MATH 1342

Test 3 Review

20 Multiple Choice Questions:

10 Questions (7 points each)

10 Questions (3 points each)

[2 groups of 5 questions, 1 question per step]

Topics to know:

When to use each type of test.

z-test vs. t-test for means

Concluding based on p vs α

Effects of changes to the Confidence Interval

Hypothesis tests:

Test	Null Hypothesis	Test Statistic
One-sample z-test for means	$\mu = \mu_o$	$z = \dfrac{\bar{x} - \mu_o}{\frac{\sigma}{\sqrt{n}}}$
One-sample t-test for means	$\mu = \mu_o$	$t = \dfrac{\bar{x} - \mu_o}{\frac{s}{\sqrt{n}}}$; df = n–1
Matched Pairs t-test	$\mu_D = \mu_{D_0}$	$t = \dfrac{\bar{x}_D - \mu_D}{s/\sqrt{n}}$; df = n – 1
One-sample z-test for proportions	$p = p_o$	$z = \dfrac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$
Two-sample t-test for means	$\mu_1 - \mu_2 = 0$ or $\mu_1 = \mu_2$	$t = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$; df=min(n1,n2)-1
Two-sample z-test for proportion	$p_1 - p_2 = 0$ or $p_1 = p_2$	$z = \dfrac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\left(\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}\right)}}$
χ^2 Goodness of fit test	no change	$\chi^2 = \sum \dfrac{(\text{observed} - \text{expected})^2}{\text{expected}}$

Confidence Intervals

General formula: *statistic* ± *margin of error*

One-sample z-test: $\bar{x} \pm z^* \dfrac{\sigma}{\sqrt{n}}$

Two-proportion z-test: $(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\dfrac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \dfrac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$

One-sample t-test: $\bar{x} \pm t^* \dfrac{s}{\sqrt{n}}$

One-proportion z-test: $\hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$

Two-sample z-test: $(\bar{x}_1 - \bar{x}_2) \pm z^* \sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$

Two-sample t-test: $(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$

An 80% confidence interval was calculated to show the difference in passing percentages of the Biology Final Exam and Algebra Final Exam. The resulting interval was [.04, .12].

Answer the following, if it is possible to calculate:

- The difference in the sample proportions.
- The pass rate of the Algebra Final Exam.
- The margin of error for the difference between these passrates.
- Are the two samples of equal size?
- Was a t-test or a z-test used?
- Which final exam had the higher passrate?

A confidence interval is calculated using a two-sample t-test for means and the resulting interval was [10, 30]. Determine the difference in sample means and the margin of error of this interval.

A study was conducted to determine the mean number of traffic tickets a person receives by the age of thirty. A 90% confidence interval was calculated, yielding [4, 10] as the result. Give an explanation of this interval.

A SRS of 81 observations produced a mean of 250 with a standard deviation of 22. Determine the 95% confidence interval for the population mean.

A random sample of 64 observations produced a sample proportion of 0.23. Determine the 95% confidence interval for the population proportion.

After performing a p-test, the P-Value is found to be smaller than the significance level (α). How should you proceed?

a. Reject the Null Hypothesis
b. Accept the Alternate Hypothesis
c. Fail to Reject the Null Hypothesis
d. Accept the Null Hypothesis
e. Fail to Reject the Alternate Hypothesis
f. Perform a q-test to confirm results
g. Accept them both, the more the merrier!
h. Throw a party
i. Any or All of the above are acceptable (*no one really hypothesis tests anyway*)

Which of the following will increase the width of confidence interval for the sample mean?

- Decrease the sample size
- Increase the confidence level
- Increase the sample size
- Decrease the confidence level
- Increase the variance
- Decrease the standard deviation
- Increase the value of the mean
- Decrease the value of the mean

The weights of pennies produced by the US Mint is determined to have a standard deviation of 0.2 grams. You wish to create a mean confidence interval of level 90%. How large of a sample of pennies should you select to have a margin of error of .02?

A one-sample z-statistic for a test of Ho: $\mu = 53$, and Ha: $\mu > 53$ based of 75 observations and calculations show $z = 1.837$.
Determine the p-value.

An assortment of candies claims that their sample bag contains the following: 15% Snickers, 35% Milky Way, 25% Three Musketeers, 15% Almond Joy and 10% Mounds.
From a bag of 200 candies, you find there are 30 Snickers, 35 Milky Way, 40 Three Musketeers, 45 Almond Joy and 50 Mounds.
Use a $\chi 2$ test for goodness of fit to determine if the company's claim is accurate. (Use $\alpha = 0.01$)

Continued from Previous Slide

Candy Name	Expected Percents	Observed Amounts
Snickers	15%	30
Milky Way	35%	35
Three Musketeers	25%	40
Almond Joy	15%	45
Mounds	10%	50
	Total	200

To determine the effectiveness of a summer reading program, a sample of 50 children were tested for their reading speed before and after the program. The mean difference of this sample was an increased reading speed of 1.4 minutes for one page of text (with a standard deviation of 0.03 minutes). Determine if the reading program was effective of the program with a significance of 2%.

Determine the Null and Alternate Hypothesis.

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Draw a conclusion.

Various studies state that, worldwide, 1% of persons suffer from Autism. You believe that this number should be higher. You take an SRS of 500 people and find that 8 people have Autism. Test your claim with 5% significance.

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