

<4.6~4.7 >

4.64 [ , ]  
 $A = 180 \text{ N}, \quad F = 90 \text{ N}, \quad b = 100 \text{ mm}$

$$\sin\theta = \frac{a}{\sqrt{a^2 + b^2}} = \frac{F}{A}$$

$$\frac{A}{F} a = \sqrt{a^2 + b^2}$$

$$\left(\frac{A}{F}\right)^2 a^2 = a^2 + b^2$$

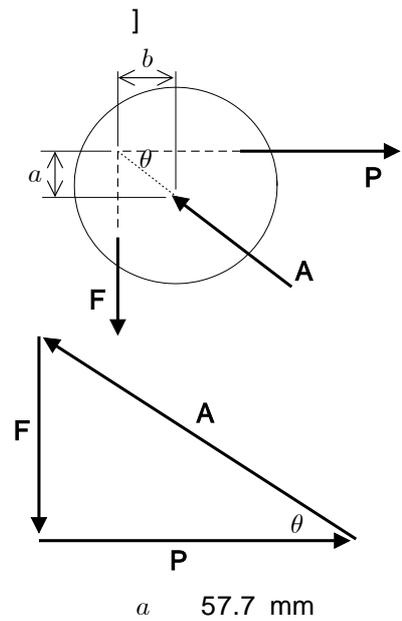
$$\left[\left(\frac{A}{F}\right)^2 - 1\right] a^2 = b^2$$

$$a^2 = \frac{b^2}{\left[\left(\frac{A}{F}\right)^2 - 1\right]}$$

$A$

$a$

$$a = \frac{b}{\sqrt{\left(\frac{A}{F}\right)^2 - 1}} = \frac{100 \text{ mm}}{\sqrt{\left(\frac{180 \text{ N}}{90 \text{ N}}\right)^2 - 1}} = 57.7 \text{ mm}$$



4.76 [ , ]  
 $W = (20 \text{ kg})(9.81 \text{ m/s}^2) = 196.2 \text{ N}$

$$R = 0.1 \text{ m}, \quad t = 0.008 \text{ m}$$

$$\alpha = 90^\circ - 30^\circ = 60^\circ$$

$$\cos\beta = \frac{R-t}{R} = \frac{(0.1 - 0.008) \text{ m}}{0.1 \text{ m}} = 0.92$$

$$\beta = \cos^{-1}0.92 = 23.1^\circ$$

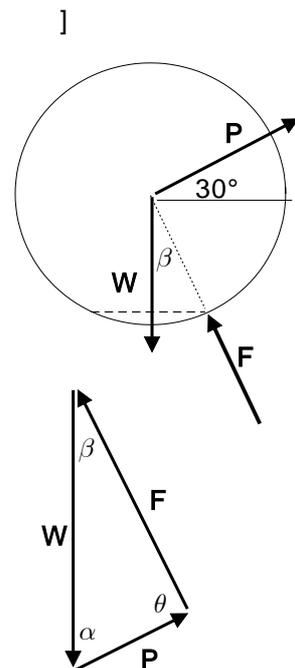
$$\theta = 180^\circ - \alpha - \beta = 180^\circ - 60^\circ - 23.1^\circ = 96.9^\circ$$

$$\text{sine} \quad \frac{P}{\sin\beta} = \frac{W}{\sin\theta}$$

$$P = W \frac{\sin\beta}{\sin\theta}$$

$$= (196.2 \text{ N}) \frac{\sin 23.1^\circ}{\sin 96.9^\circ} = 77.54 \text{ N}$$

$$P = 77.5 \text{ N } \underline{\underline{30^\circ}}$$



4.80

[ , ]

$$F = 36 \text{ N}$$

$$d_{AB} = 38 \text{ cm,}$$

$$d_1 = 20 \text{ cm, } d_3 = 21 \text{ cm}$$

$$d_2 = (20 \text{ cm}) + (40 \text{ cm}) - (30 \text{ cm}) = 30 \text{ cm}$$

$$\tan \alpha = \frac{d_{AB}}{d_1} = \frac{38 \text{ cm}}{20 \text{ cm}} = 1.9$$

$$\alpha = \tan^{-1} 1.9 = 62.2^\circ$$

$$\tan \beta = \frac{d_3}{d_2} = \frac{21 \text{ cm}}{30 \text{ cm}} = 0.70$$

$$\beta = \tan^{-1} 0.7 = 35.0^\circ$$

$$\gamma = \alpha - \beta = 62.2^\circ - 35.0^\circ = 27.2^\circ$$

$$\theta = 180^\circ - \beta - \gamma = 180^\circ - 35.0^\circ - 27.2^\circ = 117.8^\circ$$

sine

$$\frac{\sin \gamma}{T - F} = \frac{\sin \beta}{T}$$

$$T \sin \gamma = (T - F) \sin \beta$$

$$T (\sin \beta - \sin \gamma) = F \sin \beta$$

$$T = F \frac{\sin \beta}{\sin \beta - \sin \gamma} = (36 \text{ N}) \frac{\sin 35.0^\circ}{\sin 35.0^\circ - \sin 27.2^\circ} = 177.3 \text{ N}$$

$$\frac{\sin \beta}{T} = \frac{\sin \theta}{C}$$

$$C = T \frac{\sin \theta}{\sin \beta} = (177.3 \text{ N}) \frac{\sin 117.8^\circ}{\sin 35.0^\circ} = 273.4 \text{ N}$$

$$C = 273 \text{ N } \angle 35^\circ$$

