Example 3.13

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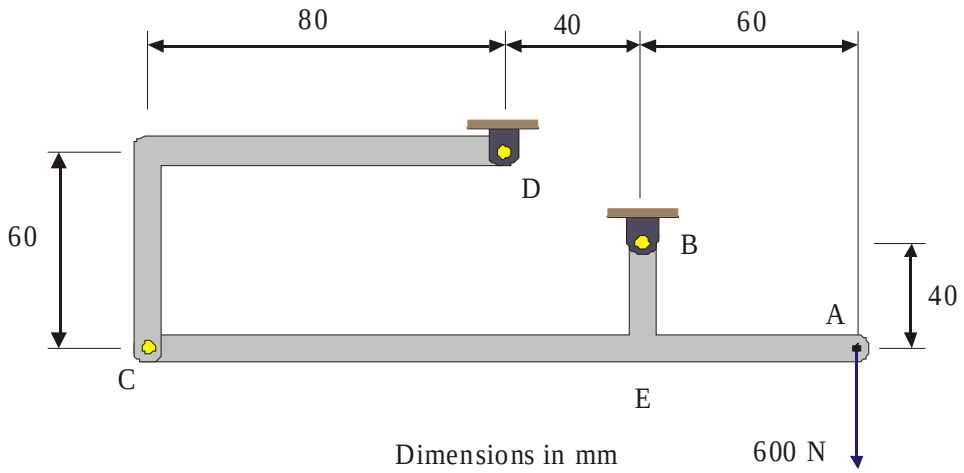
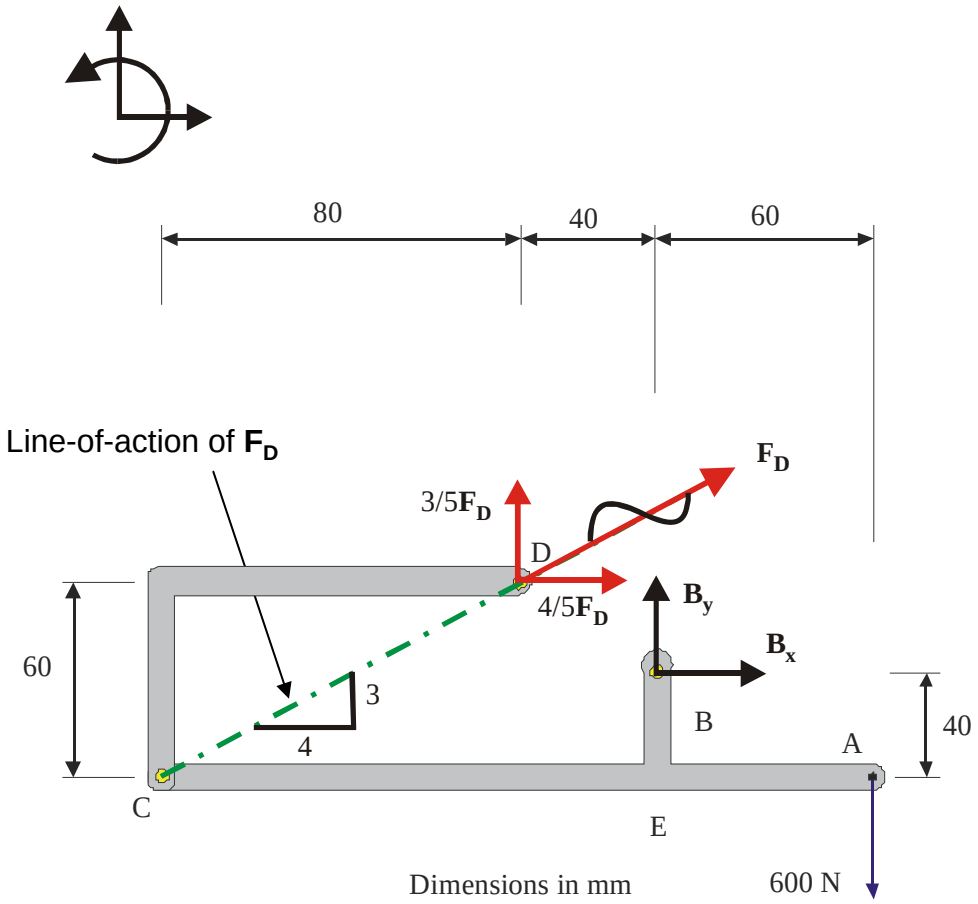
Example 3.13:
Determine the reactions at B and D considering CD as a two-force member.



Member CD is a 2-Force member since it has a pin at either end and no other forces applied to the member between the two pins.

The reaction at external support D can be represented by a single force with a line-of-action directed along the line joining C and D

We replace $\mathbf{F_D}$ with its components and apply the equilibrium equations:



$$\sum F_x = 0 \rightarrow$$

$$0.8F_D + B_x = 0 \quad (1)$$

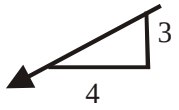
$$\sum F_y = 0 \uparrow \quad (2)$$

$$\sum M_B = 0 \circlearrowleft \quad (3)$$

$$-0.6F_D(0.04) - 0.8F_D(0.02) - 600(0.06) = 0$$

$$-0.04F_D = 36$$

$$F_D = -900\text{N}$$



$$\therefore \mathbf{F_D} = 900\text{N}$$

Substitute in (1):

$$0.8(-900) + B_x = 0$$

$$B_x = +720\text{N}$$

$$\therefore \mathbf{B_x} = 720\text{N} \rightarrow$$

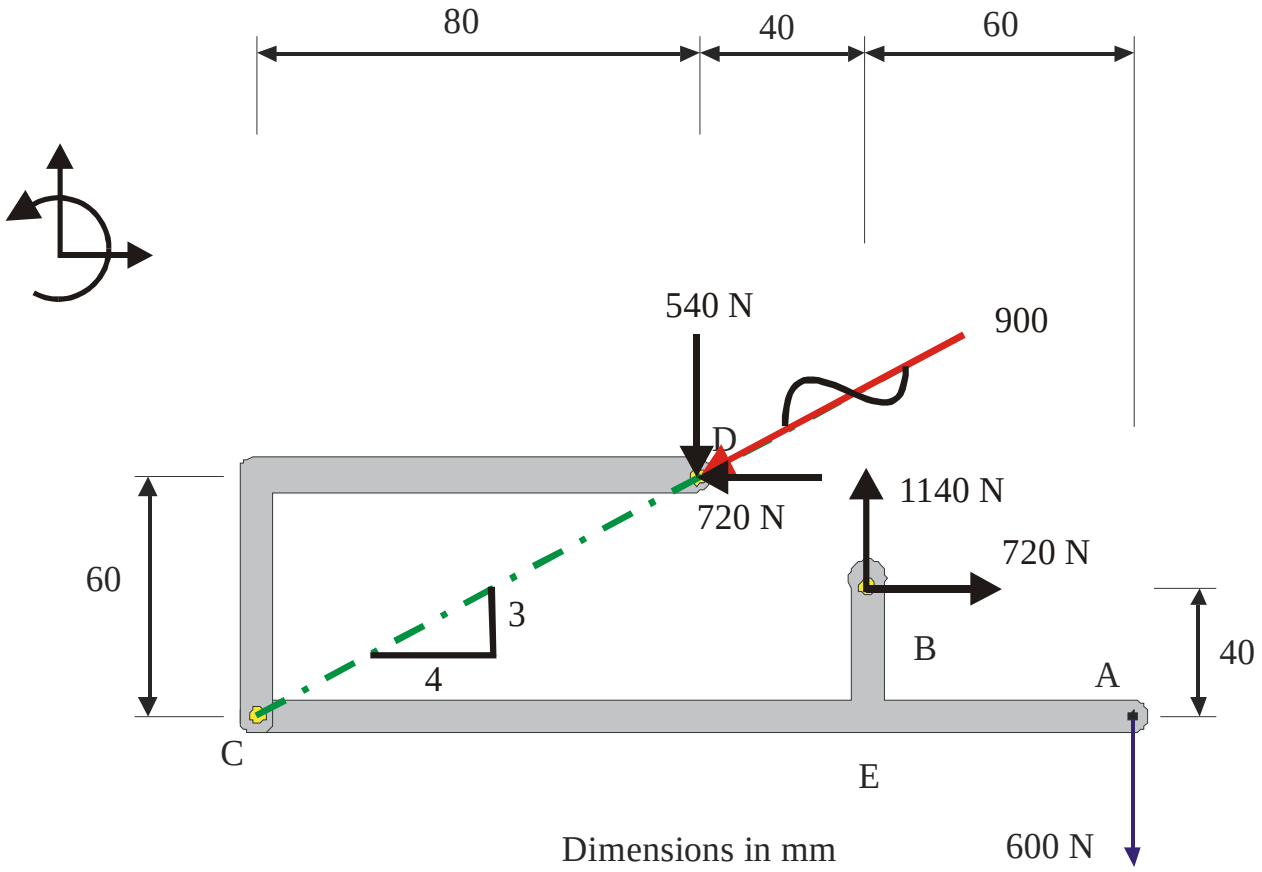
Substitute in (2):

$$0.6(-900) + B_y - 600 = 0$$

$$B_y = +1140\text{N}$$

$$\therefore \mathbf{B_y} = 1140\text{N} \uparrow$$

To check our answer we take moments about Point A.



$$\sum M_A = 0 \quad \circlearrowleft$$

$$540(0.1) + 720(0.06) - 1140(0.06) - 720(0.04) = 0$$

$$0 = 0 \quad \text{Checks!!!!}$$