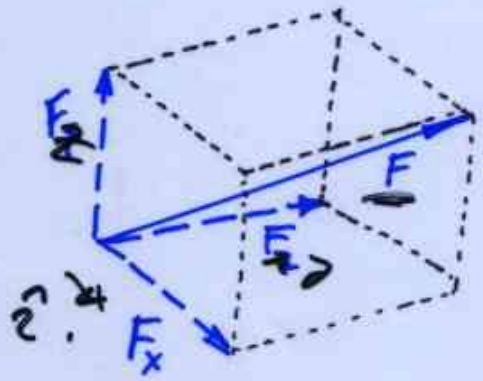
3-Dimensional Cases: Force

Important to be careful & to use components.
DIFFICULT TO DRAW.

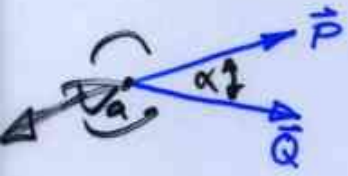
$\vec{F} = \|F\|(l\hat{i} + m\hat{j} + n\hat{k})$ where $l^2 + m^2 + n^2 = 1$

$\equiv F_x\hat{i} + F_y\hat{j} + F_z\hat{k}$



Dot Product:

$\vec{P}\cdot\vec{Q} = \|P\|\,\|Q\|\cos\alpha$



Note VECTORS ORIGINATE at same point for finding α.

Also note: $F_x = \vec{F}\cdot\hat{i}$, $F_y = \vec{F}\cdot\hat{j}$, $F_z = \vec{F}\cdot\hat{k}$ Projection onto axes

Angle between vectors:

$$\alpha = \cos^{-1}\left(\frac{\vec{P}\cdot\vec{Q}}{\|P\|\,\|Q\|}\right)$$ ... inverse cosine

if $\vec{P}\cdot\vec{Q} = 0 \Rightarrow \vec{P} \perp \vec{Q}$ (assuming $\|P\| \neq 0$ & $\|Q\| \neq 0$)

$\vec{F_1}\cdot\vec{F_2}$

$F_{1x}F_{2x} + F_{1y}F_{2y} + F_{1z}F_{2z}$