EXAMPLE 1

Consider the following hypothesis test:

$$H_0: \mu = 22$$
$$H_a: \mu \neq 22$$

A sample of 75 is used and the population standard deviation is 10. Compute the *p*-value and state your conclusion for each of the following sample results. Use $\alpha = .01$.

a. $\bar{x} = 23$
b. $\bar{x} = 25.1$
c. $\bar{x} = 20$

$\sigma = 10 \Rightarrow \sigma$ Known case $\Rightarrow z - \text{test} : z = \dfrac{\bar{x} - \mu_0}{\dfrac{\sigma}{\sqrt{n}}}$

a. $z_{23} = 0.87$

p –value = 2 P (Z > 0.87)

= 2(1 - .8078) = 0.3844

p –value = 0.3844 > $\alpha = 0.01$. Do not reject H_0

b. $z_{25.1} = 2.68$

p –value = 2 P (Z > 2.68) = 2(1 - .9963) = 0.0074

p –value = 0.0074 < $\alpha = 0.01$. Reject H_0

c. $z_{20} = -1.73$

p –value = 2 P (Z < -1.73) = 2(1 - 0.9582) = 0.0836

p –value = 0.0836 > $\alpha = 0.01$. Do not reject H_0

EXAMPLE 2

Your statistics instructor believes that the average grade on the statistics final examination was at least 75. To test the instructor's claim, you as a student select sample of 36 final examinations. The average grade in the sample was 72 with a standard deviation of 12.

a. State the null and alternative hypotheses.
b. Using the critical value approach, test the hypotheses at the 1% level of significance.
c. Using the p-value approach, test the hypotheses at the 1% level of significance.

EXAMPLE 3

Trying to encourage people to stop driving to campus, the university claims that on average it takes people 30 minutes to find a parking space on campus. I do not think it takes so long to find a spot. In fact, I have a sample of the **last five** times I drove to campus, and I calculated $\bar{x} = 24$ minutes. Assuming that the time it takes to find a parking spot is normal, and that $\sigma = 8$ minutes. Perform a hypothesis test with 1% significant level to see if the claim is correct.

a. State the null and alternative hypotheses for this test.
b. What is (are) the critical value (s)? What is the rejection rule?
c. Calculate the appropriate test statistic.
d. Find the p-value.
e. What is your conclusion?
f. What is your conclusion if the significance level is changed to 5%?

$\bar{X} = 24$, $n = 5$, $\sigma = 8$ $\qquad \alpha = 0{,}01$

a) $H_0: \mu = 30$ $\qquad H_a: \mu \neq 30$ $\Rightarrow$ Two tail

b) $Z_{\frac{\alpha}{2}} = 2{,}575$ $\qquad$ c) $Z = \dfrac{24 - 30}{8} \times \sqrt{5} = 1{,}67$

d) P-Value: $2(P > 1{,}67) = 0{,}095$

e) $0{,}095 > 0{,}01$ So accept H_0

f) $0{,}095 > 0{,}05$ Also accept H_0