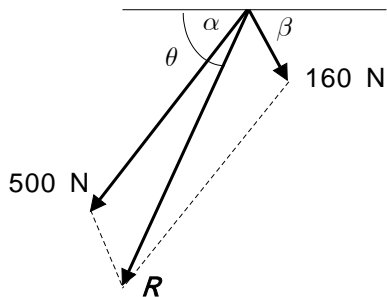


&lt;2.1~2.6 &gt;

$$2.2 \quad B \quad \alpha = \tan^{-1} \frac{2.5 \text{ m}}{2 \text{ m}} = 51.34^\circ$$

(a) [parallelogram law]

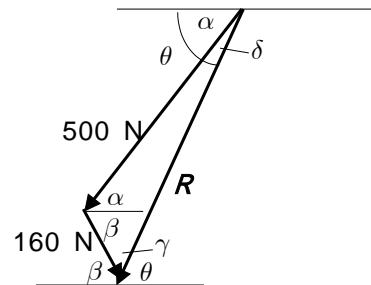


( 1)

$$R = 575 \text{ N}, \quad \theta = 67^\circ$$

$$D \quad \beta = \tan^{-1} \frac{2.5 \text{ m}}{1.5 \text{ m}} = 59.04^\circ$$

(b) [triangle rule]



$$R = 575 \text{ N} \quad \theta = 67^\circ$$

$$( 2) \quad \alpha + \beta = 51.34^\circ + 59.04^\circ = 110.68^\circ$$

$$\theta = \alpha + \delta = 51.34^\circ + \delta$$

$$\gamma = 180^\circ - (\beta + \theta) = 180^\circ - (\beta + \alpha + \delta) = 180^\circ - (110.68^\circ + \delta) = 69.32^\circ - \delta$$

$$\frac{160 \text{ N}}{\sin \delta} = \frac{500 \text{ N}}{\sin \gamma}$$

$$\sin \gamma = \sin(69.32^\circ - \delta)$$

$$[ \sin(A-B) = \sin A \cos B - \cos A \sin B ]$$

$$= \sin 69.32^\circ \cos \delta - \cos 69.32^\circ \sin \delta$$

$$(500 \text{ N}) \sin \delta = (160 \text{ N}) (\sin 69.32^\circ \cos \delta - \cos 69.32^\circ \sin \delta)$$

$$[(500 \text{ N}) + (160 \text{ N}) \cos 69.32^\circ] \sin \delta = (160 \text{ N}) \sin 69.32^\circ \cos \delta$$

$$(556.50 \text{ N}) \sin \delta = (149.69 \text{ N}) \cos \delta$$

$$\tan \delta = \frac{149.69 \text{ N}}{556.50 \text{ N}} = 0.2690$$

$$\delta = \tan^{-1} 0.2690 = 15.06^\circ$$

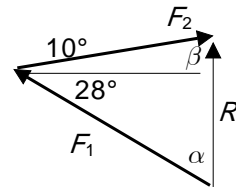
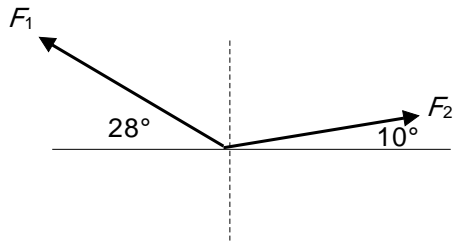
$$\theta = 51.34^\circ + 15.06^\circ = 66.40^\circ$$

$$\frac{R}{\sin(\alpha + \beta)} = \frac{160 \text{ N}}{\sin \delta}$$

$$R = (160 \text{ N}) \frac{\sin 110.68^\circ}{\sin 15.06^\circ} = 576.11 \text{ N}$$

$$R = 576 \text{ N} \quad \theta = 66.4^\circ$$

2.5



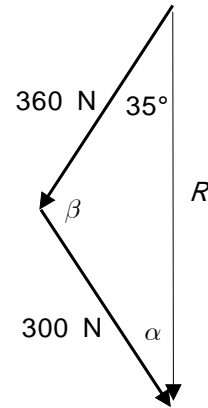
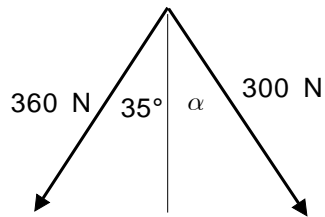
$$F_1 = 300 \text{ N}, \quad \alpha = 90^\circ - 28^\circ = 62^\circ, \quad \beta = 90^\circ - 10^\circ = 80^\circ$$

$$\text{sine} \quad \frac{F_2}{\sin \alpha} = \frac{F_1}{\sin \beta} = \frac{R}{\sin 38^\circ}$$

$$(a) \quad F_2 = \frac{F_1 \sin \alpha}{\sin \beta} = \frac{(300 \text{ N}) \sin 62^\circ}{\sin 80^\circ} = 260.6 \text{ N}$$

$$(b) \quad R = \frac{F_1 \sin 38^\circ}{\sin \beta} = \frac{(300 \text{ N}) \sin 38^\circ}{\sin 80^\circ} = 187.0 \text{ N}$$

2.10



$$(a) \quad \frac{\sin \alpha}{360 \text{ N}} = \frac{\sin 35^\circ}{300 \text{ N}}$$

$$\sin \alpha = \frac{(360 \text{ N}) \sin 35^\circ}{300 \text{ N}} = 0.6883$$

$$\alpha = \sin^{-1} 0.6883 = 43.5^\circ$$

$$(b) \quad \beta = 180^\circ - (43.5^\circ + 35^\circ) = 101.5^\circ$$

$$\frac{R}{\sin 101.5^\circ} = \frac{300 \text{ N}}{\sin 35^\circ}$$

$$R = \frac{(300 \text{ N}) \sin 101.5^\circ}{\sin 35^\circ} = 513 \text{ N}$$