Tests of Significance Practice Problems

A survey of 700 hourly wages in the U.S. is taken and it is found that the mean hourly wage is \$17.65 with a standard deviation of \$7.55. Is this evidence sufficient to conclude that the mean hourly wage is greater than the stated current mean hourly wage of \$17.20?

Answer this question by conducting a formal test of significance at the $\alpha = 0.05$ level of significance.

NULL AND ALTERNATIVE HYPOTHESES

$H_0: \mu = \$17.20$

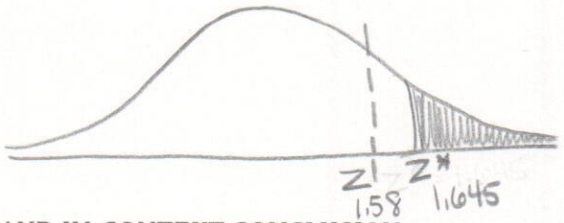
$H_a: \mu > \$17.20$

TEST STASTISTIC

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{17.65 - 17.20}{7.55/\sqrt{700}} = \frac{0.45}{0.2854} = 1.58$$

CRITICAL REGION Right-tailed test at $\alpha = 0.05$ $df = 699$ (use z row of t table)

$z^* = 1.645$



DECISION AND IN-CONTEXT CONCLUSION

Fail to reject the null. The test statistic, 1.58, does not fall in the critical region. There is not enough evidence to conclude that the mean hourly wage is greater than \$17.20.

Tests of Significance Practice Problems

The NRA claims that 32% of all Americans own guns for protection of self/family. A survey of 300 gun owners is taken and 40% of those surveyed say that they have a gun for protection of self/family. Is this evidence sufficient to conclude that the true proportion of Americans who own guns for protection is different from 32%?

Answer this question by conducting a formal test of significance at the $\alpha = 0.1$ level of significance.

NULL AND ALTERNATIVE HYPOTHESES

$H_0: p = 0.32$

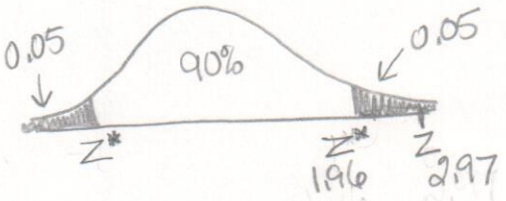
$H_a: p \neq 0.32$

TEST STASTISTIC

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.4 - 0.32}{\sqrt{\frac{(0.32)(0.68)}{300}}} = \frac{0.08}{0.0269} = 2.97$$

CRITICAL REGION

Two-tailed test at $\alpha = 0.1$ $z^* = 1.96$



DECISION AND IN-CONTEXT CONCLUSION

Reject the null. The test statistic, 2.97, is more extreme than the critical value, 1.646, i.e., the test statistic falls in the critical region. There is enough evidence from to conclude that the true proportion of Americans who own guns for protection is different from 32%.

Given that $\alpha = 0.1$, construct a 90% confidence interval estimate of the true proportion of Americans who own guns for protection. Can this information be used for the purpose of hypothesis testing?

$z^* = 1.96$

$$0.4 \pm (1.96)\sqrt{\frac{(0.32)(0.68)}{300}}$$

0.4 ± 0.027 $(0.37, 0.43)$

We are 90% confident that the interval contains the true proportion of Americans who own guns for protection. The claim of by the NRA is in question given this data.