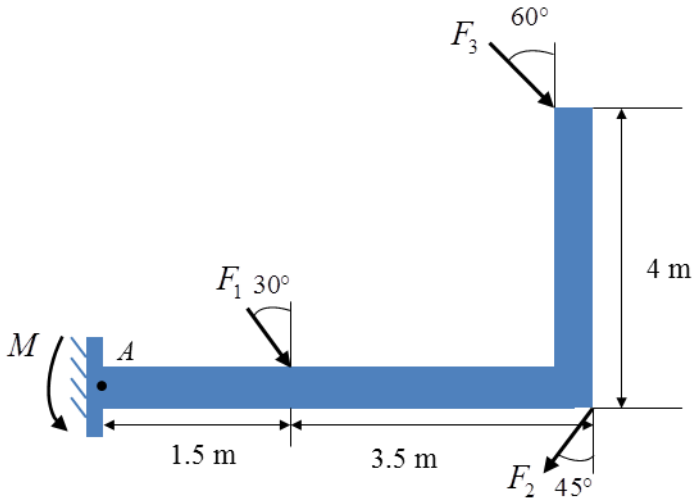
7. $F_1$ , $F_2$ , and $F_3$ are independently and normally distributed, and their distributions are $F_1 \sim N(350, 5^2)$ N, $F_2 \sim N(450, 8^2)$ N, and $F_3 \sim N(650, 15^2)$ , respectively. Determine the distribution of the resultant moment $M_A$ about point A.




**Solution**

1)

$$\sum M = 0$$

$$M_A = F_1(\cos 30^\circ)(1.5) + F_2(\cos 45^\circ)(5) + F_3(\cos 60^\circ)(5) + F_3(\sin 60^\circ)(4)$$

For $F_1 \sim N(350, 5^2)$ N, $F_2 \sim N(450, 8^2)$ N and $F_3 \sim N(650, 15^2)$, we have

$$\mu_{M_A} = \mu_{F_1}(\cos 30^\circ)(1.5) + \mu_{F_2}(\cos 45^\circ)(5) + \mu_{F_3}(5(\cos 60^\circ) + 4(\sin 60^\circ)) = 5922.32 \text{ N}$$

$$\sigma_{M_A} = \sqrt{\left(\sigma_{F_1}(\cos 30^\circ)(1.5)\right)^2 + \left(\sigma_{F_2}(\cos 45^\circ)(5)\right)^2 + \left(\sigma_{F_3}(5(\cos 60^\circ) + 4(\sin 60^\circ))\right)^2} = 94.05 \text{ N}$$

From above, the distribution of $F_3$ is $F_3 \sim N(5922.32, 94.05^2)$ N **Ans.**