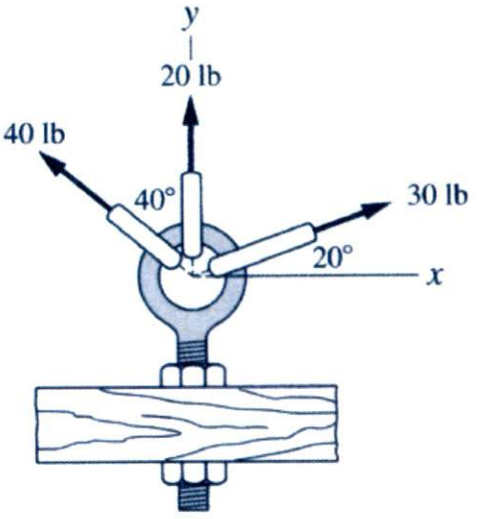
2-24 to 2-27 Determine the magnitude and direction of the resultant of the force systems shown in Figs. P2-24 to P2-27.

2-24



All angles are to be measured ccw from the + x-axis.

Force (lb)	Direction (θ)	$F_x = F\cos\theta$	$F_y = F\sin\theta$
30	20°	28.19	10.26
20	90°	0	20
40	130°	-25.71	30.64
	Σ	2.48	60.9

Magnitude

$R_x = \Sigma F_x = 2.48$ lb →

$R_y = \Sigma F_y = 60.9$ lb ↑

} Resultant lies in Quad I i.e. $\theta = \alpha$

$$R = \sqrt{R_x^2 + R_y^2} = \sqrt{2.48\text{ lb}^2 + 60.9\text{ lb}^2} = 61\text{ lb}$$

Direction

$$\alpha = \tan^{-1}\left|\frac{R_y}{R_x}\right| = \tan^{-1}\left|\frac{60.9\text{ lb}}{2.48\text{ lb}}\right| = 88^\circ$$

$$\theta = \alpha = 88^\circ$$

ANS. $R = 61$ lb ∠ 88°