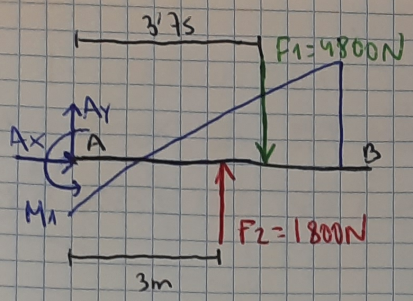


Equilibrio $\begin{cases} \vec{R}=0 \\ \vec{M}_0^R=0 \end{cases}$

$\vec{M_A}=0 \rightarrow M_1 + F_2 \cdot 3 - F_1 \cdot 3'75 = 0$

$M_1 + 1800 \cdot 3 - 4800 \cdot 3'75 = 0$

$M_1 = 12600\,Nm$ (+)

El momento 1 se da en toda la figura, no lleva distancias

$\vec{M_B}=0 \rightarrow F_1 \cdot 2'25 - F_2 \cdot 3 + M_1 - Ay \cdot 6 = 0 \rightarrow$

$\rightarrow 4800 \cdot 2'25 - 1800 \cdot 3 + 12600 - Ay \cdot 6 = 0 \rightarrow Ay = 3000N \uparrow$

$\vec{Rx}=0 \rightarrow Ax = 0$

Comprobación:

$\vec{Ry}=0 \rightarrow Ay + F_2 - F_1 = 3000 + 1800 - 4800 = 0$

$F_2 \rightarrow \square = 7 \cdot 150 = 1050\,lb$

$F_3 \rightarrow \triangle = \frac{4 \cdot (420-150)}{2} = 540\,lb$

$F_4 \rightarrow \Delta = \frac{420 \cdot 3'5}{2} = 735\,lb$

Equilibrio $\begin{cases} \vec{R}=0 \\ \vec{M}_R^0=0 \end{cases}$

$\vec{M_A}=0 \rightarrow -F_1 \cdot 1'5 - F_2 \cdot 8 - F_3 \cdot 10'17 - F_4 \cdot 12'67 + By \cdot 11 = 0 \rightarrow$

$\rightarrow -540 \cdot 1'5 - 1050 \cdot 8 - 540 \cdot 10'17 - 735 \cdot 12'67 + By \cdot 15 = 0 \rightarrow$

$\rightarrow 24014'25 + By \cdot 15 = 0 \rightarrow By = 1600'95\,lb \uparrow$

$\vec{Rx}=0 \rightarrow \vec{Ax}=0$

$\vec{M_B}=0 \rightarrow F_1 \cdot 13'5 + F_2 \cdot 7 + F_3 \cdot 4'83 + F_4 \cdot 13'5 - Ay \cdot 15 = 0 \rightarrow$

$\rightarrow 540 \cdot 13'5 + 1050 \cdot 7 + 540 \cdot 4'83 + 735 \cdot 2'33 - Ay \cdot 15 = 0 \rightarrow$

$\rightarrow 18960'75 - Ay \cdot 15 = 0 \rightarrow Ay = 1264'05\,N \uparrow$

Comprobación:

$\vec{Ry}=0 \rightarrow Ay + By - F_1 - F_2 - F_3 - F_4 = 1264'05 + 1600'95 - 540 - 1050 - 540 - 735 = 0$

2-EXAMEN 2013

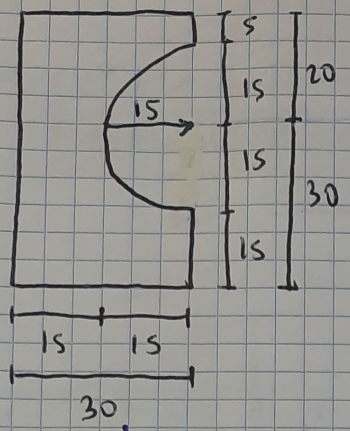


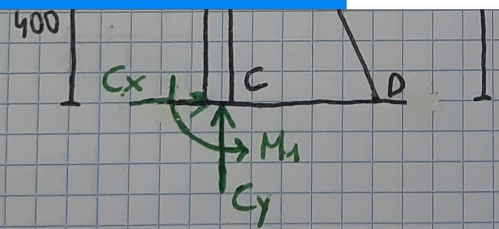
Figura	X_{Gi}	Y_{Gi}	A_i	$X_{Gi}A_i$	$Y_{Gi}A_i$
	15	25	1500	22500	37500
	23'63		-353'43	-8351'5	-1060'29
			$\Sigma = 1146'57$	$\Sigma = 14148$	$\Sigma = 26891'71$

$A_{eng} = 2\pi X_G L_{gira} \rightarrow A_{cirado} = 2\pi X_G \frac{L_{circunferencia}}{2} \rightarrow$

$\rightarrow \pi r^2 = 2\pi X_G \frac{2\pi r}{2} \rightarrow X_G = \frac{r}{2\pi} = 2'39$

$V_{eng} = 2\pi X_G A_{gira} \rightarrow V_{cirado} = 2\pi X_G A_{cirado} \rightarrow$

22'62°⇒



$T_y = T \cos 22'62° = 1300 \cos 22'62° \Rightarrow$

$T_y = 1200\ N$

$\vec{M_C} = M_1 + 450 \cdot 0'4 + 750 \cdot 0'5 - 1200 \cdot 0'15 - 500 \cdot 0'6 = 0 \rightarrow$

$\rightarrow M_1 + 75 = 0 \rightarrow M_1 = -75\ Nm$ ⟲

$\vec{M_D} = M_1 - C_y \cdot 0'4 + T_y \cdot 0'25 - T_x \cdot 0'6 + 450 \cdot 0'4 + 750 \cdot 0'9 = 0 \rightarrow$

$\rightarrow -75 - C_y \cdot 0'4 + 1200 \cdot 0'25 - 500 \cdot 0'6 + 450 \cdot 0'4 + 750 \cdot 0'9 = 0 \rightarrow$

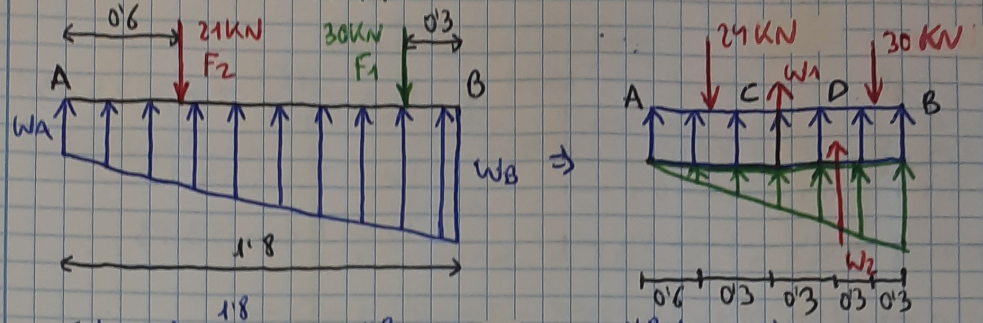
$\rightarrow -C_y \cdot 0'4 + 780 = 0 \rightarrow C_y = 1950\ N \uparrow$

$\vec{R_x} = 0 \rightarrow -450 + C_x + T_x = 0 \rightarrow C_x = 450 - 500 = -50\ N \quad C_x = 50 \leftarrow$

Comprobación:

$\vec{R_y} = 0 \rightarrow -750 + C_y - T_y = 0 \rightarrow -750 + 1950 - 1200 = 0$

1- EXAMEN 2019



$W_1 = A_{\square} = 1'8\ W_A \qquad X_{G1} = 1'8/2 = 0'9$

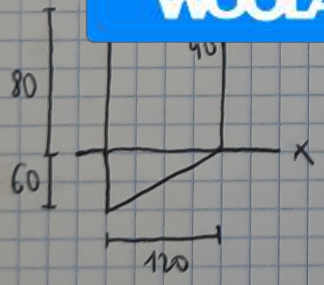
$W_2 = A_{\triangle} = \frac{1'8}{2} W_B \qquad X_{G2} = 1'8/3 = 0'6$

$\overrightarrow{M_C} = 0 \rightarrow 24 \cdot 0'3 + \frac{1'8}{2} W_B \cdot 0'3 - 30 \cdot 0'6 = 0 \rightarrow$

$\rightarrow -10'8 + 0'27\, W_B = 0 \rightarrow \underline{W_B = 40\ N/m}$

$W_2 = \frac{1'8}{2} \cdot 40 = 36 \qquad \underline{W_2 = 36\ KN}$

$\overrightarrow{M_O} = 0 \rightarrow 24 \cdot 0'6 - 30 \cdot 0'3 - 1'8 W_A \cdot 0'3 = 0 \rightarrow$



⊙	-60	-80	$-\pi 40^2$	-301592'89	-402123'86
□	60	40	2400	144000	96000
△	40	-20	800	32000	-16000
			$\sum$ 3828'32	$\sum$ 213699'11	$\sum$ 274238'39

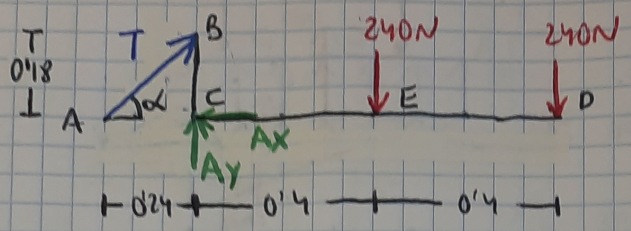
2 teorema de Guldin:

$V_{cuerpo} = 2\pi Y_G \frac{A_{cuerpo}}{2} \rightarrow \frac{4}{3}\pi r^3 = 2\pi Y_G \frac{\pi r^2}{2} \rightarrow Y_G = \frac{4r}{3\pi} = \frac{4 \cdot 60}{3 \cdot \pi}$

$X_{GT} = \frac{X_{Gi} A_T}{A_T} = \frac{213699'11}{3828'32} = \underline{55'82}$

$Y_{GT} = \frac{Y_{Gi} A_T}{A_T} = \frac{274238'39}{3828'32} = \underline{71'63}$

3-EXAMEN 2019



$tg\,\alpha = \frac{0'24}{0'18} \rightarrow \alpha = 53'13°$

$T_x = T \operatorname{sen} 53'13°$

$T_y = T \cos 53'13°$

$\overrightarrow{M_C} = 0 \rightarrow -240 \cdot 0'4 - 240 \cdot 0'8 - T_y \cdot 0'24 = 0 \rightarrow$

$\rightarrow -240 \cdot 0'4 - 240 \cdot 0'8 - T \cos 53'13° \cdot 0'24 = 0 \rightarrow$

$\rightarrow -288 - 0'144\,T = 0 \rightarrow T = -2000\ N$ ↙ $53'13°$ $T = 2000\ N$

$\overrightarrow{M_B} = 0 \rightarrow -240 \cdot 0'4 - 240 \cdot 0'8 - A_x \cdot 0'18 = 0 \rightarrow$

$\rightarrow -288 - 0'18\,A_x = 0 \rightarrow A_x = -1600\ N \rightarrow A_x = 1600N \rightarrow$

$\overrightarrow{M_A} = 0 \rightarrow -240 \cdot 0'64 - 240 \cdot 1'04 + A_y \cdot 0'24 = 0 \rightarrow$

$\rightarrow -403'2 + A_y \cdot 0'24 = 0 \rightarrow A_y = 1680\ \uparrow$

$= 0$

TEMA 6: METODOS NUDOS Y SECCIONES ESTRUCTURAS

Estructura
- articulada y formada por elementos rectos
- isostática → resoluble con equilibrio $R
- plana
- canónica → formada a partir de triángulos
- Cargas en nudos

$\vec{R}=0$ / $\vec{M_R}=0$ } Equilibrio → 3 ecuaciones → máximo 3 incógnitas

Canónica:  Los triángulos comparten lados

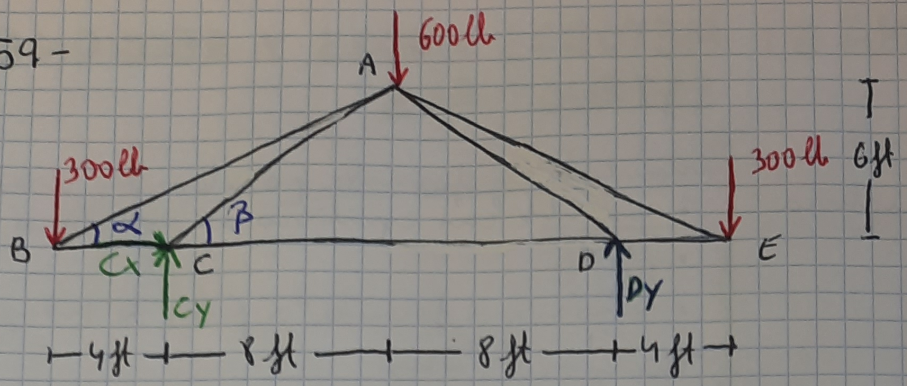
1º Aislar toda la estructura → Diagrama sólido libre → → Equilibrio Sólido Rígido → Calculo reacciones { $\vec{R}=0$ / $\vec{M_R}=0$

2º Aislar cada nudo → Aplico diagrama de sólido libre de ese punto → → Equilibrio del nudo → Calculo reacciones → $\vec{R}=0$ (porque si tengo valores en ese punto se van las fuerzas)

3º Orden elección nudos → Máximo 2 incógnitas (Solo dos barras)

4º El último nudo sirve de comprobación

59 -



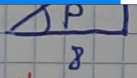
Equilibrio $\begin{cases} \vec{R} = 0 \\ \vec{M_R} = 0 \end{cases}$

$\vec{M_C} = 0 \rightarrow 300 \cdot 4 + Dy \cdot 6 - 600 \cdot 8 - 300 \cdot 20 = 0$

$Dy = \frac{300 \cdot 4 - 600 \cdot 8 - 300 \cdot 20}{6} \rightarrow \underline{Dy = 600 \text{ lb} \uparrow}$

$\vec{M_D} = 0 \rightarrow 600 \cdot 8 + 300 \cdot 20 - Cy \cdot 16 + 300 \cdot 4 = 0$

$Cx = \frac{600 \cdot 8 + 300 \cdot 20 - 300 \cdot 4}{\quad} \rightarrow Cx = 600 \text{ lb} \uparrow$

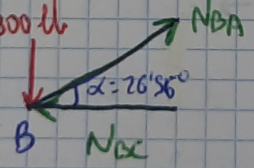


Nudo B:

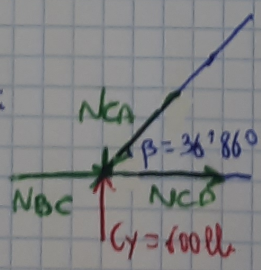
Porque solo hay 2 barras

$N_{BC} = 600 \text{ lb} \leftarrow$

$N_{BA} = 671 \text{ lb} \nearrow$



Nudo C:



$N_{CA} = 1000 \text{ lb} \swarrow$

$N_{CD} = 200 \text{ lb} \rightarrow$

Equilibrio partícula $\vec{R} = 0 \begin{cases} \vec{Rx} = 0 \\ \vec{Ry} = 0 \end{cases}$

$\vec{Rx} = 0 \rightarrow -N_{BC} + N_{BA} \cos 26'56° = 0$

$\vec{Ry} = 0 \rightarrow N_{BA} \operatorname{sen} 26'56° - 300 = 0$

$N_{BA} = \underline{671 \text{ lb}} \nearrow 26'56°$

$N_{BC} = 671 \cdot \cos 26'56° = \underline{600 \text{ lb}} \leftarrow$

$\vec{Rx} = 0 \rightarrow N_{BC} + N_{CD} - N_{CA} \cos 36'86° = 0$

$\vec{Ry} = 0 \rightarrow Cy - N_{CA} \operatorname{sen} 36'86° = 0$

$N_{CA} = \frac{600}{\operatorname{sen} 36'86°} = \underline{1000 \text{ lb}} \swarrow 36'86°$

$N_{CD} = N_{BC} + N_{CA} \cos 36'86°$

$N_{CD} = 600 - 1000 \cdot \cos 36'86° = -200 \text{ lb}$