

Answer on Question #55715 – Math – Statistics and Probability

For the previous problem, the sample of 100 screws turns out to have mean = 15.005mm. (Still testing against = 15 mm and assuming population standard deviation is known to be 0.04mm.) Does this give evidence that the lengths of the screws are longer than 15mm?

Explain using the important values you use to make your decision.

Solution

In the given problem, we need to conduct a hypothesis testing. Hypothesis testing is a systematic procedure for deciding whether the results of a research study, which examines a sample, support a particular theory or practical innovation, which applies to a population. The procedure is to first state a hypothesis about a population parameter, such as μ .

Then, we have to formulate the Null hypothesis H_0 . The accepted fact is that the population mean is 15 mm. State the Alternative Hypothesis H_a . The claim is that the lengths of the screws are longer than 15mm.

$$H_0: \mu = 15 \text{ mm}$$

$$H_a: \mu > 15 \text{ mm}$$

The typical alpha level is 0.05 ($\alpha=0.05$).

This is a one-tailed test and the critical value at $\alpha=0.05$ is 1.645.

The test statistic is

$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{15 - 15.005}{\frac{0.04}{\sqrt{100}}} = \frac{-0.005}{0.004} = -1.25$$

Method 1 (critical value approach)

The test statistic $z = -1.25$ does not fall into the rejection region ($R: z \geq 1.645$), hence we do not reject the Null hypothesis H_0 .

Method 2 (p-value approach)

Calculated Z-score = -1.25, which corresponds to $p = 0.1056$ (when we look at the Z-score table). Compare our critical value to our calculated value for p-values:

$$p_{crit} = 0.05 < p_{calc} = 0.1056$$

Thus, we do not reject the Null Hypothesis H_0 in favor of the Alternative Hypothesis H_a . We do not have enough evidence that the lengths of the screws are longer than 15mm.