

83. Solution: B

Let X_1, \dots, X_n denote the life spans of the n light bulbs purchased. Since these random variables are independent and normally distributed with mean 3 and variance 1, the random variable $S = X_1 + \dots + X_n$ is also normally distributed with mean

$$\mu = 3n$$

and standard deviation

$$\sigma = \sqrt{n}$$

Now we want to choose the smallest value for n such that

$$0.9772 \leq \Pr[S > 40] = \Pr\left[\frac{S - 3n}{\sqrt{n}} > \frac{40 - 3n}{\sqrt{n}}\right]$$

This implies that n should satisfy the following inequality:

$$-2 \geq \frac{40 - 3n}{\sqrt{n}}$$

To find such an n , let's solve the corresponding equation for n :

$$-2 = \frac{40 - 3n}{\sqrt{n}}$$

$$-2\sqrt{n} = 40 - 3n$$

$$3n - 2\sqrt{n} - 40 = 0$$

$$(3\sqrt{n} + 10)(\sqrt{n} - 4) = 0$$

$$\sqrt{n} = 4$$

$$n = 16$$