

Static Problems Worksheet **Answers**

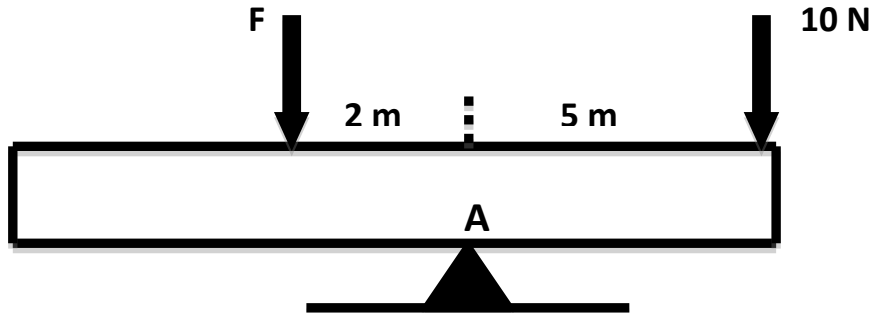
Equilibrium Equations:

$$\Sigma F_x = 0 \quad (1)$$

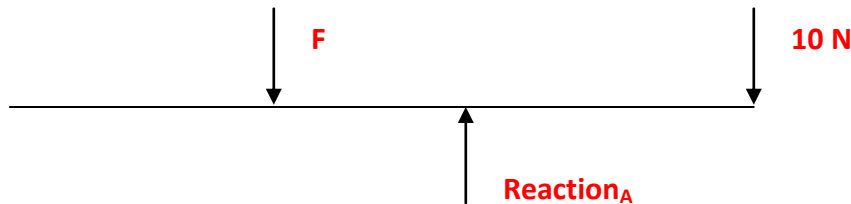
$$\Sigma F_y = 0 \quad (2)$$

$$\Sigma M = 0 \quad (3)$$

1. Determine force F and the reaction force R_A that satisfy the equilibrium equations for the following beam:



- Step 1. Draw a free-body diagram of the beam:



- Step 2. Using Equation (3), determine the force F :

$$\Sigma M_A = F \cdot 2 - 10 \cdot 5 = 0$$

$$2F = 50$$

$$F = 25 \text{ N}$$

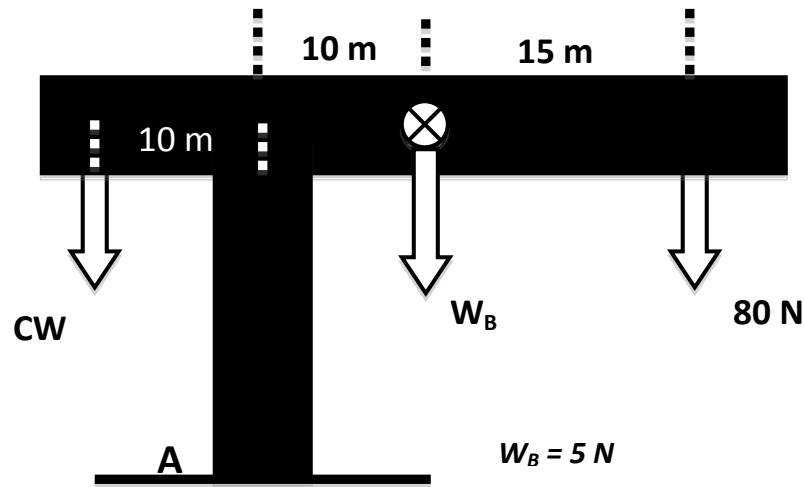
- Step 3. Using Equation (2), determine the force R_A :

$$\Sigma F_y = R_A - F - 10 = 0$$

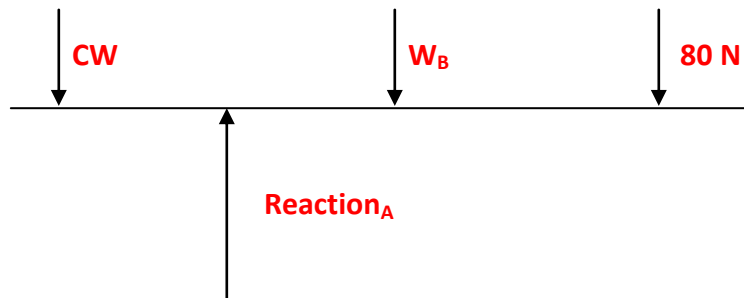
$$R_A = F + 10$$

$$R_A = 35 \text{ N}$$

2. Given the diagram below, determine the load CW and R_A :



Step 1. Draw a free-body diagram of the entire crane:



Step 2. Using Equation (3), determine the force CW:

$$\begin{aligned}\Sigma M_A &= CW \cdot 10 - W_B \cdot 10 - 80 \cdot 25 = 0 \\ 10CW &= 10 \cdot 5 + 80 \cdot 25 \\ CW &= 205\text{ N}\end{aligned}$$

Step 3. Using Equation (2), determine the force R_A :

$$\begin{aligned}\Sigma F_y &= R_A - CW - W_B - 80 = 0 \\ R_A &= CW + W_B + 80 \\ R_A &= 290\text{ N}\end{aligned}$$