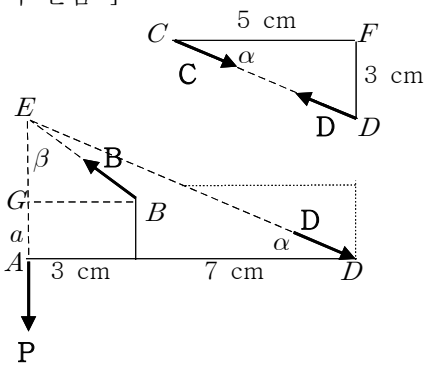
[4.6~4.7절]

4.68 [세 힘이 작용하는 강체의 평형, 세 힘의 작용선이 한 점에서 만남]



P = 50 N, a = 1.5 cm

$\triangle CDF$; $\tan\alpha = \dfrac{DF}{CF} = \dfrac{3}{5} = 0.6$

$\Rightarrow \quad \alpha = \tan^{-1}(0.6) = 30.96°$

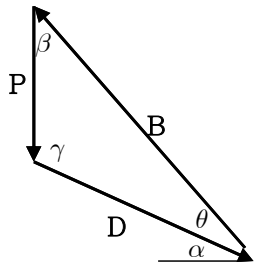
$\triangle ADE$; $\tan\alpha = \dfrac{AE}{AD}$

$\Rightarrow \quad AE = AD \tan\alpha = (3+7\ \text{cm})\ (0.6) = 6.0\ \text{cm}$

$EG = AE - AG = (6.0-1.5\ \text{cm}) = 4.5\ \text{cm}$

$\triangle BEG$; $\tan\beta = \dfrac{BG}{EG} = \dfrac{3}{4.5} = 0.6667$

$\Rightarrow \quad \beta = \tan^{-1}(0.6667) = 33.69°$



$\gamma = 90° + \alpha = 90° + 30.96° = 120.96°$

$\theta = 180° - \beta - \gamma = 180° - 33.69° - 120.96° = 25.35°$

$\dfrac{B}{\sin\gamma} = \dfrac{P}{\sin\theta}$

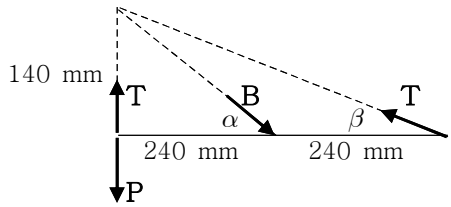
$\Rightarrow \quad B = P\dfrac{\sin\gamma}{\sin\theta} = (50\ \text{N})\ \dfrac{\sin 120.96°}{\sin 25.35°} = 100.16\ \text{N} \qquad \Rightarrow \qquad \mathrm{B} = 100.2\ \text{N}\ \nwarrow 56.3°$

$\dfrac{D}{\sin\beta} = \dfrac{P}{\sin\theta}$

$\Rightarrow \quad D = P\dfrac{\sin\beta}{\sin\theta} = (50\ \text{N})\ \dfrac{\sin 33.69°}{\sin 25.35°} = 64.79\ \text{N}$

$\Rightarrow \qquad \mathrm{C} = \mathrm{D} = 64.8\ \text{N}\ \searrow 31.0°$

4.75 [세 힘이 작용하는 강체의 평형, 세 힘의 작용선이 한 점에서 만남]



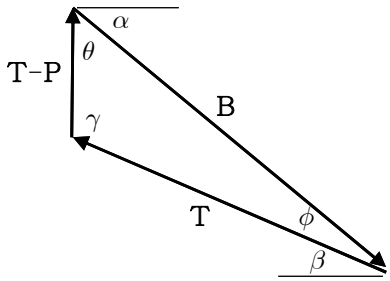
P = 300 N

$\tan\alpha = \dfrac{140}{240} = 0.5833$

$\Rightarrow \quad \alpha = \tan^{-1}(0.5833) = 30.26°$

$\tan\beta = \dfrac{140}{240+240} = 0.2917$

$\Rightarrow \quad \beta = \tan^{-1}(0.2917) = 16.26°$



$\gamma = 90° + \beta = 90° + 16.26° = 106.26°$

$\theta = 90° - \alpha = 90° - 30.26° = 59.74°$

$\phi = \alpha - \beta = 30.26° - 16.26° = 14.00°$

$\dfrac{T}{\sin\theta} = \dfrac{T-P}{\sin\phi}$

$\Rightarrow \quad T\sin\phi = (T-P)\sin\theta$

$\Rightarrow \quad T = P\dfrac{\sin\theta}{\sin\theta - \sin\phi} = (300\ \text{N})\ \dfrac{\sin 59.74°}{\sin 59.74° - \sin 14.00°} = 416.7\ \text{N}$

$\Rightarrow \qquad T = 417\ \text{N}$

$\dfrac{B}{\sin\gamma} = \dfrac{T}{\sin\theta}$

$B = T\dfrac{\sin\gamma}{\sin\theta} = (416.7\ \text{N})\ \dfrac{\sin 106.26°}{\sin 59.74°} = 463.1\ \text{N} \qquad \Rightarrow \qquad \mathrm{B} = 463\ \text{N}\ \searrow 30.3°$