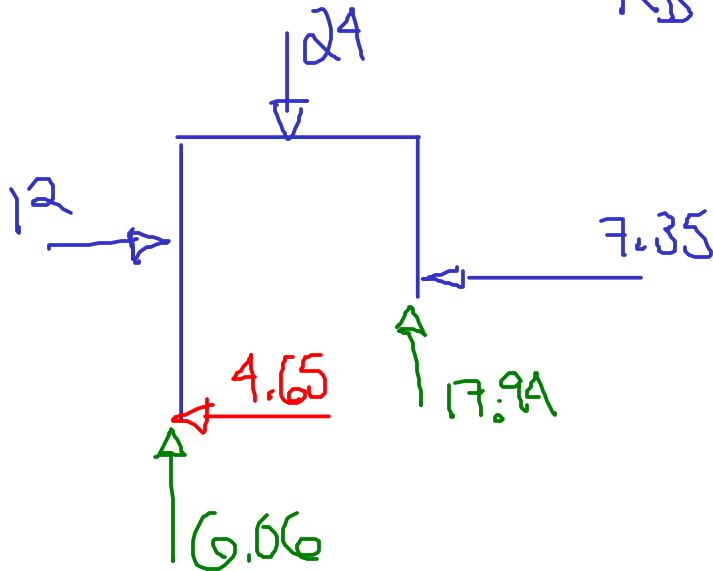
$$+ \int_0^{10} \frac{(0)(-x) dx}{EI} \Rightarrow \frac{-17,712}{EI}$$

$$\int_{DD} = \int_0^9 \frac{(-x)(-x) dx}{EI} + \int_9^{15} \frac{(-x)(-x) dx}{EI} + \int_0^6 \frac{(-15+\frac{5}{12}x)^2 dx}{2EI}$$

$$+ \int_0^6 \frac{(-10-\frac{5}{12}x)^2 dx}{2EI} + \int_0^{10} \frac{(-x)(-x) dx}{EI} = \frac{2408,33}{EI}$$

$$\frac{-17712}{EI} + \frac{2408.33}{EI} R_D = 0$$

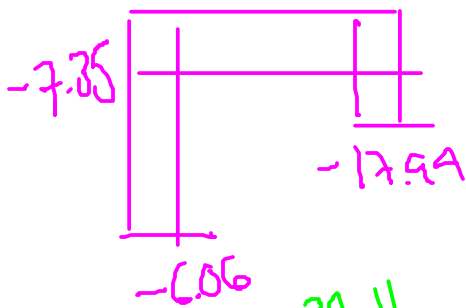
$$R_D = 7.35$$



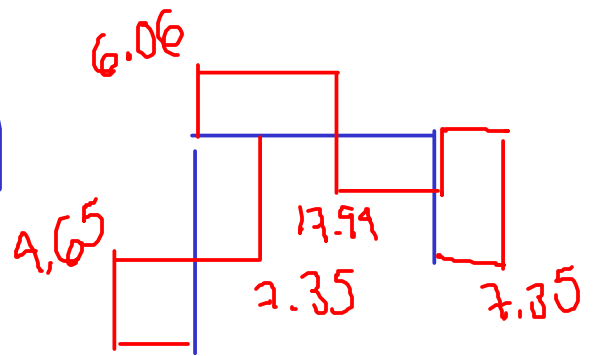
$$\sum M_A = 0 = 12(9) + 24(6) - 7.35(5) + R_D(12)$$

$$R_D = 17.94$$

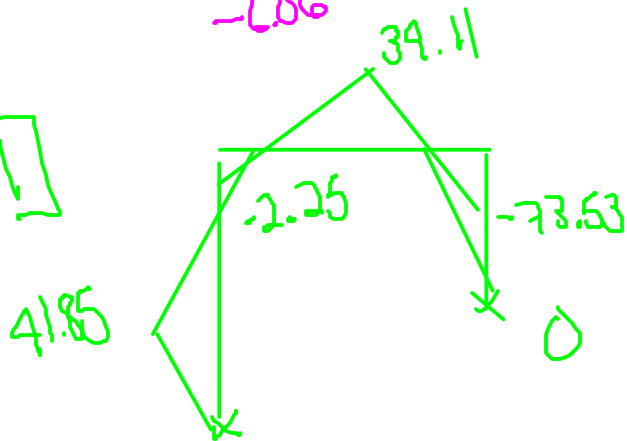
A]

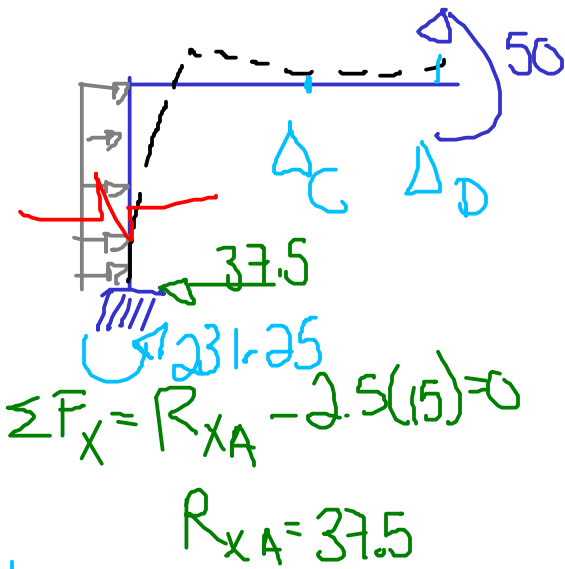
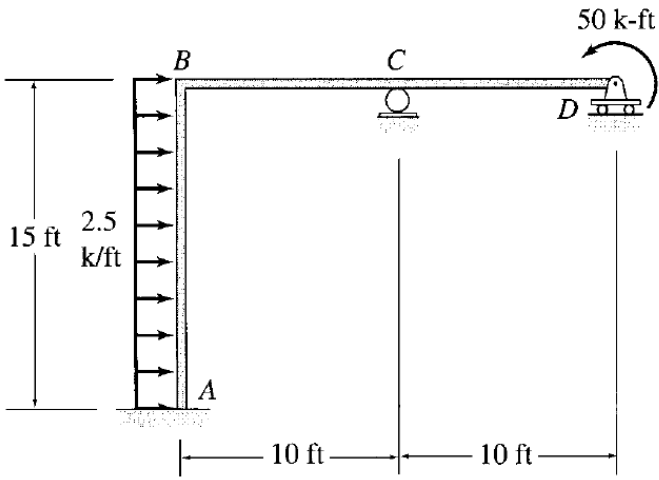


V]

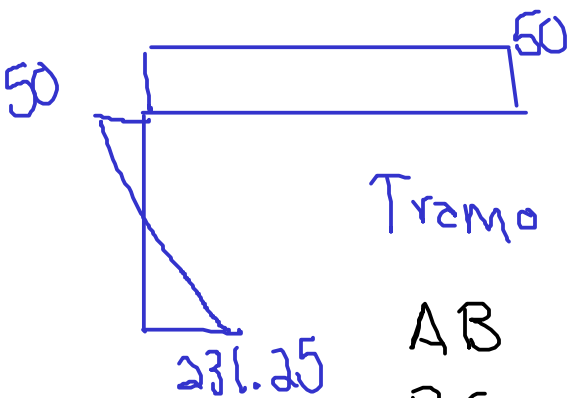
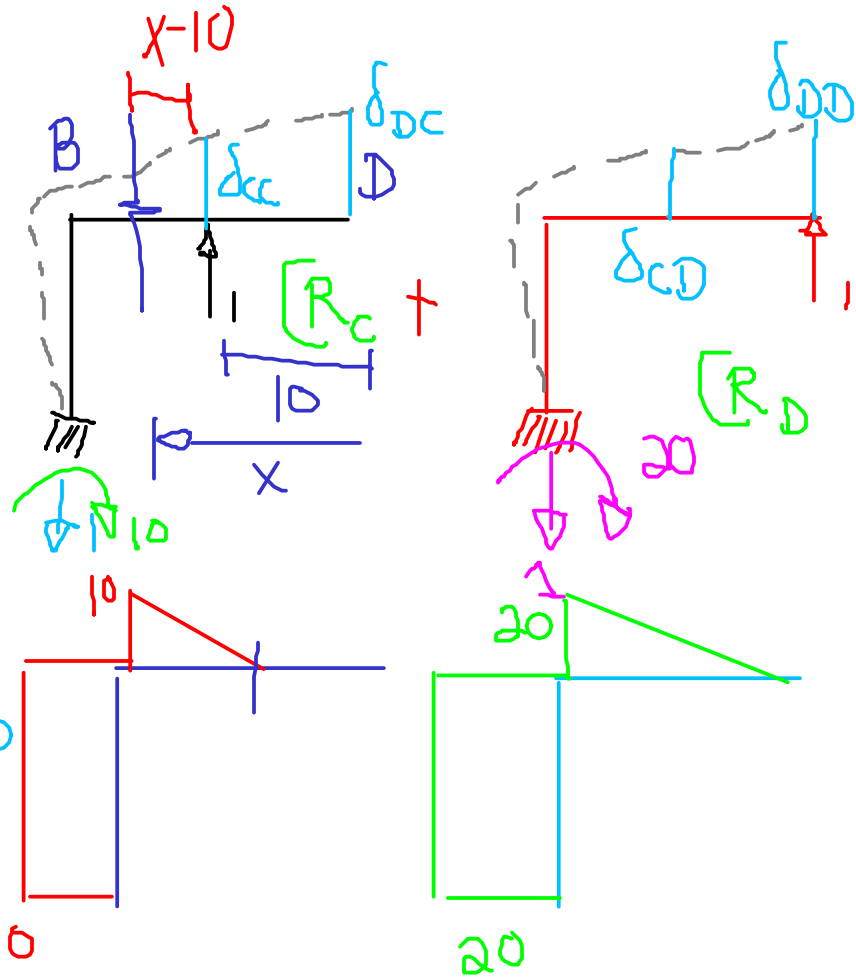


M]





$\sum M_A = M_A + 37.5\left(\frac{15}{2}\right) - 50 = 0$   
 $M_A = 231.25$



Tramo	Origen	Límites	$M_p$	$M_{Q_c}$	$M_{Q_D}$
AB	A	0-15	$-231.25 + 37.5x - 2.5x\left(\frac{x}{2}\right)$		
BC	D	10-20	50	$1(x-10)$	X
CD	D	0-10	50	0	X

# Ecuaciones de Compatibilidad

$$\Delta_C + \delta_{CC} R_C + \delta_{CD} R_D = 0$$

$$\Delta_D + \delta_{DC} R_C + \delta_{DD} R_D = 0$$

$$\Delta_C = \int_0^{15} \left( -231.25 + 37.5x - \frac{2.5x^2}{2} \right) (10) \frac{dx}{EI}$$
$$+ \int_{10}^{20} (50)(x-10) \frac{dx}{EI} + \int_0^{10} (50)(0) \frac{dx}{EI}$$

$$\Delta_D = \int_0^{15} \left( -231.25 + 37.5x - \frac{2.5x^2}{2} \right) (20) \frac{dx}{EI}$$
$$+ \int_{10}^{20} (50)(x) \frac{dx}{EI} + \int_0^{10} (50)(x) \frac{dx}{EI}$$

$$\delta_{CC} = \int_0^{15} (10)(10) \frac{dx}{EI} + \int_{10}^{20} (x-10)(x-10) \frac{dx}{EI} + \int_0^{10} (0)(0) \frac{dx}{EI}$$

$$\delta_{DD} = \int_0^{15} (20)(20) \frac{dx}{EI} + \int_{10}^{20} x \cdot x \frac{dx}{EI} + \int_0^{10} (x)(x) \frac{dx}{EI}$$

$$\delta_{DC} = \delta_{CD} = \int_0^{15} (10)(20) \frac{dx}{EI} + \int_{10}^{20} (x-10)(x) \frac{dx}{EI} + \int_0^{10} (0)(x) \frac{dx}{EI}$$

$$\int_0^{15} \left( -231.25 + 37.5 \cdot x - \frac{2.5}{2} \cdot x \cdot x \right) (10) dx + \int_{10}^{20} 50 \cdot (x-10) dx + \int_0^{10} 0 \cdot x dx = -4062.5$$

$$\int_0^{15} \left( -231.25 + 37.5 \cdot x - \frac{2.5}{2} \cdot x \cdot x \right) (20) dx + \int_{10}^{20} 50 \cdot (x) dx + \int_0^{10} 50 \cdot x dx = -3125$$

$$\int_0^{15} (20) \cdot (20) dx + \int_{10}^{20} x \cdot (x) dx + \int_0^{10} x \cdot x dx = 8666.6667$$

$$\int_0^{15} (10) \cdot (10) dx + \int_{10}^{20} (x-10) \cdot (x-10) dx + \int_0^{10} 0 \cdot 0 dx = 1833.3333$$

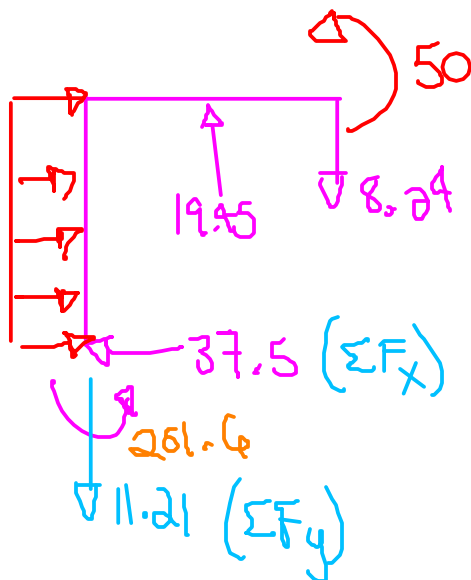
$$\int_0^{15} (10) \cdot (20) dx + \int_{10}^{20} (x-10) \cdot (x) dx + \int_0^{10} 0 \cdot x dx = 3833.3333$$

$$\begin{aligned} -4062.5 + 1833.33 R_C + 3833.33 R_D &= 0 \\ -3125 + 3833.33 R_C + 8666.67 R_D &= 0 \end{aligned}$$

$$\begin{bmatrix} 1833.33 & 3833.33 \\ 3833.33 & 8666.67 \end{bmatrix}^{-1} \begin{bmatrix} 4062.5 \\ 3125 \end{bmatrix} = \begin{bmatrix} 19.4476 \\ -8.2413 \end{bmatrix}$$

$$R_C = 19.45 \uparrow$$

$$R_D = 8.24 \downarrow$$

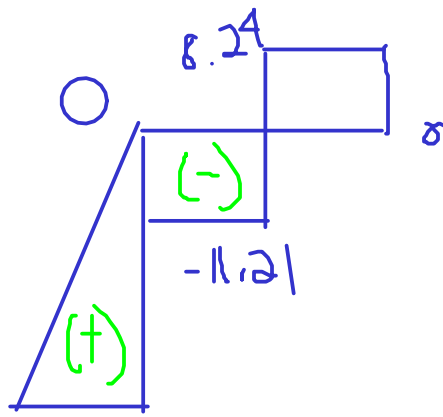


$$\Sigma M_A = 2.5(15) \left( \frac{15}{2} \right) - 19.45(10)$$

$$+ 8.24(20) - 50 + M_A = 0$$

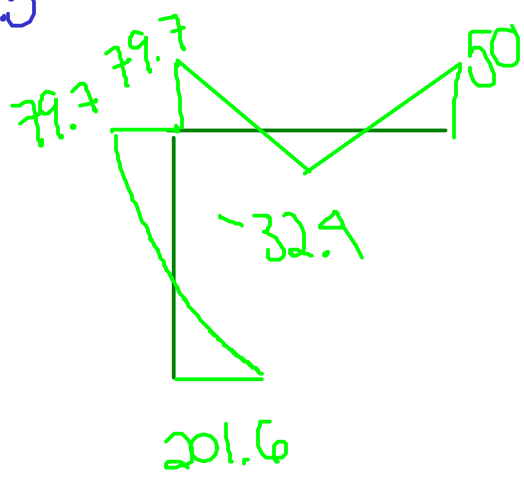
$$M_A = 261.6 \curvearrowright$$

V



$$37.5 - 2.5(15) = 0$$

M



$$-201.6 + \frac{1}{2}(37.5)(15) = 79.7$$

$$79.7 - 12(11.21) = -32.4$$

$$-32.4 + 8.24(10) = 50$$

