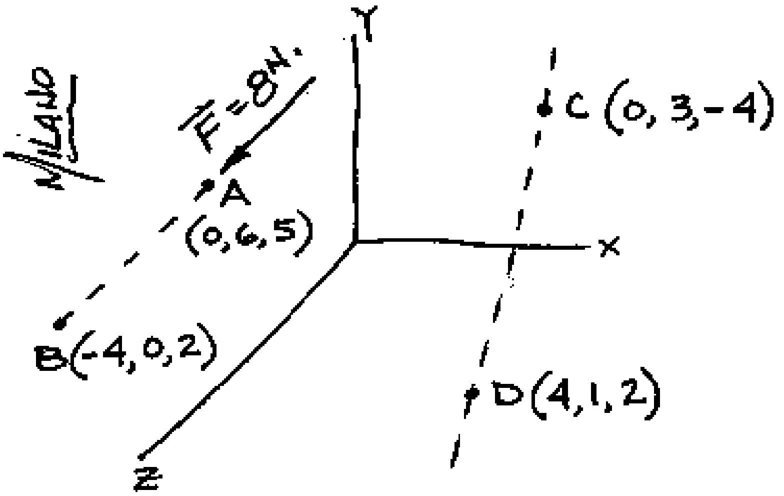
MOMENT OF A FORCE ABOUT A LINE

$$\vec{M}_{line} = \left(\vec{M}_{pt.} \cdot \lambda_{line}\right)\lambda_{line} = \left[(\vec{r} \times \vec{F}) \cdot \lambda\right]\lambda$$

where λ = UNIT VECTOR in the direction of the Line



Determine the moment of the 8N. force about Line $\overline{CD}$.

To find $\vec{M}_{line\ \overline{CD}}$, you need the moment with respect to any point on the line such as pt. C or pt. D.

Using pt. C as the "pivot", $\vec{M}_C = \vec{r}_{CA} \times \vec{F}_A$

- moment arm or radial distance:

$\vec{r}_{CA}$ = distance from pt. C to pt. A = (pt. A) − (pt. C)

$$\begin{array}{lr} \text{end pt. A,} & (0\hat{i} + 6\hat{j} + 5\hat{k}) \\ -\ \text{start pt. C,} & -(0\hat{i} + 3\hat{j} - 4\hat{k}) \\ \hline & 3\hat{j} + 9\hat{k} \end{array}$$

$\therefore \boxed{\vec{r}_{CA} = 3\hat{j} + 9\hat{k}}$

Now determine the "position" of the FORCE along its "LINE of ACTION" from A to B.

$$\begin{array}{lr} \text{end pt. B,} & (-4\hat{i} + 0\hat{j} + 2\hat{k}) \\ -\ \text{start pt. A,} & -(0\hat{i} + 6\hat{j} + 5\hat{k}) \\ \hline \overline{AB} = & -4\hat{i} - 6\hat{j} - 3\hat{k} \end{array}$$

$\therefore \sqrt{4^2 + 6^2 + 3^2} = 7.81$

Position Vector, $\lambda_{AB} = \frac{-4}{7.81}\hat{i} - \frac{6}{7.81}\hat{j} - \frac{3}{7.81}\hat{k}$

$= -0.512\hat{i} - 0.768\hat{j} - 0.384\hat{k}$