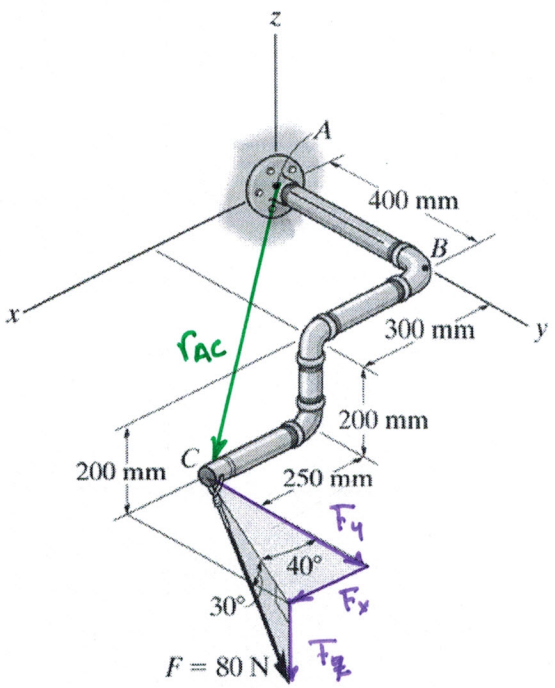
The pipe assembly is subjected to a force **F** of magnitude 80N. Determine the moment of this force about point *A*.



$M_A = r_{AC} \times F$

Position vector r_{AC}

$r_{AC} = \{0.55\,\hat{i} + 0.4\,\hat{j} - 0.2\,\hat{k}\}$ m

Resolve force F

$F = \|F\| u_F$

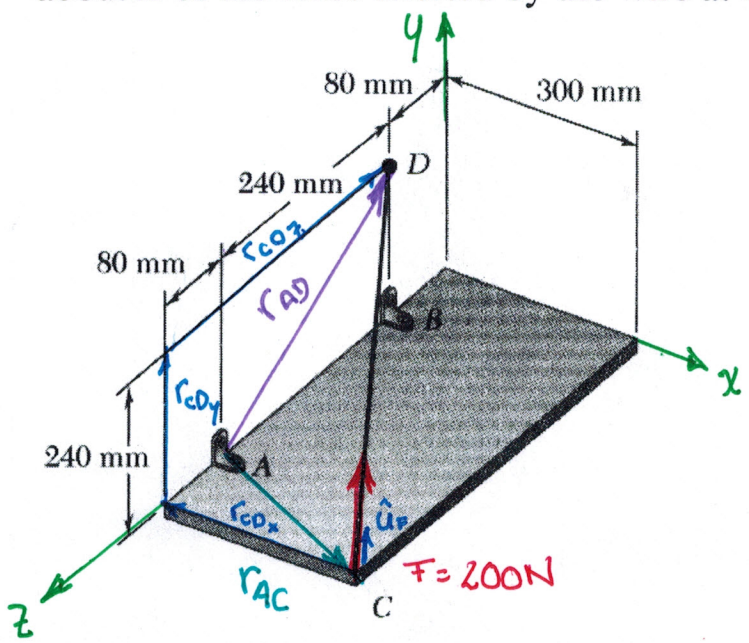
$= 80\{\cos 30 \sin 40\,\hat{i} + \cos 30 \cos 40\,\hat{j} - \sin 30\,\hat{k}\}$

$= \{44.53\,\hat{i} + 53.07\,\hat{j} - 40\,\hat{k}\}$ N

$$M_A = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0.55 & 0.4 & -0.2 \\ 44.53 & 53.07 & -40 \end{vmatrix} = (0.4(-40) - 53.07(-0.2))\,\hat{i} - (0.55(-40) - 44.53(-0.2))\,\hat{j} + (0.55(53.07) - 44.53(0.4))\,\hat{k}$$

$M_A = \{-5.386\,\hat{i} + 13.094\,\hat{j} + 11.377\,\hat{k}\}$ N·m

The rectangular plate is supported by the brackets at A and B and by a wire CD. Knowing that the tension in the wire is 200 N, determine the moment about A of the force exerted by the wire at C.



$M_A = r \times F$

Resolve force F

$\vec{F} = \|F\| u_F$

$u_F = \dfrac{r_{CD}}{\|r_{CD}\|}$

$r_{CD} = \{-0.3i + 0.24j - 0.32k\}$ m

$\|r_{CD}\| = \sqrt{(-0.3)^2 + 0.24^2 + (-0.32)^2} = 0.5$

$u_F = \{-0.6i + 0.48j - 0.64k\}$

$\vec{F} = \|F\| u_F = 200\{-0.6i + 0.48j - 0.64k\} = \{-120i + 96j - 128k\}$ N

$M_A = r_{AC} \times F$ $\qquad r_{AC} = \{0.3i + 0\hat{j} + 0.08\hat{k}\}$

$$M_A = \begin{vmatrix} i & j & k \\ 0.3 & 0 & 0.08 \\ -120 & 96 & -128 \end{vmatrix} = (-96(0.08)i - ((0.3)(-128) - (-120)(0.08))j + 0.3(96)k)$$

$M_A = \{-7.68i + 28.8j + 28.8k\}$ N·m

$M_A = r_{AD} \times F$ $\qquad r_{AD} = \{0\hat{i} + 0.24\hat{j} - 0.24\hat{k}\}$ m

$$M_A = \begin{vmatrix} i & j & k \\ 0 & 0.24 & -0.24 \\ -120 & 96 & -128 \end{vmatrix} = (0.24(-128) - 96(-0.24))i - (0(-128) - (-120)(-0.24))$$

$(0(96) - (-120)(0.24))\hat{k}$

$M_A = \{-7.68\hat{i} + 28.8\hat{j} + 28.8\hat{k}\}$ N·m