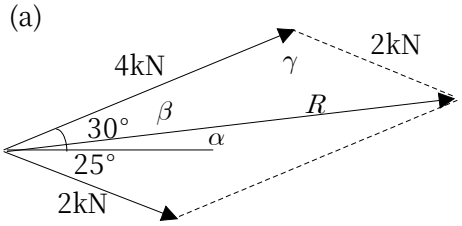
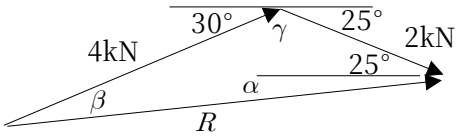
[2.1~2.6절]

2.4　(a)



(b)



$\gamma = 180° - (25° + 30°) = 125°$

[방법 1]

$R^2 = (4\ \text{kN})^2 + (2\ \text{kN})^2 - 2\,(4\ \text{kN})\,(2\ \text{kN})\cos 125° = 29.177\ (\text{kN})^2$

$\Rightarrow \quad R = 5.401\ \text{kN}$

$$\frac{\sin(25^\circ + \alpha)}{4.0\ \text{kN}} = \frac{\sin\gamma}{R} \quad \Rightarrow \quad \frac{\sin(25^\circ + \alpha)}{4.0\ \text{kN}} = \frac{\sin 125^\circ}{5.401\ \text{kN}}$$

$$\Rightarrow \quad \sin(25° + \alpha) = \frac{(4.0\ \text{kN})\sin 125^\circ}{5.401\ \text{kN}} = 0.6067$$

$\Rightarrow \quad 25° + \alpha = \sin^{-1}0.6067 = 37.34° \quad \Rightarrow \quad \alpha = 12.34°$

$\therefore \quad \mathbf{R} = 5.40\ \text{kN} \angle 12.34°$

[방법 2]

$\beta = 180° - \gamma - (25° + \alpha) = 30° - \alpha$

$$\frac{\sin\beta}{2.0\ \text{kN}} = \frac{\sin(25^\circ + \alpha)}{4.0\ \text{kN}} = \frac{\sin\gamma}{R}$$

$$\frac{\sin\beta}{2.0\ \text{kN}} = \frac{\sin(25^\circ + \alpha)}{4.0\ \text{kN}} \quad \Rightarrow \quad \frac{\sin(30^\circ - \alpha)}{2.0\ \text{kN}} = \frac{\sin(25^\circ + \alpha)}{4.0\ \text{kN}}$$

$\Rightarrow \quad \sin(30° - \alpha) = 0.5\ \sin(25° + \alpha)$

$\Rightarrow \quad \sin 30° \cos\alpha - \cos 30° \sin\alpha = 0.5\ (\sin 25° \cos\alpha + \cos 25° \sin\alpha)$

$\Rightarrow \quad (\sin 30° - 0.5\ \sin 25°)\cos\alpha = (\cos 30° + 0.5\ \cos 25°)\sin\alpha$

$$\Rightarrow \quad \tan\alpha = \frac{\sin 30^\circ - 0.5\sin 25^\circ}{\cos 30^\circ + 0.5\cos 25^\circ} = 0.2188$$

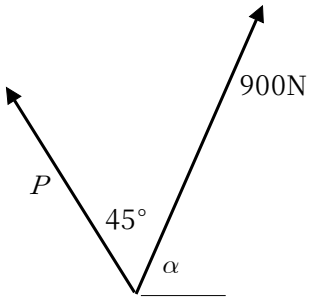
$\Rightarrow \quad \alpha = \tan^{-1}(0.2188) = 12.34°$

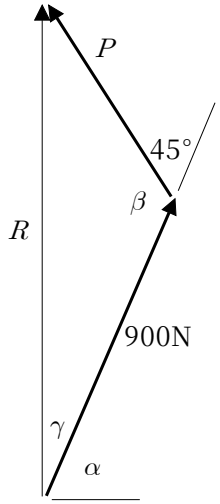
$$\frac{\sin(25^\circ + \alpha)}{4.0\ \text{kN}} = \frac{\sin\gamma}{R} \quad \Rightarrow \quad \frac{\sin(25^\circ + 12.34^\circ)}{4.0\ \text{kN}} = \frac{\sin 125^\circ}{R}$$

$$\Rightarrow \quad R = (4.0\ \text{kN})\ \frac{\sin 125^\circ}{\sin 37.34^\circ} = (4.0\ \text{kN})\ (1.351) = 5.402\ \text{kN}$$

$\therefore \quad \mathbf{R} = 5.40\ \text{kN} \angle 12.34°$

2.7 P = 600 N





β = 180° - 45° = 135°

(b) $R^2 = P^2 + (900\ \text{N})^2 - 2\ P\ (900\ \text{N})\cos\beta$

$= (600\ \text{N})^2 + (900\ \text{N})^2 - 2\ (600\ \text{N})\ (900\ \text{N})\cos135°$

$= 1{,}933{,}675\ \text{N}^2$

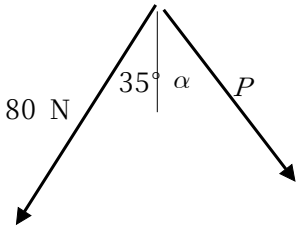
$\Rightarrow \quad R = 1391\ \text{N} \quad \Rightarrow \quad R = 1.391\ \text{kN}$

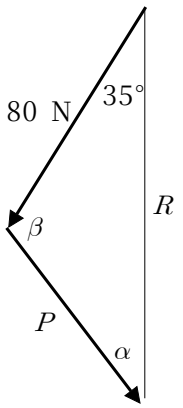
(a) $\dfrac{\sin\beta}{R} = \dfrac{\sin\gamma}{P} \quad \Rightarrow \quad \sin\gamma = \dfrac{P}{R}\sin\beta = \dfrac{600\ \text{N}}{1391\ \text{N}}\sin135° = 0.3051$

$\gamma = \sin^{-1}(0.3051) = 17.76°$

$\alpha = 90° - \gamma = 90° - 17.76° = 72.24° \quad \Rightarrow \quad \alpha = 72.2°$

2.11 α = 25°





β = 180° - 35° - 25° = 120°

$\dfrac{\sin35^\circ}{P} = \dfrac{\sin\alpha}{80\ \text{N}} = \dfrac{\sin\beta}{R}$

(a) $\dfrac{\sin35^\circ}{P} = \dfrac{\sin\alpha}{80\ \text{N}} \quad \Rightarrow \quad P = (80\ \text{N})\ \dfrac{\sin35^\circ}{\sin25^\circ} = 108.6\ \text{N}$

(b) $\dfrac{\sin\alpha}{80\ \text{N}} = \dfrac{\sin\beta}{R} \quad \Rightarrow \quad R = (80\ \text{N})\ \dfrac{\sin120^\circ}{\sin25^\circ} = 163.9\ \text{N}$