

TOPIC

Engineering Probability and Statistics – Section II – Question 5

QUESTION

The life in hours of batteries is known to be approximately normally distributed with standard deviation $\sigma = 25$ hours. A random sample of 10 batteries resulted in the following data: 535, 541, 562, 551, 573, 528, 565, 548, 543, and 567 hours. The 95% two-sided confidence interval on the mean battery life is

- (A) [525.1, 560.4]
- (B) [535.8, 566.8]
- (C) [528.0, 573.0]
- (D) [545.3, 557.3]

HINT

When the variance is known, the standard normal distribution is used, and the $100(1-\alpha)\%$ confidence interval on mean μ is $[\bar{x} - \frac{z_{\alpha/2}\sigma}{\sqrt{n}}, \bar{x} + \frac{z_{\alpha/2}\sigma}{\sqrt{n}}]$.

SOLUTION

The sample size is

$$n = 10.$$

A 95% confidence interval means

$$\alpha = 0.05, z_{0.025} = 1.96.$$

Compute the sample average as

$$\begin{aligned}\bar{x} &= \frac{535+541+562+551+573+528+565+548+543+567}{10} \\ &= 551.3.\end{aligned}$$

Calculate

$$551.3 \pm \frac{1.96 \times 25}{\sqrt{10}} = [535.8, 566.8]$$

ANSWER

(B)

CONTRIBUTOR

Michael Weng