Tutorial #1 (No Quiz; 2 problems)

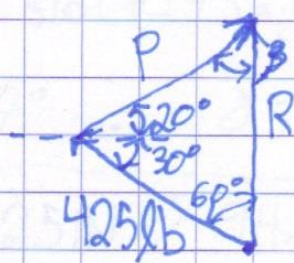
2.11)

a) Find the magnitude of P so that the reactant force is vertical

b) Find the corresponding magnitude of R.

ANS:

a)



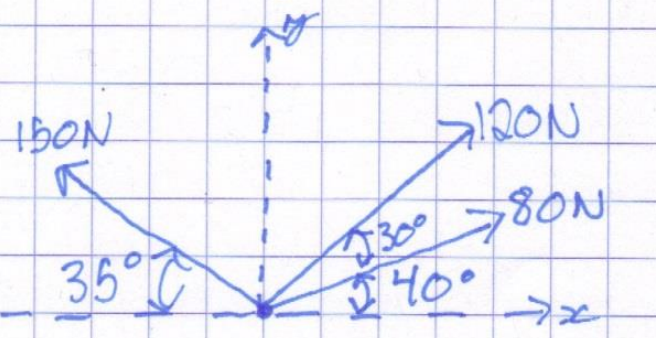
$60° + (20° + 30°) + \beta = 180°$

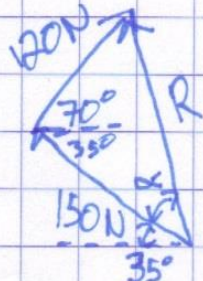
$\therefore \beta = 70°$

$$\frac{425\,lb}{\sin\beta} = \frac{P}{\sin 60} \rightsquigarrow P = \frac{425\,lb \cdot \sin 60}{\sin(70°)} = 392\,lb$$

b) $$\frac{425\,lb}{\sin\beta} = \frac{R}{\sin 50} \rightsquigarrow R = \frac{425\,lb \cdot \sin 50}{\sin 70} = 346\,lb$$

2.21) Find the force magnitude + direction of the resultant.



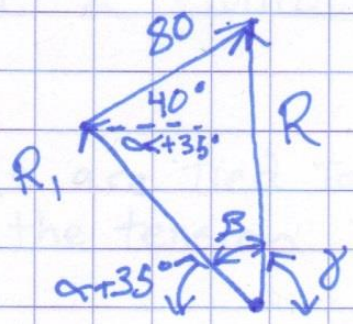


$$R_1 = \sqrt{(150N)^2 + (120N)^2 - 2(150N)(120N)\cos 105°}$$

$$R_1 = 215N$$

$$\frac{120N}{\sin\alpha} = \frac{215N}{\sin(105°)} \rightsquigarrow \alpha = \sin^{-1}\left(\frac{120N \sin 105}{215N}\right)$$

$$\therefore \alpha = 32.6°$$



$$R = \sqrt{(215N)^2 + (80N)^2 - 2(215N)(80N)\cos(75° + 32.6°)}$$

$$\boxed{R = 251N}$$

$$\frac{80N}{\sin\beta} = \frac{R}{\sin(75° + 32.6°)} \rightsquigarrow \beta = \sin^{-1}\left(\frac{80N \cdot \sin(107.6°)}{251N}\right)$$

$$\beta = 17.7° \quad \therefore \quad \gamma = 180° - 35° - \alpha - \beta = 94.7°$$

$$\boxed{R = 251N \angle 94.7°}$$