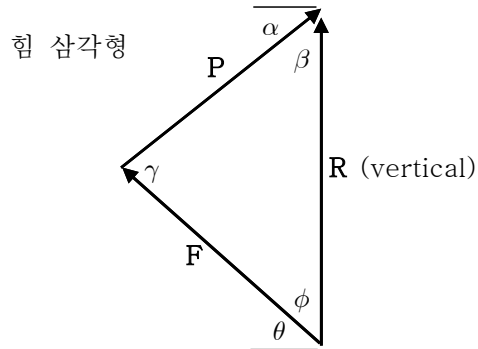
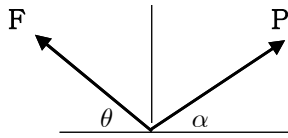


[2.1~6절]

2.11 [힘의 합성, 삼각법]



$F = 425 \text{ N}, \quad \theta = 30^\circ, \quad \alpha = 20^\circ$

$\phi = 90^\circ - \theta = 90^\circ - 30^\circ = 60^\circ$

$\beta = 90^\circ - \alpha = 90^\circ - 20^\circ = 70^\circ$

$\gamma = \theta + \alpha = 30^\circ + 20^\circ = 50^\circ$

(a) $\frac{P}{\sin\phi} = \frac{F}{\sin\beta} \Rightarrow P = F \frac{\sin\phi}{\sin\beta} = (425 \text{ N}) \frac{\sin 60^\circ}{\sin 70^\circ} = 391.7 \text{ N}$
 $\Rightarrow P = 392 \text{ N}$

(b) <방법 1>

$\frac{R}{\sin\gamma} = \frac{F}{\sin\beta} \Rightarrow R = F \frac{\sin\gamma}{\sin\beta} = (425 \text{ N}) \frac{\sin 50^\circ}{\sin 70^\circ} = 346.4 \text{ N}$
 $\Rightarrow R = 346 \text{ N}$

<방법 2>

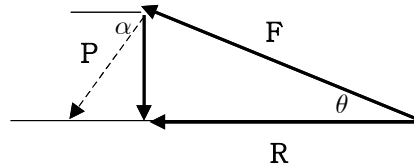
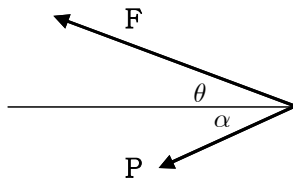
$R^2 = F^2 + P^2 - 2FP \cos\gamma$
 $= (425 \text{ N})^2 + (391.7 \text{ N})^2 - 2(425 \text{ N})(391.7 \text{ N})\cos 50^\circ = 120041.0 \text{ N}^2$
 $R = (120041.0 \text{ N}^2)^{1/2} = 346.4 \text{ N} \Rightarrow R = 346 \text{ N}$

[힘의 합성, 수평·수직성분]

(a) $F \cos\theta = P \cos\alpha \Rightarrow P = F \frac{\cos\theta}{\cos\alpha} = (425 \text{ N}) \frac{\cos 30^\circ}{\cos 20^\circ} = 391.7 \text{ N}$
 $\Rightarrow P = 392 \text{ N}$

(b) $R = F \sin\theta + P \sin\alpha = (425 \text{ N}) \sin 30^\circ + (391.7 \text{ N}) \sin 20^\circ = 346.4 \text{ N}$
 $\Rightarrow R = 346 \text{ N}$

2.14 [힘의 합성, 최소 힘]

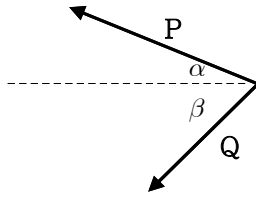


$F = 50 \text{ N}, \quad \theta = 25^\circ$

(a) R이 수평, P의 크기가 최소 $\Rightarrow \alpha = 90^\circ$
 $P = F \sin\theta = (50 \text{ N}) \sin 25^\circ = 21.13 \text{ N} \Rightarrow P = 21.1 \text{ N} \downarrow$

(b) $R = F \cos\theta = (50 \text{ N}) \cos 25^\circ = 45.32 \text{ N} \Rightarrow R = 45.3 \text{ N}$

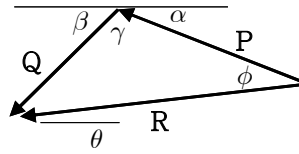
2.16 [힘의 합성, 삼각법]



$$P = 6 \text{ kN}, \quad Q = 4 \text{ kN}$$

$$\alpha = 25^\circ, \quad \beta = 50^\circ$$

힘 삼각형



$$\gamma = 180^\circ - (\alpha + \beta)$$

$$= 180^\circ - (25^\circ + 50^\circ) = 105^\circ$$

$$R^2 = P^2 + Q^2 - 2PQ \cos \gamma$$

$$= (6 \text{ kN})^2 + (4 \text{ kN})^2 - 2(6 \text{ kN})(4 \text{ kN})\cos 105^\circ = 64.4233 \text{ kN}^2$$

$$R = (64.4233 \text{ kN}^2)^{1/2} = 8.026 \text{ kN}$$

$$\frac{Q}{\sin \phi} = \frac{R}{\sin \gamma}$$

$$\sin \phi = \frac{Q}{R} \sin \gamma = \frac{4 \text{ kN}}{8.026 \text{ kN}} \sin 105^\circ = 0.4814$$

$$\phi = \sin^{-1}(0.4814) = 28.78^\circ$$

$$\theta = \phi - \alpha = 28.78^\circ - 25^\circ = 3.78^\circ$$

$$\Rightarrow \quad \mathbf{R} = 8.03 \text{ kN } \nearrow 3.8^\circ$$