Section 7-5 Testing a Claim about a Proportion

for testing claims about population proportions

1) The sample observations are a simple random sample.

2) The conditions for a binomial experiment are satisfied (Section 4-3)

3) The condition $np \geq 5$ and $nq \geq 5$ are satisfied, so the binomial distribution of sample proportions can be approximated by a normal distribution with $\mu = np$ and $\sigma = \sqrt{npq}$

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Notation

n = number of trials

* $\hat{p} = x/n$ (*sample* proportion)

p = population proportion (used in the null hypothesis)

$q = 1 - p$

CAUTION

- When the calculation of $\hat{p}$ results in a decimal with many places, store the number on your calculator and use all the decimals when evaluating the z test statistic.
- Large errors can result from rounding $\hat{p}$ too much.

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Test Statistic for Testing a Claim about a Proportion

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$$

Traditional Method

Same as described in Sections 7-2 and 7-3 and in Figure 7-5

P-Value Method

Reject the null hypothesis if the *P*-value is less than or equal to the significance level α.

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Ex1a) In a survey of 1002 people, 701 said that they voted in recent presidential elections. Test the claim that when surveyed, the proportion of people who say that they voted is equal to 0.61, which is the proportion of people who actually did vote. Use a 0.05 significance level with the traditional method of testing.

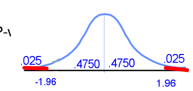
1. H_0: $p = .61$ H_1: $p \neq .61$

2. Find $\hat{p}$: $\frac{701}{1002} = .699600798$

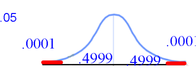
3. test statistics: $\frac{.699600798 - .61}{\sqrt{\frac{.61(.39)}{1002}}} = 5.81$

4. Critical Value or P-v

$\alpha = .05$



p-value :.0002 < .05



5. Conclusion:

Reject H_0: There isn't sufficient evidence to support $\mu = .61$.

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Ex2b) A Republican candidate takes a poll to assess his chances in a two-candidate race. He polls 1200 potential voters and finds that 621 plan to vote for the Democratic candidate. Does the republican have a chance to win? Use α=.05.

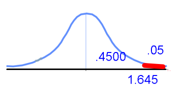
1. H_0: $p \leq .50$ H_1: $p > .50$

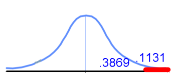
2. Find $\hat{p}$: $\frac{621}{1200} = .5175$

3. test statistics: $\frac{.5175 - .5}{\sqrt{\frac{.5(.5)}{1200}}} = 1.21$

4. Critical Value or P-value:

$\alpha = .05$





5. Conclusion:

Fail to reject the Null: Therefore the republican candidate has less than or = to 50% of the vote so he won't win.

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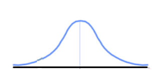
Try. An airline claims that the no-show rate for passengers is less than 5%. In a sample of 420 randomly selected reservations, 19 were no-shows. At α = .01, test the airlines claim.

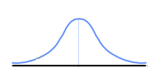
1. H_0: H_1:

2. Find $\hat{p}$:

3. test statistics:

4. Critical Value or P-value:





5. Conclusion:

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