

Unit 6 Extra Problems

1. A revenue department is under orders to reduce the time small business owners spend filling out pension form ABC-5500. Previously the average time spent on the form was 5.2 hours. In order to test whether the time to fill out the form has been reduced, a sample of 65 small business owners who annually complete the form was randomly chosen, and their completion times recorded. The mean completion time for ABC-5500 form was 4.8 hours with a standard deviation of 2.6 hours. Test that the time to complete the form has been reduced.

$$H_0 : \mu \geq 5.2$$

$$H_a : \mu < 5.2$$

$$\begin{aligned} z &= \frac{4.8 - 5.2}{\frac{2.6}{\sqrt{60}}} \\ &= -1.19 \end{aligned}$$

Assume that $\alpha = 0.05$. Compare the test statistic to the critical value $z_c = -1.645$. Since $z > z_c$, at the 95% confidence level, we can not reject the null that the mean completion time has not change.

2. How many tissues should a package of tissues contain? Researchers have determined that a person uses an average of 62 tissues during a cold. Suppose a random sample of 2500 people yielded the following data on the number of tissues used during a cold: $\bar{x} = 57$, $s = 18$. Determine if the mean number of tissues used during a cold is less than 62.

$$H_0 : \mu \geq 62$$

$$H_a : \mu < 62$$

$$\begin{aligned} z &= \frac{57 - 62}{\frac{18}{\sqrt{2500}}} \\ &= -13.89 \end{aligned}$$

Assume that $\alpha = 0.05$. Compare the test statistic to the critical value $z_c = -1.645$. Since $z < z_c$, at the 95% confidence level, we can reject the null that the mean number of tissues used during a cold more than or equal to 62.

3. An industrial supplier has shipped a truckload of teflon lubricant cartridges to an aerospace customer. The customer has been assured that the mean weight of these cartridges is in excess of the 11 ounces printed on each cartridge. To check this claim, a sample of $n = 15$ cartridges are randomly selected from the shipment and carefully weighed. Summary statistics for the sample are: $\bar{x} = 11.13$ ounces, $s = 0.15$ ounce. Determine whether the supplier's claim is true.

To use a t-test, we must assume that the weight of the cartridges is distributed normally.

$$\begin{aligned}H_0 &: \mu \leq 11 \\H_a &: \mu > 11\end{aligned}$$

$$\begin{aligned}t &= \frac{11.13 - 11}{\frac{0.15}{\sqrt{14}}} \\&= 3.24\end{aligned}$$

Assume that $\alpha = 0.05$. Compare the test statistic to the critical value $t_c = 1.761$. Since $t > t_c$, at the 95% confidence level, we find that the supplier's claim is true.

4. A company claims that 9 out of 10 doctors (i.e., 90%) recommend its brand of cough syrup to their patients. A random sample of 100 doctors was chosen which resulted in 86 who indicate that they recommend this cough syrup. Test the company's claim.

$$\begin{aligned}H_0 &: \mu = 0.9 \\H_a &: \mu \neq 0.9\end{aligned}$$

$$\begin{aligned}z &= \frac{0.86 - 0.9}{\sqrt{\frac{0.86(0.14)}{100}}} \\&= -1.15\end{aligned}$$

Assume that $\alpha = 0.05$. Compare the test statistic to the critical value $z_c = -1.96$. Since $z > z_c$, at the 95% confidence level, we can not reject the null that the company's claim is true.