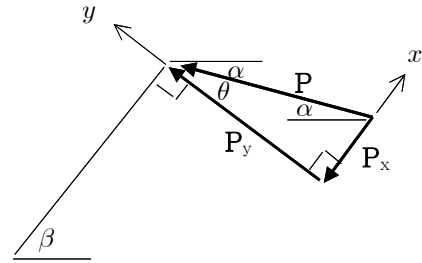


[2.7~8절]

2.30 [힘의 직각성분]

$$\begin{aligned}
 P_y &= 600 \text{ N}, \quad \alpha = 30^\circ, \quad \beta = 45^\circ, \\
 \theta + \alpha &= 90^\circ - \beta \\
 \Rightarrow \theta &= 90^\circ - \beta - \alpha \\
 &= 90^\circ - 45^\circ - 30^\circ = 15^\circ
 \end{aligned}$$



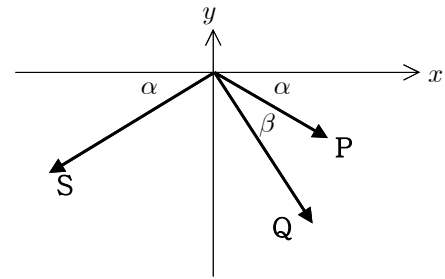
(a) $P_y = P \cos\theta$

$$\Rightarrow P = \frac{P_y}{\cos\theta} = \frac{600 \text{ N}}{\cos 15^\circ} = 621.2 \text{ N} \quad \Rightarrow \quad P = 621 \text{ N}$$

(b) $P_x = P_y \tan\theta = (600 \text{ N}) \tan 15^\circ = 160.77 \text{ N} \quad \Rightarrow \quad P_x = 160.8 \text{ N}$

2.39 [직각성분 합에 의한 힘의 합성]

$$\begin{aligned}
 P &= 100 \text{ N}, \quad Q = 150 \text{ N}, \quad S = 200 \text{ N} \\
 \beta &= 30^\circ, \\
 \gamma &= \alpha + \beta
 \end{aligned}$$



(a) **R** is vertical $\Rightarrow R_x = 0$

$$\begin{aligned}
 R_x &= P_x + Q_x + S_x \\
 &= P \cos\alpha + Q \cos\gamma - S \cos\alpha \\
 &\quad \leftarrow \cos\gamma = \cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta \\
 &= P \cos\alpha + Q (\cos\alpha \cos\beta - \sin\alpha \sin\beta) - S \cos\alpha = 0 \\
 \Rightarrow (P + Q \cos\beta - S) \cos\alpha &= Q \sin\beta \sin\alpha \\
 \Rightarrow \tan\alpha &= \frac{P + Q \cos\beta - S}{Q \sin\beta} = \frac{P + Q \cos\beta - S}{Q \sin\beta} \\
 &= \frac{(100 \text{ N}) + (150 \text{ N}) \cos 30^\circ - (200 \text{ N})}{(150 \text{ N}) \sin 30^\circ} = 0.3987 \\
 \Rightarrow \alpha &= \tan^{-1}(0.3987) = 21.73^\circ \quad \Rightarrow \quad \alpha = 21.7^\circ
 \end{aligned}$$

(b) $\gamma = \alpha + \beta = 21.73^\circ + 30^\circ = 51.73^\circ$

$$\begin{aligned}
 R_y &= P_y + Q_y + S_y \\
 &= -P \sin\alpha - Q \sin\gamma - S \sin\alpha \\
 &= -(100 \text{ N}) \sin 21.73^\circ - (150 \text{ N}) \sin 51.73^\circ - (200 \text{ N}) \sin 21.73^\circ \\
 &= -(37.02 \text{ N}) - (117.77 \text{ N}) - (74.05 \text{ N}) = -228.84 \text{ N} \\
 \mathbf{R} &= 229 \text{ N} \downarrow \quad \Rightarrow \quad R = 229 \text{ N}
 \end{aligned}$$