

{4.6~4.7 }

4.65 [,]

$$F_A = 6 \text{ N}, \quad \alpha = 30^\circ, \quad \delta = 0.03 \text{ m}$$

$$\begin{aligned} d_{EF} &= (2.2 \text{ cm}) + (6 \text{ cm}) \tan \alpha \\ &= (2.2 \text{ cm}) + (6 \text{ cm}) \tan 30^\circ \\ &= 5.664 \text{ cm} \end{aligned}$$

$$\begin{aligned} d_{AF} &= d_{EF} \tan \alpha \\ &= (5.664 \text{ cm}) \tan 30^\circ = 3.270 \text{ cm} \end{aligned}$$

$$\begin{aligned} \tan \theta &= \frac{(2.2 \text{ cm})}{d_{AF} + (6 \text{ cm})} = \frac{(2.2 \text{ cm})}{(3.270 \text{ cm}) + (6 \text{ cm})} \\ &= 0.2373 \end{aligned}$$

$$\theta = \tan^{-1}(0.2373) = 13.35^\circ$$

$$\gamma = 90^\circ + \alpha = 90^\circ + 30^\circ = 120^\circ$$

$$\begin{aligned} \beta &= 180^\circ - \gamma - \theta \\ &= 180^\circ - 120^\circ - 13.35^\circ = 46.65^\circ \end{aligned}$$

$$\frac{F_C}{\sin \beta} = \frac{F_A}{\sin \theta} = \frac{F_B}{\sin \gamma}$$

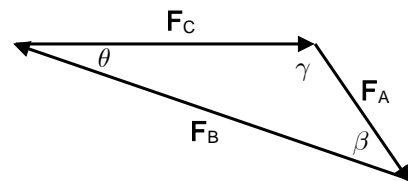
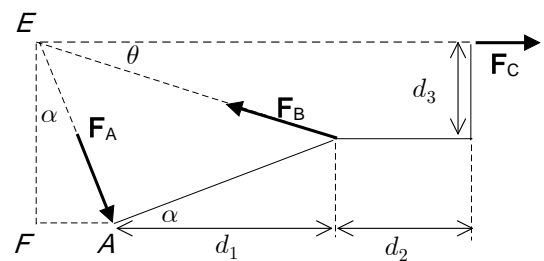
$$(a) \quad F_C = F_A \frac{\sin \beta}{\sin \theta} = (6 \text{ N}) \frac{\sin 46.64^\circ}{\sin 13.35^\circ} = 18.89 \text{ N}$$

$$F_C = k \delta \quad k = \frac{F_C}{\delta} = \frac{18.89 \text{ N}}{0.03 \text{ m}} = 629.8 \text{ N/m}$$

$$k = 629 \text{ N/m}$$

$$(b) \quad F_B = P_A \frac{\sin \gamma}{\sin \theta} = (6 \text{ N}) \frac{\sin 120^\circ}{\sin 13.35^\circ} = 22.5 \text{ N}$$

$$F_B = 22.5 \text{ N} _13.35^\circ$$



4.83 [,]

$$\alpha = 30^\circ, \quad P = 330 \text{ N}$$

$$d_{BC} = 0.25 \text{ m}, \quad d_{CE} = 0.25 \text{ m}, \quad d_{AE} = 0.3 \text{ m}$$

$$d_{EF} = d_{CD} = \frac{d_{BC}}{\tan \alpha} = \frac{0.25 \text{ m}}{\tan 30^\circ} = 0.4330 \text{ m}$$

$$\begin{aligned} d_{AF} &= d_{AE} + d_{EF} = (0.3 \text{ m}) + (0.4330 \text{ m}) \\ &= 0.7330 \text{ m} \end{aligned}$$

$$\tan \theta = \frac{d_{DF}}{d_{AF}} = \frac{0.25 \text{ m}}{0.7330 \text{ m}} = 0.3411$$

$$\theta = \tan^{-1}(0.3411) = 18.83^\circ$$

$$\begin{aligned} \beta &= 180^\circ - \alpha - \theta \\ &= 180^\circ - 30^\circ - 18.83^\circ = 131.17^\circ \end{aligned}$$

$$\frac{F_A}{\sin \alpha} = \frac{P}{\sin \beta} = \frac{F_B}{\sin \theta}$$

$$F_A = P \frac{\sin \alpha}{\sin \beta} = (330 \text{ N}) \frac{\sin 30^\circ}{\sin 131.17^\circ} = 219.2 \text{ N}$$

$$180^\circ - \theta = 90^\circ - 18.83^\circ = 71.17^\circ$$

$$F_A = 219 \text{ N} _71.2^\circ$$

$$F_B = P \frac{\sin \theta}{\sin \beta} = (330 \text{ N}) \frac{\sin 18.83^\circ}{\sin 131.17^\circ} = 141.49 \text{ N}$$

$$180^\circ - \alpha = 90^\circ - 30^\circ = 60^\circ$$

$$F_B = 141.5 \text{ N} _60.0^\circ$$

