

Answer on Question #80495 – Math – Statistics and Probability

Question

Suppose the manager of a fast-food restaurant on campus wishes to determine whether the population waiting time to place an order has changes in the past month from its previous value of 4.5minutes. From past experiences, it can be assumed that the population standard deviation is 1.2minutes. By selecting a sample of 25orders during the last one hour, the sample mean is 5.1minutes. **(i)** Construct a 99% confidence interval estimate for the population mean waiting time **(ii)** Using the six-step method of hypothesis testing, determine whether there is evidence that the population mean waiting time to place an order has changed in the past month from its previous population mean value of 4.5minutes.

Solution

(i)

$$\begin{aligned}\bar{x} - Z_{\frac{\alpha}{2}} * \frac{\sigma}{\sqrt{n}} &\leq \bar{x} \leq \bar{x} + Z_{\frac{\alpha}{2}} * \frac{\sigma}{\sqrt{n}} \\ 5.1 - Z_{\frac{99}{2}} * \frac{1.2}{\sqrt{25}} &\leq \bar{x} \leq 5.1 + Z_{\frac{99}{2}} * \frac{1.2}{\sqrt{25}} \\ 5.1 - 2.575 * 0.24 &\leq \bar{x} \leq 5.1 + 2.575 * 0.24 \\ 5.1 - 0.62 &\leq \bar{x} \leq 5.1 + 0.62 \\ 4.48 &\leq \bar{x} \leq 5.72\end{aligned}$$

Answer: we know the necessary interval estimate from 4.48 minutes till 5.72 minutes.

(ii)

1. HYPOTHESES.

the null hypothesis $H_0: \mu = 4.5$

the alternative hypotheses $H_1: \mu \neq 4.5$

2. ASSUMPTIONS.

the level of significance, $\alpha=0.05$

the sample size $n=25$

3. TEST STATISTIC.

Test statistic is Z test static

4. REJECTION REGION.

$|Z| > 1.96$

5. CALCULATIONS.

$$Z = \frac{5.1 - 4.5}{\frac{1.2}{\sqrt{25}}} = 2.5$$

6. CONCLUSIONS.

$2.5 > 1.96$, hence the null hypothesis is rejected.

Answer: $H_1: \mu \neq 4.5$, the population mean waiting time to place an order has changed.