



Philadelphia University

Faculty of Engineering

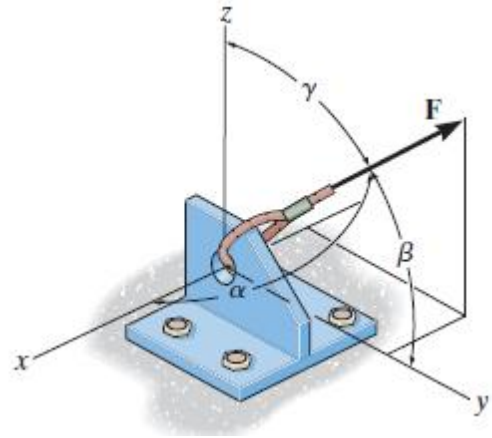
Mech. Engineering Department

Statics(620211)

Quiz:1-C.1<sup>st</sup> sem. 2014/15

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If the force  $F=400\text{ N}$   $\beta=60^\circ$ , and  $\gamma=45^\circ$ , determine  $x$ ,  $y$ ,  $z$  component of  $F$ .



$$\begin{aligned}\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma &= 1 \\ \cos^2 \alpha + \cos^2 60^\circ + \cos^2 45^\circ &= 1 \\ \cos \alpha &= \pm 0.5\end{aligned}$$

Since  $F$  is in the octant shown in Fig.  $\alpha$ ,  $\theta_x$  must be greater than  $90^\circ$ . Thus,

$$\alpha = \cos^{-1}(-0.5) = 120^\circ.$$

**Rectangular Components:** By referring to Fig.  $\alpha$ , the  $x$ ,  $y$ , and  $z$  components of  $F$  can be written as

$$F_x = F \cos \alpha = 400 \cos 120^\circ = -200\text{ N} \quad \text{Ans.}$$

$$F_y = F \cos \beta = 400 \cos 60^\circ = 200\text{ N} \quad \text{Ans.}$$

$$F_z = F \cos \gamma = 400 \cos 45^\circ = 283\text{ N} \quad \text{Ans.}$$

