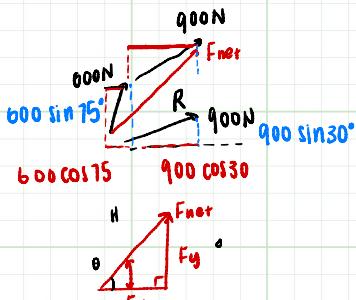
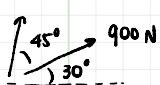


2.1

600N



$$F_y = 600 \sin 75^\circ + 900 \sin 30^\circ \\ = 600 \sin 75^\circ + 450 = 1029.55 \text{ N}$$

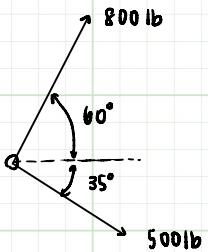
$$F_x = 600 \cos 75^\circ + 900 \cos 30^\circ = 934.71 \text{ N}$$

$$F_{\text{net}}^2 = F_y^2 + F_x^2$$

$$F_{\text{net}} = \sqrt{F_y^2 + F_x^2} = \sqrt{(1029.55)^2 + (934.71)^2} \\ = 1390.55 \text{ N} \approx 1391 \text{ N}$$

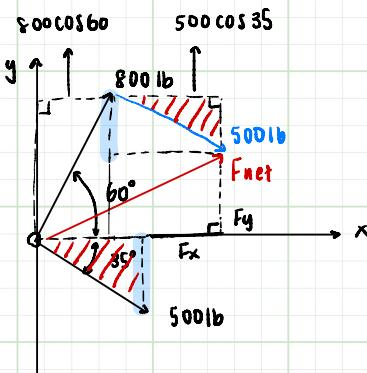
$$\sin \theta = \frac{1029.55}{1390.55} \quad \theta = \sin^{-1} \left(\frac{1029.55}{1390.55} \right) = 47.76^\circ \\ \approx 47.8^\circ$$

2.2



$$\begin{aligned} F_y &= 800 \sin 60^\circ - 500 \sin 35^\circ \\ &= 406.03^\circ \end{aligned}$$

$$\begin{aligned} F_x &= 800 \cos 60^\circ + 500 \cos 35^\circ \\ &= 809.58^\circ \end{aligned}$$

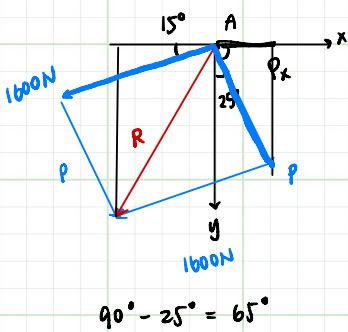


$$F_{net}^2 = F_y^2 + F_x^2 \quad F_{net} = \sqrt{F_y^2 + F_x^2} = \sqrt{(406.03)^2 + (809.58)^2} = 905.69 \text{ lb}$$

$\approx 906 \text{ lb}$

$$\sin \theta = \frac{406.03}{809.58} \quad \theta = \sin^{-1} \left(\frac{406.03}{809.58} \right) = 26.6^\circ$$

2.7



$$(a) \quad P = ?$$

(b)

resultant is vertical, so

$$\begin{aligned} F &= (F_x, F_y) \\ &= (0, F_y) \end{aligned}$$

$$F_x = P \cos 65^\circ - 1600 \cos 15^\circ = 0$$

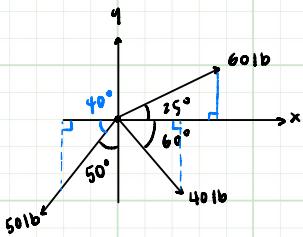
$$P \cos 65^\circ = 1600 \cos 15^\circ$$

$$P = \frac{1600 \cos 15^\circ}{\cos 65^\circ} = 3656.92 \text{ N}$$

$$\approx 3660 \text{ N}$$

$$\begin{aligned} |F_y| &= |-1600 \sin 15^\circ - 3656.92 \sin 65^\circ| \\ &= 3728.48 \text{ N} \\ &\approx 3730 \text{ N} \end{aligned}$$

2.18



$$F_x = ?$$

$$F_y = ?$$

50 lb

$$F_x = -50 \cos 40^\circ = -38.3 \text{ lb}$$

$$F_y = -50 \sin 40^\circ = -32.1 \text{ lb}$$

40 lb

$$F_x = 40 \cos 60^\circ = 20 \text{ lb} = 20.0 \text{ lb}$$

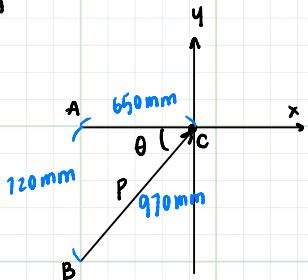
$$F_y = -40 \sin 60^\circ = -34.64 \text{ lb} \approx -34.6 \text{ lb}$$

60 lb

$$F_x = 60 \cos 25^\circ = 54.39 \text{ lb} \approx 54.4 \text{ lb}$$

$$F_y = 60 \sin 25^\circ = 25.36 \text{ lb} \approx 25.4 \text{ lb}$$

2.21



$$P_x = 325 \text{ N}$$

$$(a) P = ?$$

$$(b) P_y = ?$$

$$\overline{BC}^2 = 650^2 + 720^2$$

$$\begin{aligned}\overline{BC} &= \sqrt{650^2 + 720^2} \\ &= 970\end{aligned}$$

$$\cos \theta = \frac{650}{970}$$

$$\theta = \cos^{-1}\left(\frac{650}{970}\right) = 47.9^\circ$$

$$P_x = P \cos 47.9^\circ$$

$$325 = P \cos 47.9$$

$$P = \frac{325}{\cos 47.9} = 484.17 \text{ N} \approx 486 \text{ N} \quad (a)$$

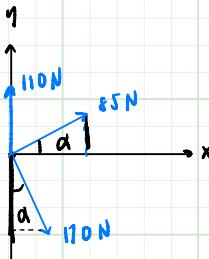
$$P^2 = P_y^2 + P_x^2$$

$$486^2 = P_y^2 + 325^2$$

$$129600 = P_y^2$$

$$P_y = 360 \text{ N} \quad (b)$$

2.28



(a) $\alpha = ?$ $\alpha = 28.1^\circ$

R horiz

$R^2 = Rx^2 + Ry^2$

(b) $R = ?$

$R^2 = Rx^2 + 0$

$R_x = 85 \cos \alpha + 110 \sin \alpha$

$= 85 \cos(28.1) + 110 \sin(28.1)$

$= 155.05 \text{ N}$

resultant is horiz. so

$$\begin{aligned} R &= (R_x, R_y) \\ &= (R_x, 0) \end{aligned}$$

$R_y = 85 \sin \alpha + 110 \sin 90 - 170 \cos \alpha$

$0 = 85 \sin \alpha + 110 \sin 90 - 170 \cos \alpha$

$170 \cos \alpha - 85 \sin \alpha = 110 \sin 90$

$170 \cos \alpha - 85 \sin \alpha = 110$

$34 \cos \alpha - 17 \sin \alpha = 22$

$\cos^2 \theta + \sin^2 \theta = 1$

$\cos^2 \theta = 1 - \sin^2 \theta$

$\cos \theta = \sqrt{1 - \sin^2 \theta}$

$\theta = \alpha$

$34 (\pm \sqrt{1 - \sin^2 \alpha}) - 17 \sin \alpha = 22$

$[34 (\pm \sqrt{1 - \sin^2 \alpha})]^2 = (22 + 17 \sin \alpha)^2$

$1156 (1 - \sin^2 \alpha) = 484 + 748 \sin \alpha + 289 \sin^2 \alpha$

$1156 - 1156 \sin^2 \alpha = 484 + 748 \sin \alpha + 289 \sin^2 \alpha$

$572 = 1445 \sin^2 \alpha + 748 \sin \alpha$

$1445 \sin^2 \alpha + 748 \sin \alpha - 572 = 0$

$-748 \pm \sqrt{748^2 - 4(1445)(-572)} = \sin \alpha$

28.90

$\sin \alpha = 0.471$

$\alpha = \sin^{-1}(0.471) = 26.099^\circ$

$\approx 28.1^\circ \text{ (a)}$