# Example 3.5

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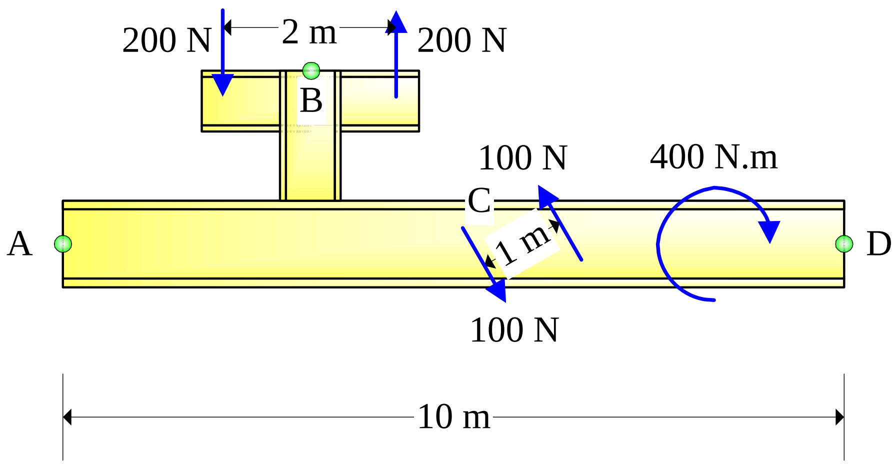
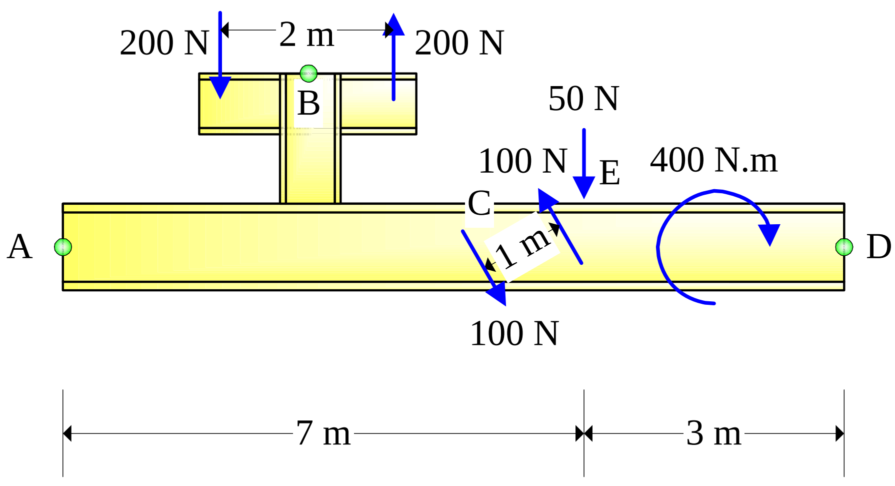
# Example 3.5:

Find the equivalent force-couple system at point A.

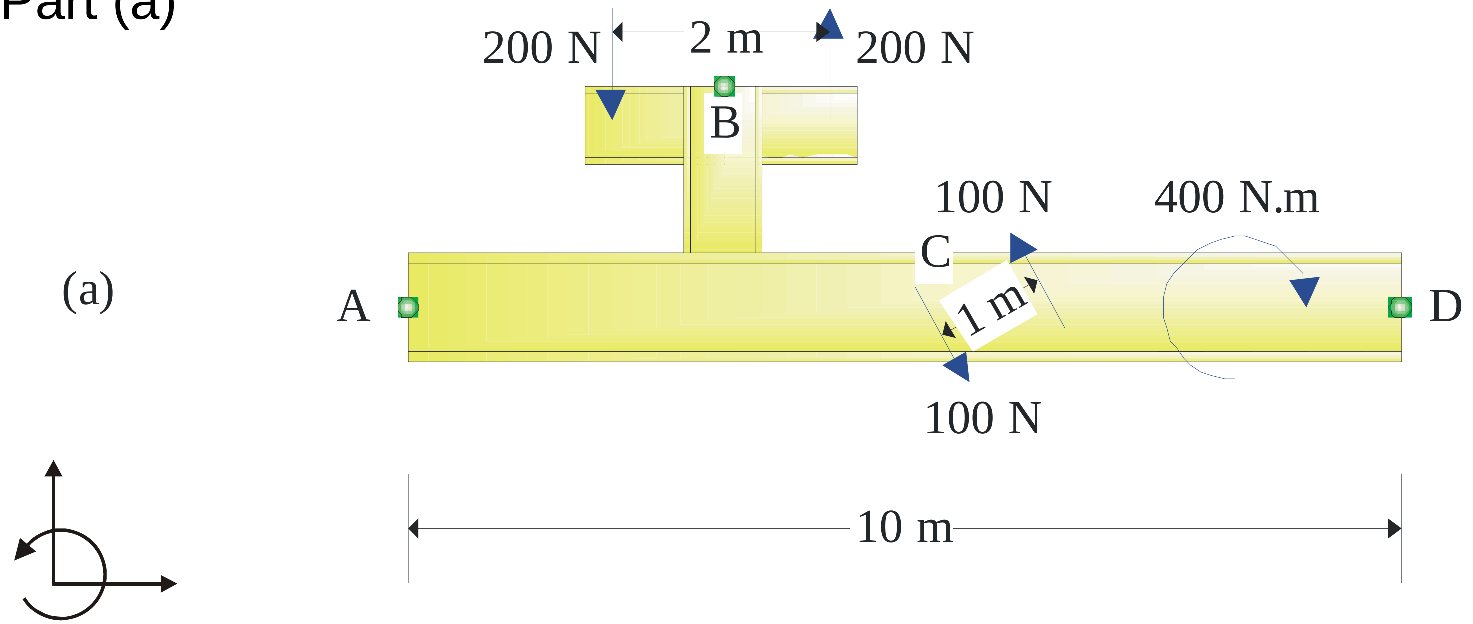
(a)




(b)



Part (a)




$$R_x = \sum F_x = 0$$

$$R_y = \sum F_y = 0$$

Since there are only couples applied to the rigid body, both $R_x$ and $R_y$ =0.

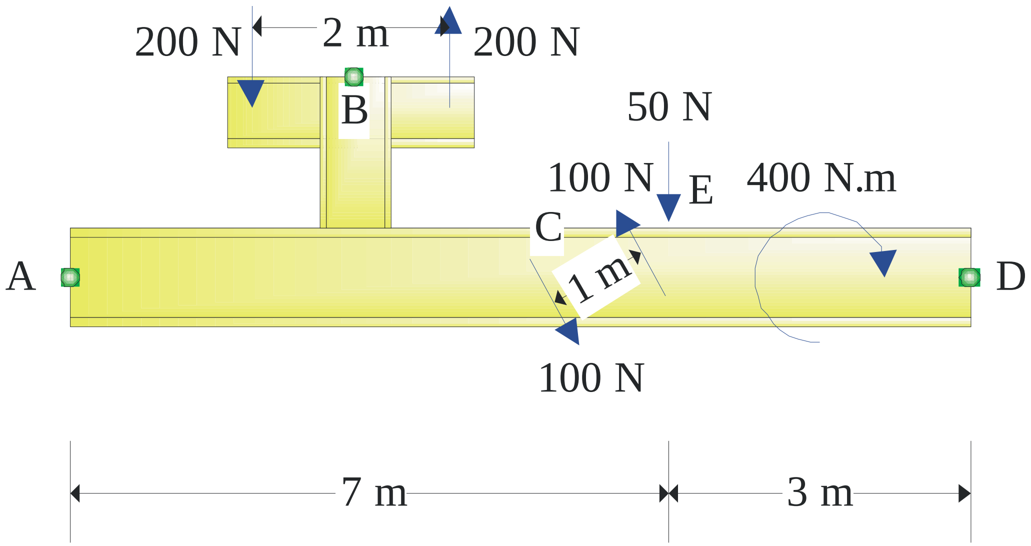
$$M_{RA} = +200(2) + 100(1) - 400 = +100\text{N.m}$$

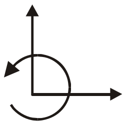
$$\therefore \mathbf{M_{RA}} = 100\text{N.m}$$

The couple-moment $\mathbf{M_{RA}}$ is a “Free vector”. Since $\mathbf{R_x}$ and $\mathbf{R_y}$ = 0, the Equivalent Force-Couple will be $\mathbf{M_{RA}}$ at any point on the rigid body.

# Part (b)

(b)



$$R_x = \sum F_x = 0$$

$$R_y = \sum F_y = -50$$

Note that $R_y$ is no longer equal to 0.

$$\therefore \mathbf{R_y} = 50\text{N} \downarrow$$

$$M_{RA} = +200(2) + 100(1) - 400 - 50(7) = -250\text{N.m}$$

$$\therefore \mathbf{M_{RA}} = 250\text{N.m}$$

# For part (b) – Equivalent Force-Couple at A:

We have moved the 3 couples and the 50 N force applied at E to A. The couples are “free vectors” and the couple-moment is independent of location. However, when we move the 50 N force from E to A, we MUST add into the system the moment that it has about A!!!

We are left with the Equivalent Force-Couple at A shown below: