

8.1-8.2 BASICS OF HYPOTHESIS TESTING

Read the Chapter Problem on pg. 391.

Hypothesis: In statistics, is a claim or statement about a property of a population.
Example: "The proportion of all babies born to couples that used XSORT is greater than 0.5."

Rare Event Rule For Inferential Statistics. If, under a given assumption, the probability of a particular observed event is exceptionally small, we conclude that the assumption is probably not correct. [From section 4.1]

Method of Reasoning: Analyze a sample in an attempt to distinguish between results that can easily occur and results that are highly unlikely.

Stating conclusions about claims under the rare event rule:

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COMPONENTS OF A FORMAL HYPOTHESIS TEST

1. **Claim** - The statement in the problem that you are trying to prove.
2. **Null hypothesis** - A statement about the value of a population parameter.
It is denoted H_0 and it must contain the condition of equality.
(=) (*We always assume H_0 to be true*)
3. **Alternate Hypothesis** - The statement that differs from the null hypothesis
The Alternative Hypothesis must use one of these symbols:
(\neq , $<$, $>$)

Identifying Hypotheses. Always write the claim first.

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4. Test Statistic - A sample statistic or a value based on the sample data.

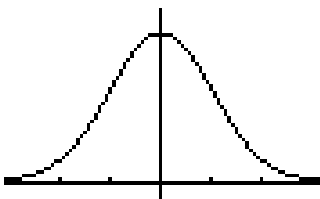
It is the z- score corresponding to the score in the sample.

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}, \text{ where } p \text{ is the proportion of the claim}$$

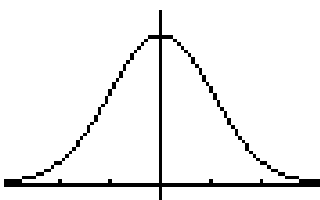
Example: Use the sample data ($n = 880, \hat{p} = 0.56$) and find the value of the test statistic for the claim that the population proportion $p > 0.50$.

Finding the test statistic

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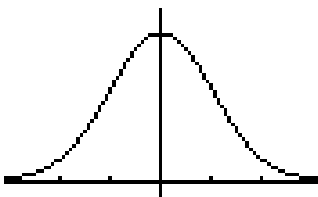
5. **Critical Region** - The set of all values of the test statistic that would cause us to reject the null hypothesis.
6. **Critical Value** - The value or values that separate the critical region from the values of the test statistic that would not lead to rejection of the null hypothesis.
7. **Significance Level** - (α) the probability that the test statistic will fall in the critical region when the null hypothesis is actually true. Use .05 if α is not given.

Two-Tailed, Left-Tailed, Right-Tailed - The tails in a distribution are the extreme regions bounded by critical values.

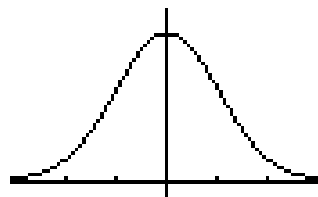
- We reject the null hypothesis if our test statistic is in the critical region because that indicates a significant discrepancy between the null hypothesis and the sample data.
- The tail will correspond to the critical region containing the values that would conflict significantly with the null hypothesis. Thus, the shape of the critical region is determined by the alternate hypothesis (H_1).

Finding critical values :

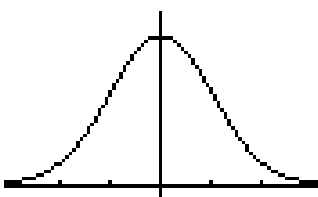
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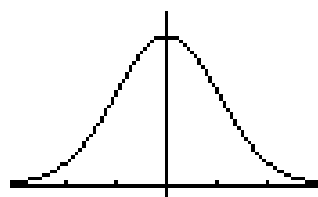
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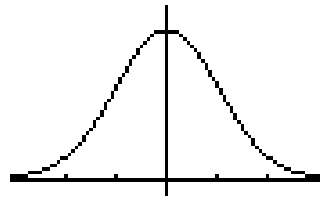
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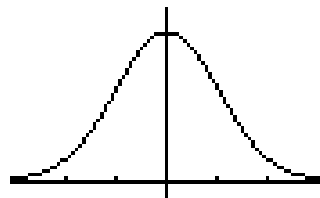
8. **The P-value:** the probability of getting a value of the test statistic that is at least as extreme as the one representing the sample data, assuming that the null hypothesis is true. **The null hypothesis is rejected if the P-value is very small.**

Finding P – values :

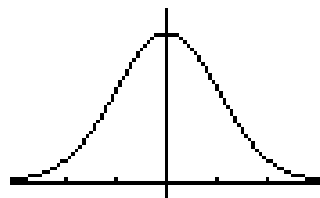
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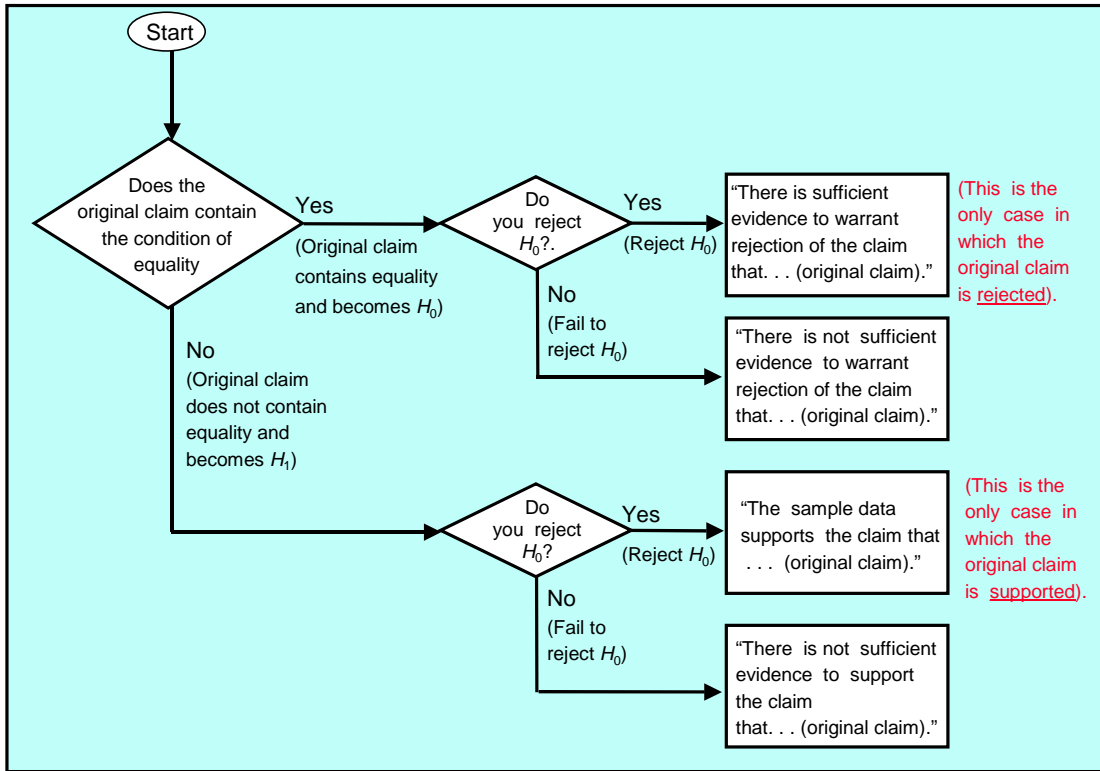


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9. **Conclusion** - Fail to Reject Null or Reject Null pg. 403 and on card

FIGURE 7-4 Wording of Final Conclusion



Note 1: We test the null hypothesis directly in the sense that we assume it is true and reach a conclusion to either reject H_0 or fail to reject H_0 .

Note 2: If your claim is the alternate hypothesis, then you assume the opposite and hope to reject this assumption, thus proving that your claim is correct. (This is the best case scenario.)

Otherwise, if the claim is the null hypothesis, then you either do not prove it right or you reject it.

Stating conclusions

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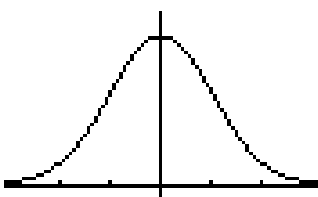
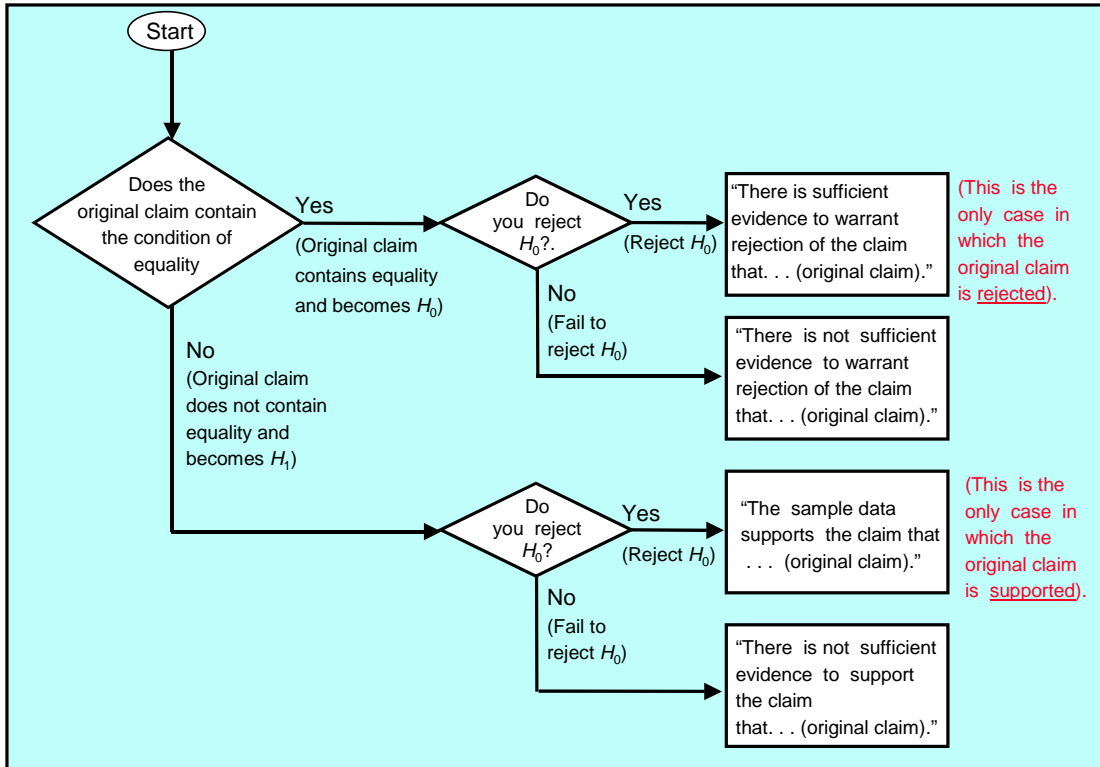
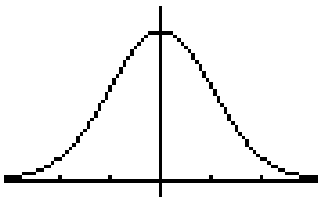


FIGURE 7-4 Wording of Final Conclusion



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TWO TYPES OF ERRORS: (see table 8-1 on p. 405)

- Type I Error: The mistake of rejecting the null hypothesis when it is true. (Can occur when a rare event happens by chance.) The probability of rejecting the null hypothesis when it is true is called the **significance level** and is denoted α . Common choices for α : 0.05 and 0.01.
- Type II Error: The mistake of failing to reject the null hypothesis when it is false. It is denoted by β .

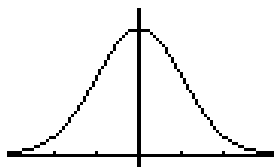
HYPOTHESIS TESTING — CONCLUSIONS

Write the conclusions in each of the four problems given below:

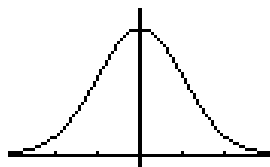
(1) claim : $\mu = 30$

H_o :

H_1 :



a) Reject H_o

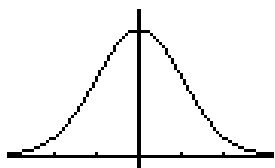


b) Fail to Reject H_o

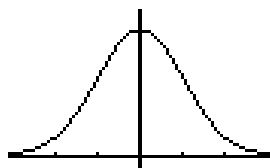
(2) claim : $\mu < 30$

H_o :

H_1 :



a) Reject H_o



b) Fail to Reject H_o