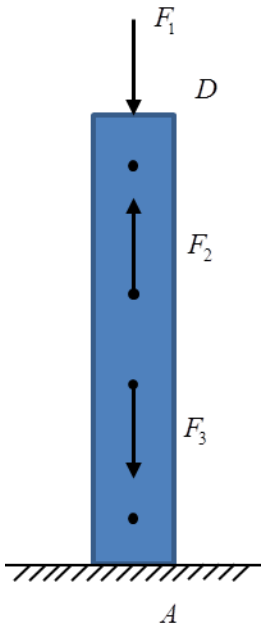
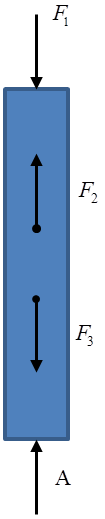
2 A column is subject to forces F_1, F_2 and F_3 as shown. The three forces are independently and normally distributed with $F_1 \sim N(8, 0.1^2)$ kN, $F_2 \sim N(25, 0.3^2)$ kN, and $F_3 \sim N(36, 0.6^2)$ kN . Determine the distribution of the internal normal force at point *A*.



Solution



$$\Sigma F_y = 0; \quad A + F_2 - F_1 - F_3 = 0$$

$$A = F_1 + F_3 - F_2$$

$$\mu_A = \mu_{F_1} + \mu_{F_3} - \mu_{F_2}$$

$$\sigma_A = \sqrt{\sigma_{F_2}^2 + \sigma_{F_1}^2 + \sigma_{F_3}^2}$$

For $F_1 \sim N(8, 0.1)$ kN, $F_2 \sim N(25, 0.3)$ kN, and $F_3 \sim N(36, 0.6)$ kN , we get

$$\mu_A = 19 \text{ kN}, \ \sigma_A = 0.68 \text{ kN}$$

Therefore, $A \sim N(19, 0.68)$ kN . **Ans.**