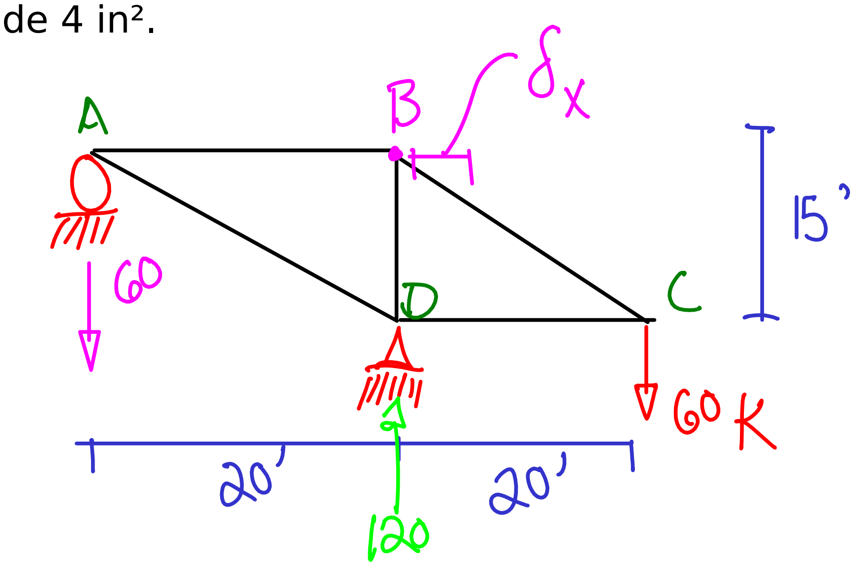
Calcule el desplazamiento horizontal dx en la unión B para la armadura mostrada. Se da E = 30,000 ksi, el área de las barras AD y BC = 5 in², y el área de las demás barras de 4 in².

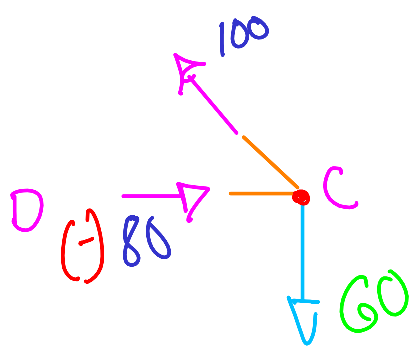


$$\sum M_D = 60(20) - A_y(20) = 0 \quad \therefore A_y = 60\ K \downarrow$$

$$\sum F_y = -60 - 60 + D_y = 0 \quad \therefore D_y = 120 \uparrow$$

$$\sqrt{20^2 + 15^2} = \underline{25}$$

B

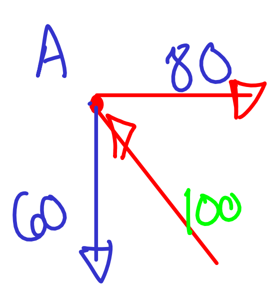


$$\sum F_y = -60 + F_{BC}\left(\frac{15}{25}\right) = 0$$

$$F_{BC} = 100$$

$$\sum F_x = -100\left(\frac{4}{5}\right) + F_{DC} = 0$$

$$F_{DC} = 80\ (-)$$



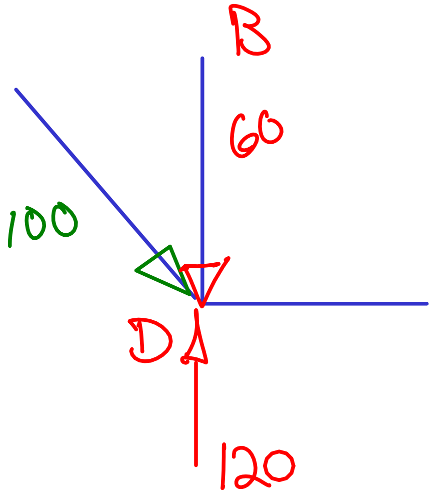
B

$$\sum F_y = -60 + F_{AD}\left(\frac{3}{5}\right) = 0$$

$$F_{AD} = 100\ (-)$$

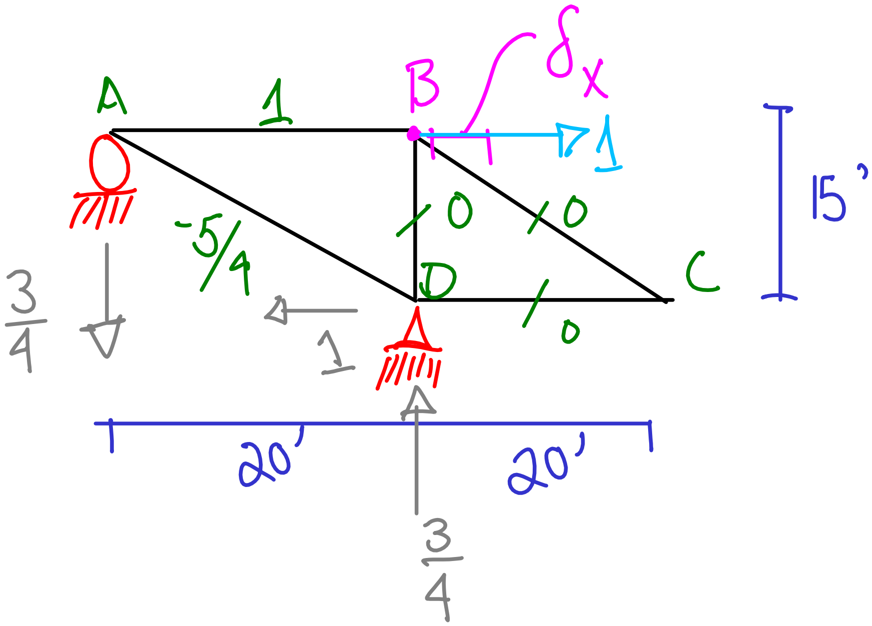
D

$$\sum F_x = -100\left(\frac{4}{5}\right) + F_{AB} = 0 \quad \therefore F_{AB} = 80$$



$$\Sigma F_y = -100\left(\frac{3}{5}\right) + 120 - F_{DB} = 0$$

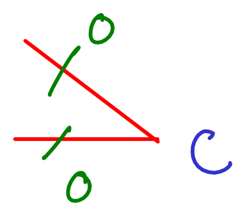
$$F_{DB} = 60\ (-)$$

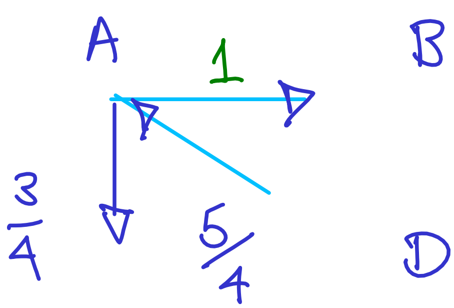


$(1)(15) = 15$

$x(20) = 15$

$x = \frac{3}{4}$





$$\Sigma F_y = -\frac{3}{4} + F_{AD}\left(\frac{3}{5}\right) = 0$$

$$F_{AD} = \frac{5}{4}\ (-)$$

$$\Sigma F_x = -\frac{5}{4}\left(\frac{4}{5}\right) + F_{AB} = 0$$

$$F_{AB} = 1$$

$$\Sigma Q\,\delta_p = \Sigma \frac{F_Q F_p L}{AE}$$

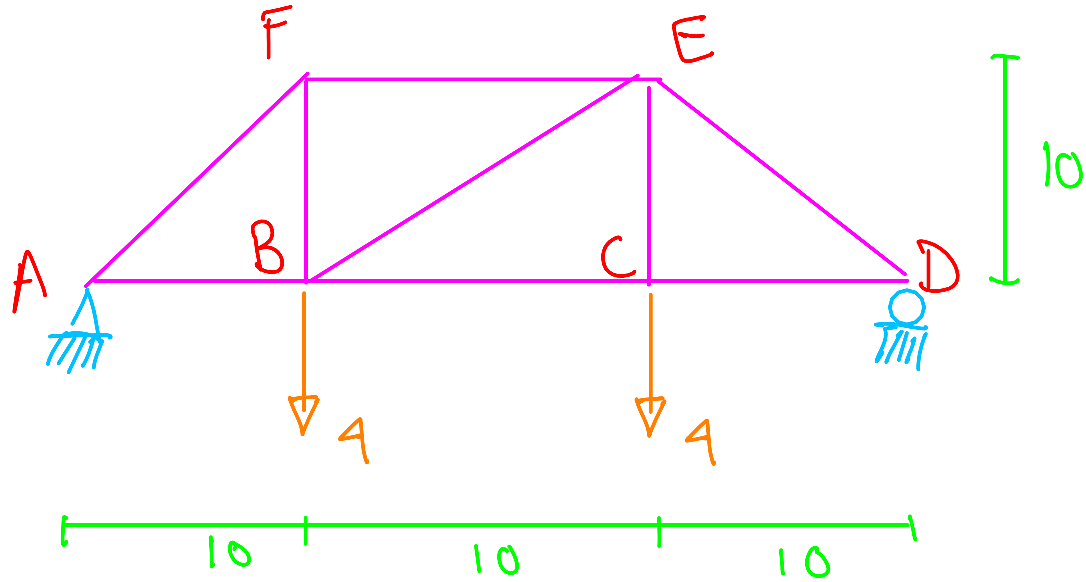
Miembro	F_Q	F_p	L (in)	A (in²)	$\frac{F_Q F_p L}{AE}$
AB	1	80	240	4	0.16
BC	0	100	300	5	0
CD	0	-80	240	4	0
AD	-5/4	-100	300	5	0.25
BD	0	-60	180	4	0
					0.41

E = 30,000 Ksi

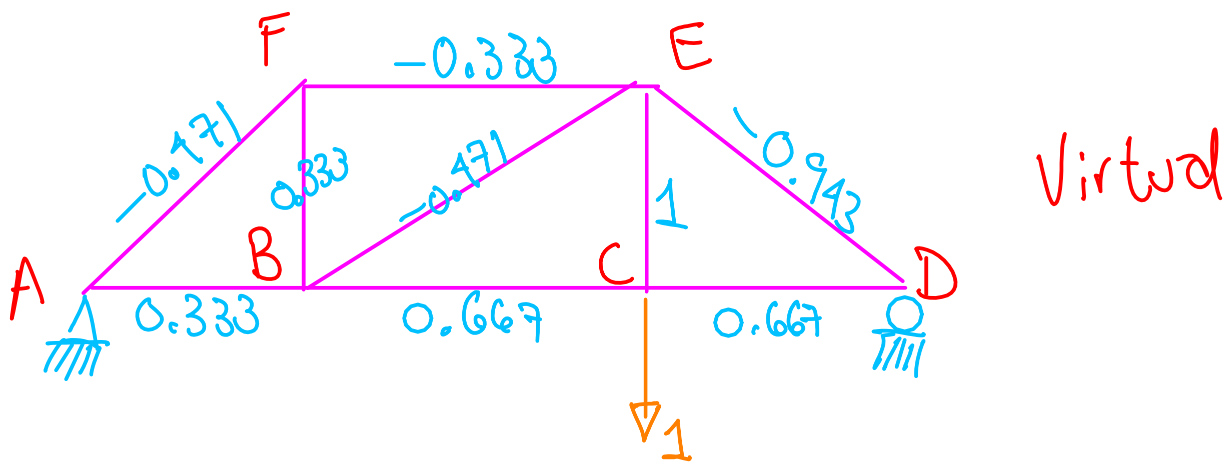
$$\Sigma Q\,\delta_p = \Sigma \frac{F_Q F_p L}{AE}$$

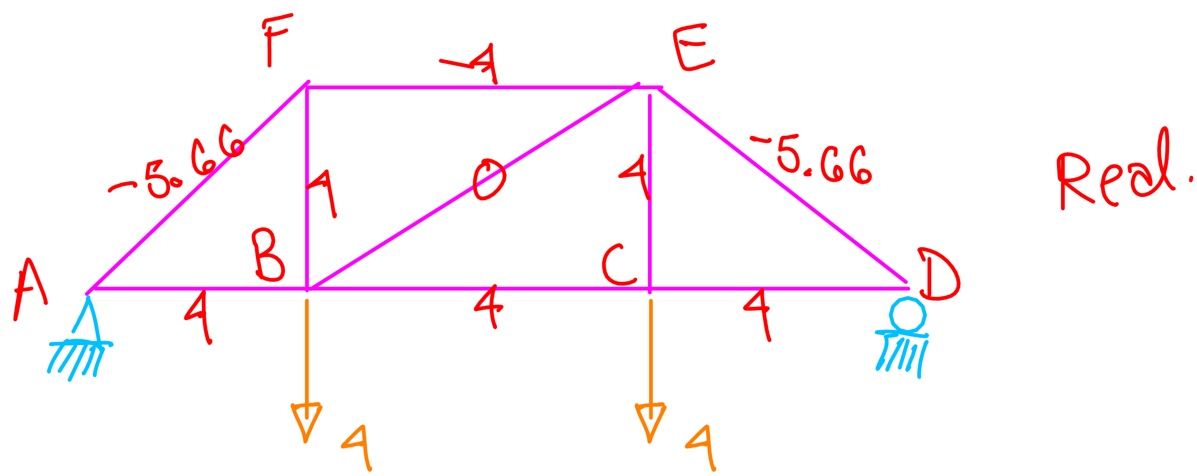
$$1\,\delta_{Bx} = 0.41$$

$$\underline{\underline{\delta_{Bx} = 0.41 \text{ in} \rightarrow}}$$



Determine el desplazamiento vertical de la junta C de la armadura de acero mostrada. El área de la sección transversal de cada miembro es A = 0.5 in², E = 29000 ksi.

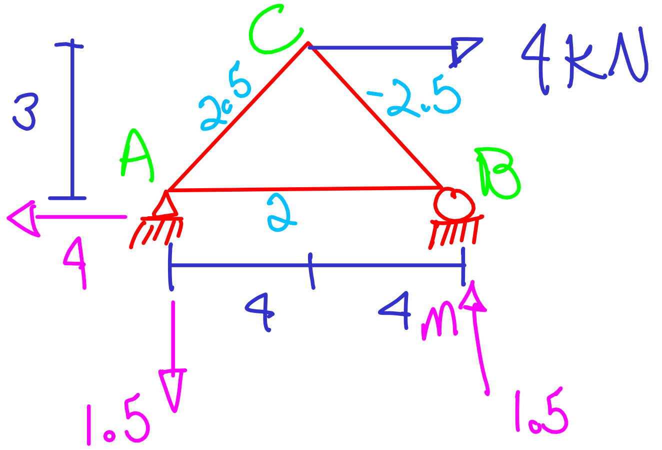




Miembro	F_Q	F_p	L (in)	A (in²)	$\frac{F_Q F_p L}{AE}$
AB	0.333	4	120	0.5	0.011
BC	0.667	4	120	0.5	0.022
CD	0.667	4	120	0.5	0.022
DE	-0.943	-5.66	169.71	0.5	0.062
FE	-0.333	-4	120	0.5	0.011
EB	-0.471	0	169.71	0.5	0
BF	0.333	4	120	0.5	0.011
AF	-0.471	-5.66	169.71	0.5	0.031
CE	1	4	120	0.5	0.033
					0.203 in

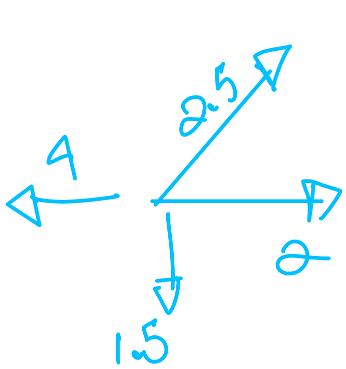
$$\Sigma Q\,\delta_p = \Sigma \frac{F_p F_Q L}{AE}$$

$$1\,\delta_p = 0.203 \qquad \delta_p = 0.203 \text{ in} \downarrow$$



Área secc. transv. = 400 mm².
E = 200 GPa.
¿Desplazamiento vertical en C?

$\frac{12}{8}$

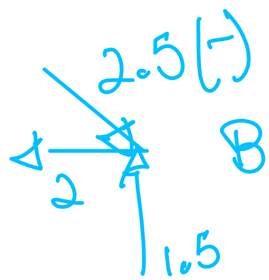


$$\Sigma F_y = -1.5 + F_{AC}\left(\frac{3}{5}\right) = 0$$

$$F_{AC} = 2.5$$

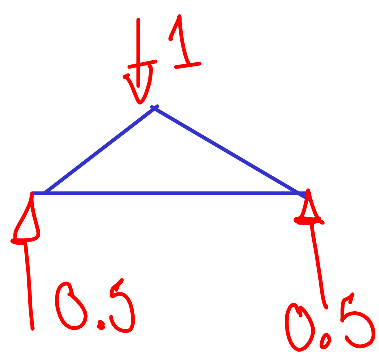
$$\Sigma F_x = 2.5\left(\frac{4}{5}\right) + F_{AB} - 4 = 0$$

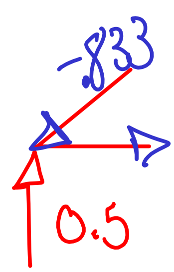
$$F_{AB} = 2$$



$$\Sigma F_y = 1.5 - F_{CB}\left(\frac{3}{5}\right) = 0$$

$$F_{CB} = 2.5\ (-)$$





$$\Sigma F_y = 0.5 - F_{AC}\left(\frac{3}{5}\right) = 0$$

$$F_{AC} = 0.833\ (-)$$

$$\Sigma F_x = -0.833\left(\frac{4}{5}\right) + F_{AB} = 0$$

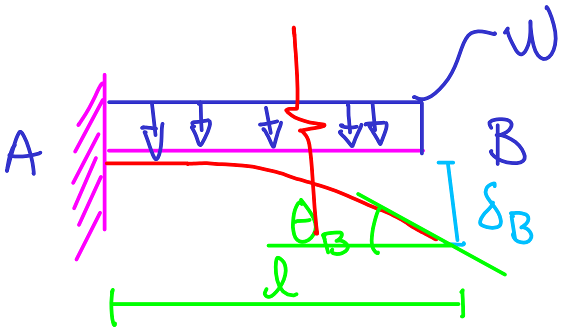
$$F_{AB} = 0.667$$

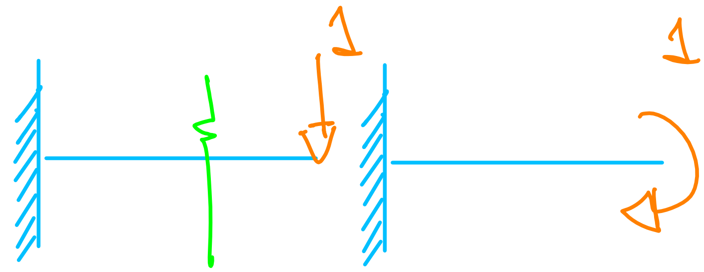
Miembro	F_Q	F_P	L	A	$\frac{F_Q F_P L}{A}$
AC	-0.833	2.5	5	0.0004	~~-26031.25~~
AB	0.667	2	8	0.0004	26680
CB	-0.833	-2.5	5	0.0004	~~26031.25~~

200×10^9 Pa

$$\frac{26\,680\,(1000)(1000)}{200 \times 10^{9}} = 0.1334 = Q\,\delta_p = 1000N\,\delta_p$$

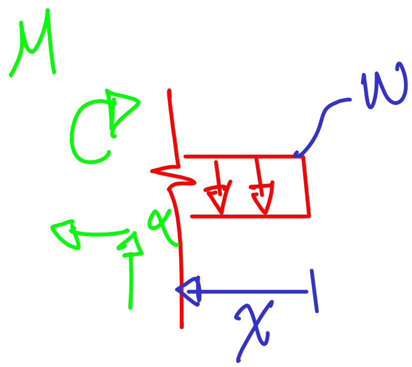
$$\delta_p = 0.0001334\,m = 0.1334\,mm$$





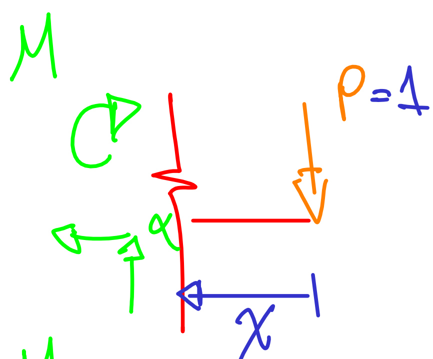
Usando el trabajo virtual, calcule la deflexión delta b y la rotación theta b en la punta de la viga en voladizo cargada uniformemente. EI = constante.

$$\sum Q\,\delta_p = \int \frac{M_p M_Q}{EI}\,dx$$



$$\sum M_\alpha = M + wx\left(\frac{x}{2}\right) = 0$$

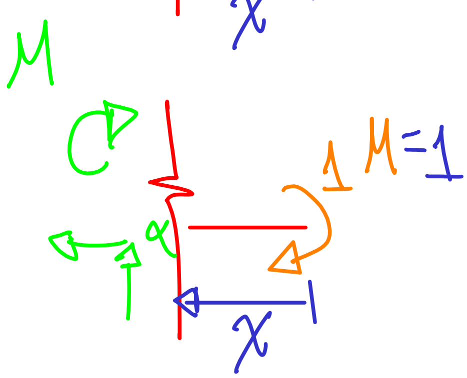
$$M = -\frac{wx^2}{2}$$



$$\sum M_\alpha = M + Px = 0$$

$$M = -Px$$

$$M = -x$$



$$\sum M_\alpha = M + 1 = 0$$

$$M = -1$$

Miembro	Tramo	Origen	M_p	M_Q	M_μ
AB	0-l	B	$\frac{-wx^2}{2}$	$-x$	-1

θ_p

$$\Sigma Q\delta_p = \int \frac{M_p M_Q}{EI} dx$$

$$EI\,\delta_p = \int_0^l \frac{-wx^2}{2}(-x)\,dx$$

$$\delta_p = \frac{wx^4}{8EI}\Big|_0^l = \frac{wl^4}{8EI} \downarrow$$

$$\theta_p = \int_0^l \frac{-wx^2}{2}\frac{(-1)}{EI}dx = \frac{wx^3}{6EI}\Big|_0^l = \frac{wl^3}{6EI}$$