

Answer on Question #80383 – 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 25 orders 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 4.5 minutes.

Solution

(i) Construct a 99% confidence interval estimate for the population mean waiting time

$$\bar{x} \pm Z_{\frac{\alpha}{2}} * \frac{\sigma}{\sqrt{n}}$$

$$\bar{x} = 5.1$$

$$Z_{\frac{\alpha}{2}}(99\%) = 2.575$$

$$\sigma = 1.2$$

$$n = 25$$

$$5.1 \pm 2.575 * \frac{1.2}{\sqrt{25}}$$
$$5.1 \pm 0.618$$
$$4.482 \leq \bar{x} \leq 5.718$$

Answer: 99% confidence interval estimate for the population mean waiting time is $4.482 \leq \bar{x} \leq 5.718$

(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.

Step 1: $H_0: \mu = 4.5$ vs $H_1: \mu \neq 4.5$

Step 2: $n = 25; \alpha = 0.05$

Step 3: σ is known, we use the normal distribution and the Z test static

Step 4: $\alpha = 0.05$. The rejection region is $Z < -1.96$ or $Z > + 1.96$

Step 5: $Z = \frac{5.1 - 4.5}{\frac{1.2}{\sqrt{25}}} = \frac{0.6}{0.24} = 2.50$

Step 6: $Z = 2.50 > 1.96$, we need to reject the null hypothesis.

Answer: The population mean waiting time to place an order has changed in the past month from its previous population mean value of 4.5 minutes.