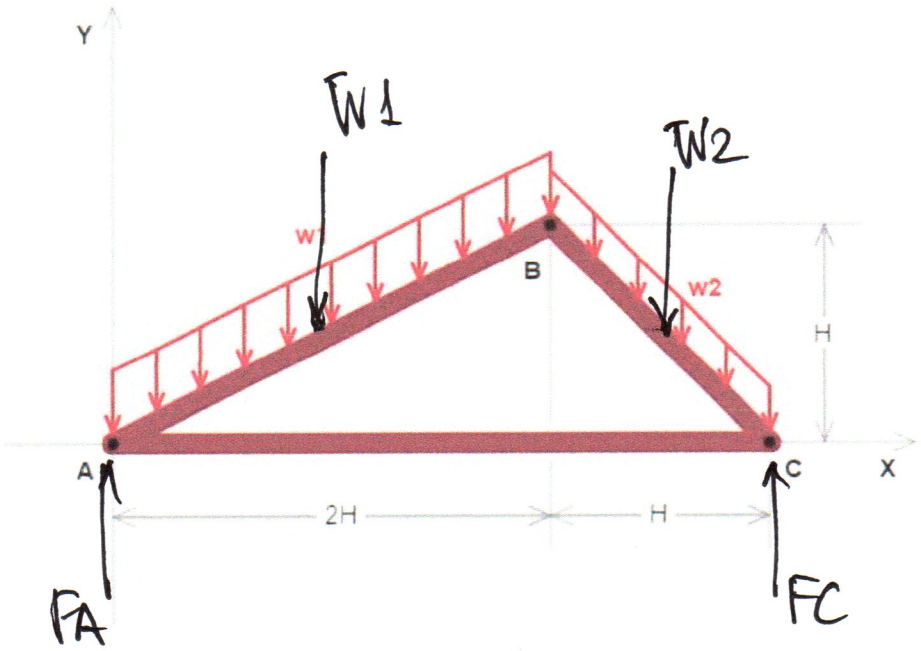
SOLUTION

ip4STATICS Worksheet for U04_P09

A rigid frame that supports a section of roof carries snow loading as shown below. w1 and w2 are equivalent weights per unit length along the frame segments.

Instance variables: loads w1 and w2 in N/m, length H in m.



Geometry

$L_{AB} = \sqrt{H^2 + 4H^2} = H\sqrt{5}$

$L_{BC} = \sqrt{H^2 + H^2} = H\sqrt{2}$

(1) What is force FA at A? (mag,deg)

(2) What is force FC at C? (mag,deg)

$W_1 = w_1 \cdot L_{AB}$

$W_2 = w_2 \cdot L_{BC}$

$\Sigma F_y = 0: \quad F_A + F_C = W_1 + W_2$

$\Sigma M_A = 0: \quad W_1 \cdot \left(\frac{2H}{2}\right) + W_2\left(2H + \frac{H}{2}\right) = F_C \cdot (3H)$

(2) so $|F_C| = \frac{W_1}{3} + \left(\frac{5}{6}\right)W_2$; $\angle F_C = 90^\circ$

(1) $|F_A| = \frac{2}{3}W_1 + \frac{1}{6}W_2$; $\angle F_A = 90^\circ$