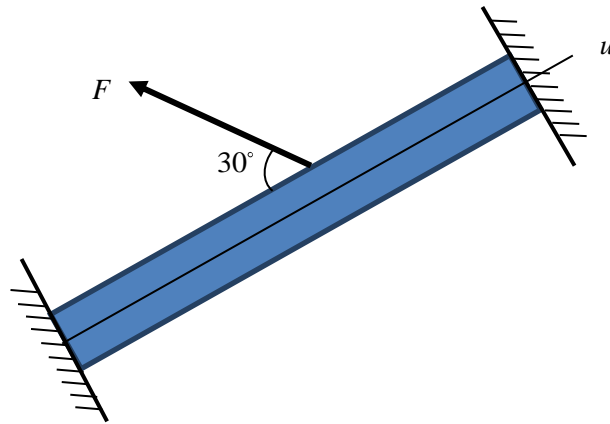23. The force acting on a beam is normally distributed with $F \sim N(950, 10^2)$ lb. Find the distributions of its two components, one parallel and the other one perpendicular to the u axis.

Solution

F_1 stands for the parallel force; F_2 stands for the perpendicular force.

For F_1

$$\mu_1 = \mu_F \cos 30^o = -822.72 \text{ lb}$$

$$\sigma_1 = \sigma_F \cos 30° = -8.66 \text{ lb}$$

For F_2

$$\mu_2 = \mu_F \sin 30° = 475 \text{ lb}$$

$$\sigma_2 = \sigma_F \sin 30° = 5 \text{ lb}$$

Thus the distributions of F_1 and F_2 follow

$$F_1 \sim N(-822.72, -8.66^2) \text{ lb} \qquad \textbf{Ans.}$$

$$F_2 \sim N(475, 5^2) \text{ lb} \qquad \textbf{Ans.}$$