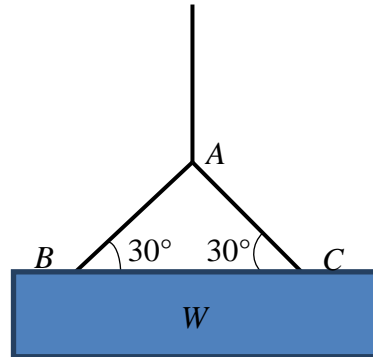
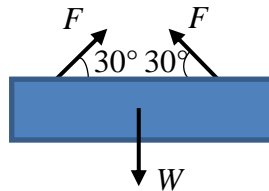


9. Cords AB and AC can each sustain a maximum tension $T \sim N(920, 6^2)$ N . If the weight is $W \sim N(900, 10^2)$ N and is independent of T . Determine the probability that the cord will fail?



Solution



$$\sum F_y = 0; 2F \sin 30^\circ - W = 0$$

Thus, we have

$$\mu_F = \frac{\mu_W}{2 \sin 30^\circ} = 900 \text{ N}$$

$$\sigma_F = \frac{\sigma_W}{2 \sin 30^\circ} = 10 \text{ N}$$

We construct the limit state function $Y = T - F$

$$\mu_Y = \mu_T - \mu_F = 20 \text{ N}$$

$$\sigma_Y = \sqrt{\sigma_T^2 + \sigma_F^2} = 11.67 \text{ N}$$

Thus, the probability of the cord failure is

$$p_f = \Pr(Y < 0) = \Phi\left(-\frac{\mu_Y}{\sigma_Y}\right) = 0.0432 \quad \mathbf{Ans.}$$