Answer on Question #47127 – Math – Statistics and Probability

The new Twinkle bulb has a standard deviation hours. A random sample of 60 light bulbs is selected from inventory. The sample mean was found to be 500 hours.

Construct 90%, 95% and 99% confidence intervals for the mean life, □ of all Twinkle bulbs. Round to the nearest three decimals.

Solution.

To answer this question, we need to know the standard deviation σ.

Then the margin of error for 90% confidence interval will be:

$$\mathbf{1.645}\frac{\sigma}{\sqrt{60}} = \mathbf{0.212}\sigma;$$

the margin of error for 95% confidence interval will be:

$$\mathbf{1.96}\frac{\sigma}{\sqrt{60}} = \mathbf{0.253}\sigma;$$

the margin of error for 99% confidence interval will be:

$$\mathbf{2.58}\frac{\sigma}{\sqrt{60}} = \mathbf{0.333}\sigma;$$

And the confidence intervals for the mean life, respectively:

$\mathbf{90}\%$: $(\mathbf{500} - \mathbf{0.212}\sigma, \quad \mathbf{500} + \mathbf{0.212}\sigma)$;

$\mathbf{95}\%$: $(\mathbf{500} - \mathbf{0.253}\sigma, \quad \mathbf{500} + \mathbf{0.253}\sigma)$;

$\mathbf{99}\%$: $(\mathbf{500} - \mathbf{0.333}\sigma, \quad \mathbf{500} + \mathbf{0.333}\sigma)$.

For example, for standard deviation $\sigma = \mathbf{40}$:

$\mathbf{90}\%$: $(\mathbf{491.520}, \quad \mathbf{508.480})$;

$\mathbf{95}\%$: $(\mathbf{489.880}, \quad \mathbf{510.120})$;

$\mathbf{99}\%$: $(\mathbf{486.680}, \quad \mathbf{513.320})$.