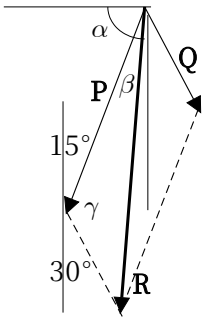
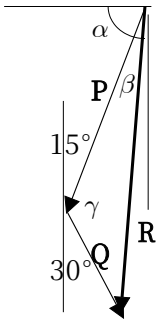
{2.1~6절}

2.2　(a) parallelogram　　(b) triangle





P = 45 N,　　Q = 15 N,　　γ = 180° - (15°+30°) = 135°

magnitude

$R^2 = P^2 + Q^2 - 2\,P\,Q\cos\gamma$　　[아는 각도 값이 하나뿐이므로 cosine공식 사용]

$= (45\text{ N})^2 + (15\text{ N})^2 - 2\,(45\text{ N})\,(15\text{ N})\cos135° = 3204.6\text{ N}^2$

$\Rightarrow \quad R$ = 56.61 N

direction

<방법 1 : sine공식 사용>

$\dfrac{Q}{\sin\beta} = \dfrac{R}{\sin\gamma} \quad \Rightarrow \quad \sin\beta = \dfrac{Q}{R}\sin\gamma = \dfrac{15\text{ N}}{56.61\text{ N}}\sin135° = 0.18736$

$\beta = \sin^{-1}(0.18736) = 10.799°$

$\alpha = (90° - 15°) + \beta = 75° + 10.80° = 85.8°$

<방법 2 : cosine공식 사용>

$Q^2 = P^2 + R^2 - 2\,P\,R\cos\beta$

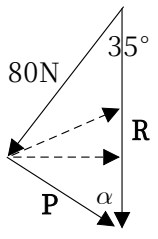
$\Rightarrow \quad \cos\beta = \dfrac{P^2 + R^2 - Q^2}{2\,P\,R} = \dfrac{(45\text{ N})^2 + (56.61\text{ N})^2 - (15\text{ N})^2}{2\,(45\text{ N})\,(56.61\text{ N})} = 0.9823$

$\beta = \cos^{-1}(0.9823) = 10.798°$

$\alpha = (90° - 15°) + \beta = 75° + 10.80° = 85.8°$

$\Rightarrow \quad$ **R** = 56.6 N ↙85.8°

2.13 (a) <방법 1> [Sample Problem 2.2 참고]



Force **P** is the smallest when α = 90°.

P = (80 N) sin35° = 45.89 N

<방법 2> sine공식

$\dfrac{80\text{ N}}{\sin\alpha} = \dfrac{P}{\sin35°} \quad \Rightarrow \quad P = (80\text{ N})\dfrac{\sin35°}{\sin\alpha}$

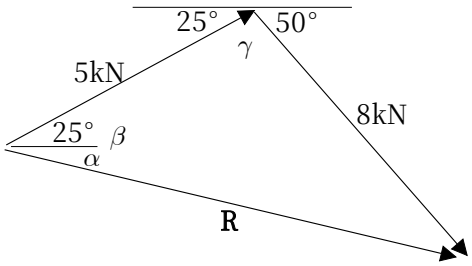
Force **P** is the smallest when $\sin\alpha$ is maximum, $\sin\alpha$ = 1　⇒　α = 90°

P = (80 N) sin35° = 45.89 N

$\Rightarrow$　**P** = 45.9 N →

(b)　R = (80 N) cos35° = 65.53 N　　⇒　　R = 65.5 N

2.17



$\gamma = 180° - (25°+50°) = 105°$

magnitude [아는 각도 값이 하나뿐이므로 cosine공식 사용]

$R^2 = (5\ \text{kN})^2 + (8\ \text{kN})^2 - 2\,(5\ \text{kN})\,(8\ \text{kN})\cos 105° = 109.71\ \text{kN}^2$

$\Rightarrow \quad R = 10.474\ \text{kN}$

direction

<방법 1 : sine공식 사용>

$\frac{8\ \text{kN}}{\sin\beta} = \frac{R}{\sin\gamma} \quad \Rightarrow \quad \sin\beta = \frac{8\ \text{kN}}{R}\sin\gamma = \frac{8\ \text{kN}}{10.474\ \text{kN}}\sin 105° = 0.7378$

$\beta = \sin^{-1}(0.7378) = 47.54°$

$\alpha = \beta - 25° = 47.54° - 25° = 22.54°$

<방법 2 : cosine공식 사용>

$(8\ \text{kN})^2 = (5\ \text{kN})^2 + R^2 - 2\,(5\ \text{kN})\,R\cos\beta$

$\Rightarrow \quad \cos\beta = \frac{(5\ \text{kN})^2 + R^2 - (8\ \text{kN})^2}{2\,(5\ \text{kN})\,R} = \frac{(5\ \text{kN})^2 + (10.474\ \text{kN})^2 - (8\ \text{kN})^2}{2\,(5\ \text{kN})\,(10.474\ \text{kN})} = 0.6750$

$\beta = \cos^{-1}(0.6750) = 47.54°$

$\alpha = \beta - 25° = 47.54° - 25° = 22.54°$

$\Rightarrow \quad \mathbf{R} = 10.47\ \text{kN}\ \overline{\searrow} 22.5°$