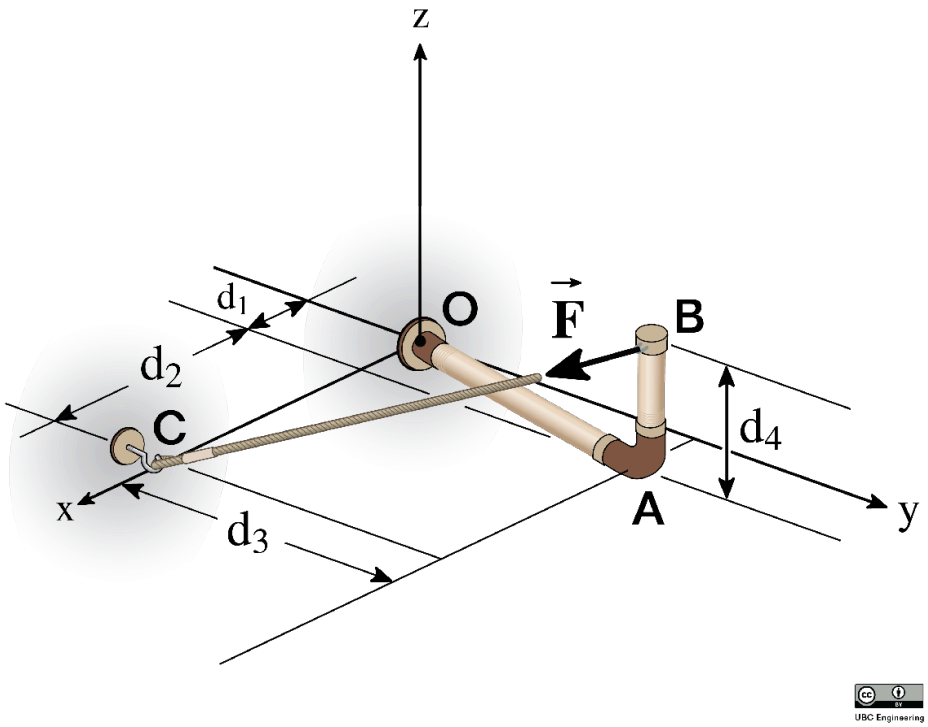
21-S-2.9-RP-01



A rope is attached to a pipe as shown above.

Calculate the angle θ (in DEGREES) between $\overrightarrow{BC}$ and $\overrightarrow{OA}$.

$\overrightarrow{BC} = < d_2, -d_3, -d_4 >$

$\overrightarrow{OA} = < d_1, d_3, 0 >$

$$\theta = \arccos\left(\frac{\overrightarrow{BC} \cdot \overrightarrow{OA}}{||\overrightarrow{BC}||\,||\overrightarrow{OA}||}\right) = \arccos\left(\frac{d_2 d_1 - {d_3}^2}{\sqrt{{d_2}^2 + {d_3}^2 + {d_4}^2}\,\sqrt{{d_1}^2 + {d_3}^2}}\right)$$

Find the vector projection of $\vec{F}$ along the OA member ($Proj_{\overrightarrow{OA}}\vec{F}$).

$$Proj_{\overrightarrow{OA}}\vec{F} = ||\vec{F}||\cos(\theta)\frac{\overrightarrow{OA}}{||\overrightarrow{OA}||}$$