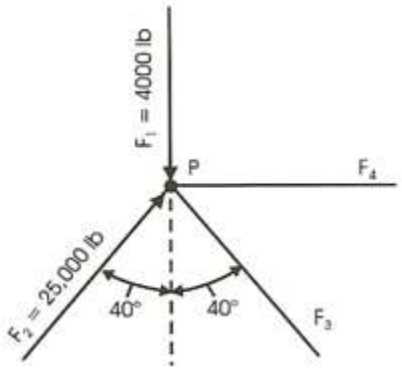
Q- Figure shows four concurrent forces in equilibrium. Find the magnitude and direction of F_3 and F_4.

Resolving the forces in vertical direction



F_{1y} = - 4000 lb

F_{2y} = 25000 cos 40^0 = 25000*0.766 = 19151.11 lb

F_{3y} = F_3 cos 40^0 = F_3*0.766 and

F_{4y} = F_4 cos 90^0 = 0

As the forces are balanced in vertical direction we have

$$F_{1y} + F_{2y} + F_{3y} + F_{4y} = 0$$

Or -4000 + 19151.11 +F_3*0.766 + 0 = 0

Gives F_3 = -19778.2 lb

Thus the magnitude of F_3 is 19778.2 lb.

As the sign of this force is negative, it means that the force has a negative component in vertical direction and for that its direction must be away from P.

Now resolving the forces in horizontal direction

F_{1x} = F_1 sin90^0 = 4000*0 = 0

F_{2x} = 25000 sin 40^0 = 25000*0.643 = 16069.7 lb

F_{3x} = F_3 sin 40^0 = 19778.2*0.643 = 12713.2 and

F_{4x} = F_4 sin 90^0 = F_4

As the forces are balanced in horizontal direction we have

$$F_{1x} + F_{2x} + F_{3x} + F_{4x} = 0$$

Or 0 + 16069.7 + 12713.2 + F_4 = 0

Gives F_4 = - 28782.9 lb

Thus the magnitude of F_4 is 28782.9 lb. The negative sign shows that the force is in negative x direction and hence towards P.