$\vec{V} = \vec{P} \times \vec{Q}$ $\quad V = PQ \sin\theta$

$\vec{Q} \times \vec{P} = -(\vec{P} \times \vec{Q})$

Distributive

$\vec{P} \times (\vec{Q}_1 + \vec{Q}_2) = \vec{P} \times \vec{Q}_1 + \vec{P} \times \vec{Q}_2$

$\vec{V} = \vec{P} \times \vec{Q} = (P_x i + P_y j + P_z k) \times (Q_x i + Q_y j + Q_z k)$

$= P_x i \times Q_x i + P_x i \times Q_y j + \cdots$

$= (P_y Q_z - P_z Q_y) i + (P_z Q_x - P_x Q_z) j + (P_x Q_y - P_y Q_x) k$

$$\vec{V} = \vec{P} \times \vec{Q} = \begin{vmatrix} i & j & k \\ P_x & P_y & P_z \\ Q_x & Q_y & Q_z \end{vmatrix} \begin{matrix} i & j \\ P_x & P_y \\ Q_x & Q_y \end{matrix} = P_y Q_z i - P_z Q_y i + \cdots$$

$\vec{M}_o = \vec{r} \times \vec{F}$ $\quad M_o = rF \sin\theta = Fd$

horizontal

y

x

$\vec{F} = 50 i$

$\vec{r} = 5 \cos 60\, i + 5 \sin 60\, j$

$= 2.5 i + 4.33 j$

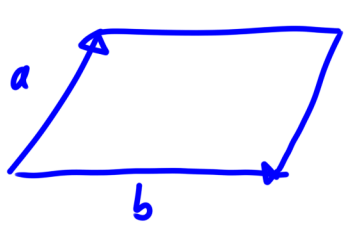
$$\vec{M}_o = \begin{vmatrix} i & j & k \\ 2.5 & 4.33 & 0 \\ 50 & 0 & 0 \end{vmatrix} \begin{matrix} i & j \\ 2.5 & 4.33 \\ 50 & 0 \end{matrix} = -50(4.33) k$$

$= -217 k$ lb-in

$\theta = 120°$ ✓

$M_o = 5(50) \sin 120 = 217$ lb-in

Area



$\vec{A} = \vec{a} \times \vec{b}$