



A rope is attached to a pipe as shown above.

Find vectors \overrightarrow{BC} and \overrightarrow{AO} as well as their magnitudes.

$$\overrightarrow{BC} = \langle d_2, -d_3, -d_4 \rangle$$

$$\overrightarrow{AO} = \langle -d_1, -d_3, 0 \rangle$$

$$||\overrightarrow{BC}|| = \sqrt{d_2^2 + d_3^2 + d_4^2}$$

$$||\overrightarrow{AO}|| = \sqrt{d_1^2 + d_3^2}$$

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

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

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

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