Ch 7.3 Testing Means with large samples

Three Methods Discussed

1) Traditional method
2) P-value method
3) Confidence intervals

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Assumptions

for testing claims about population means

1) The sample is a simple random sample.
2) The sample is large (n > 30).
   a) Central limit theorem applies
   b) Can use normal distribution
3) If σ is unknown, we can use sample standard deviation s as estimate for σ.

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Traditional (or Classical) Method of Testing Hypotheses

Goal Identify a sample result that is significantly different from the claimed value

The traditional (or classical) method of hypothesis testing converts the relevant sample statistic into a test statistic which we compare to the critical value.

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Test Statistic for Claims about μ when n > 30

$$z = \frac{\bar{x} - \mu_{\bar{x}}}{\frac{\sigma}{\sqrt{n}}}$$

Determine the test statistic, the critical values, and the critical region. Draw a graph and include the test statistic, critical value(s), and critical region.

Reject H_0 if the test statistic is in the critical region. Fail to reject H_0 if the test statistic is not in the critical region.

Restate this previous decision in simple nontechnical terms. (See Figure 7-4)

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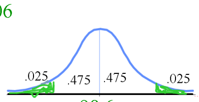
Ex1) Body Temperature: n = 106, $\bar{x}$ = 98.20, s = 0.62 and a .05 significance level. Test the claim that the mean body temp of a healthy adult is equal to 98.6°F using the traditional method.

1. H_0: $\mu = 98.6$ original claim
   H_1: $\mu \neq 98.6$

2. test statistic = $\frac{98.20 - 98.6}{\frac{.62}{\sqrt{106}}}$

3. find the critical value:



4. Conclusion:
Determine if in shaded or non shaded region:
Do you reject or fail to reject the null hyp?
Give a statement of your findings:

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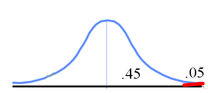
Ex1b)In data set 1 in the back of your book, it lists the weight of 36 Coke cans. $\bar{x}$ = 12.19 oz, s = .66 oz. Upon seeing these stats, a line manager claims that the mean Coke is greater than 12 oz, causing lower company profit. Using a .01 significance level, test the manager claim that the mean coke is greater than 12 oz.

1. H_0: $\mu \leq 12$
   H_1: $\mu > 12$ original claim

2. TS: $= \frac{12.19 - 12}{\frac{.66}{\sqrt{36}}}$ = 10.36

3. Critical Value:



4. Conclusion:

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Try 1. A trucking co. suspects that the mean lifetime of certain tire it uses is less than 35,000 miles. To check the claim, the firm randomly selects and test 54 tires and gets a mean of 34,350 miles with s = 1200 miles. At α=.05, test the trucking co. claim.

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P-Value Method
of Testing Hypotheses

- very similar to traditional method
- key difference is the way in which we decide to reject the null hypothesis
- approach finds the *probability* (*P*-value)

Steps: 1. Identify the Null and Alternative Hyp:
2. Find the Test statistics
3. Use the test statistics as the z-score and find the percentage or p-value that corresponds to the z-score on table A-2.
4. Compare the p-value to the α. If p-value $\le \alpha$, reject H_0.

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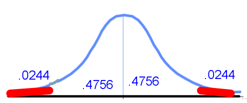
Ex2) Find the p-value for the set of info:
n = 35, x = 19.1, s = 2.7 and test the claim that $\mu \neq 20$.

Find the test statistic: $\dfrac{19.1-20}{\frac{2.7}{\sqrt{35}}} = 1.97$

look up 1.97 on A-2 =.4756



p-value = Shaded Region .0244(2) = .0488

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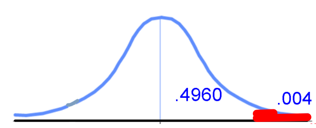
Ex2b) Find the p-value:
n = 40, x = 26.8, s = 4.3. Test the claim $\mu \le 25$.

Find the test statistic: $\dfrac{26.8 - 25}{\frac{4.3}{\sqrt{40}}}$ =2.65

look up 1.97 on A-2



p-value = Shaded Region

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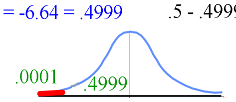
Ex3a) Let's use the P-value method to test body temperatures: n = 106, x = 98.20, s = .62. Use α=.05 and μ = 98.6.

1. H_0: μ = 98.6 original claim
   H_1: $\mu \neq 98.6$

2. test statistic = $\dfrac{98.20 - 98.6}{\frac{.62}{\sqrt{106}}}$ = -6.64

3. Find the p-value: look up on A-2 the z score that corresponds with the test statistics.
   z = -6.64 = .4999 .5 - .4999



4. Conclusion:
   .0001 < .05 so reject the null
   There is significant evidence to reject the μ = 98.6.

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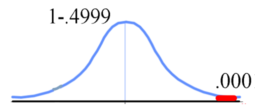
Ex3b) Look at the Coke Data:n = 36, x = 12.19 oz, s = .11 oz. α=.01 and test μ > 12 oz.

1. H_0: $\mu \le 12$ and H_1: μ< 12

2. TS = $\dfrac{12.19 - 12}{\frac{.11}{\sqrt{36}}}$ = 10.36

3. Find the p-value: z = .4999
   1-.4999



4. .0001 < .01 so reject the H_0: Significant evidence mean is greater than 12 ounces.

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Try #2. A fast food outlet claims that the mean waiting time in line is less than 3.5 minutes. A random sample of 60 customers has a mean of 3.6 minutes with s = .6 mins. If α =05, the fast food claim using a p-value.

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