

Diagram of a beam with forces and moments:

- Force $F_1 = 150\text{N}$ acting downwards at a distance of 1.5m from point A.
- Force $F_2 = 150\text{N}$ acting downwards at a distance of 2.5m from point A.
- A uniformly distributed load $w = 100\text{N/m}$ acting downwards over a length of 1.75m .
- Reaction force B acting upwards at the right end of the beam, which is 3.5m from point A.

Sign convention: \ominus (counter-clockwise), \oplus (clockwise).

Elegimos el ΔA (Pivote A)

$$\oplus M_A + M_{F_1} + M_w + M_{F_2} + M_B = 0$$

$$\downarrow$$

$$-(1.5\text{m})(150\text{N}) + (2.5\text{m})(150\text{N}) - (1.75\text{m})(100\text{N}) - (3.5\text{m})(B) = 0$$

$$B = M_A + M_{F_1} + M_w + M_{F_2} \quad \rightarrow \quad -225 + 375 - 175 + (-3.5B) = 0$$

Calculation for reaction force B:

$$\frac{225 + 175 + 375}{3.5\text{m}} = B \quad \rightarrow \quad \frac{775}{3.5\text{m}} = B$$

$$\downarrow$$

$$221.4\text{N} = B$$

Calculation for reaction force A:

$$\ominus M_A + M_{F_1} + M_w + M_{F_2} + M_B = 0$$

$$\downarrow$$

$$A + (-150\text{N}) + (-100\text{N}) + (-150\text{N}) + 221.4\text{N} = 0$$

$$\downarrow$$

$$A = 150\text{N} + 100\text{N} + 150\text{N} - 221.4\text{N}$$

$$\downarrow$$

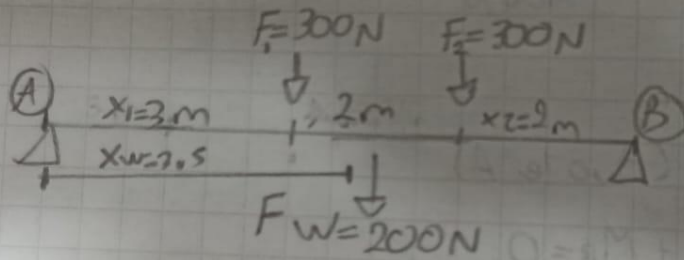
$$A = 178.6\text{N}$$

Ejercicios.

- ① Una tabla con 10m de largo con peso insignificante está sostenida en un punto localizado a 3m del extremo derecho donde se ~~le aplica~~ aplica un peso de 60N. ¿Qué fuerza descendente se debe ejercer en el otro extremo para alcanzar el equilibrio?

AY

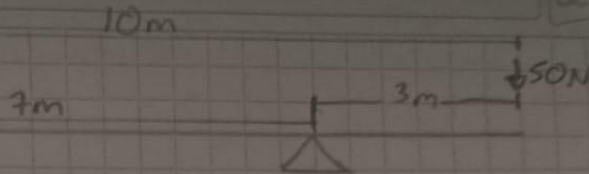
②



Solución.

①

F_1 ?



$$T=0; T = F_1 x_1 - F_2 x_2 = 0 \rightarrow 0 = (F_1)(7m) - (50N)(3m)$$

$$F_1 = \frac{150N}{7m} \rightarrow \boxed{F_1 = 21,42N}$$

La fuerza a aplicar en el extremo izquierdo es de 21,42N.

②

$$B = \frac{(X_1 \cdot F_1) + (X_w \cdot F_w) + (X_2 \cdot F_2)}{x_B}$$

$$F_B = \frac{(3m \cdot 300N) + (3,5m \cdot 200N) + (5m \cdot 300N)}{7m}$$

$$F_B = \frac{900N + 700N + 1500N}{7m} \rightarrow F_B = \frac{3100N}{7m}$$

$$\boxed{F_B = 442,857N}$$

$$F_A = +(F_1) + (F_w) + (F_2) - F_B \rightarrow F_A = 300N + 200N + 300N + (-442,857N)$$

$$F_A = 800N - 442,857N \rightarrow \boxed{F_A = 357,15N}$$