Sample Exam Math 105 Test 2a

1. In a survey of 9700 T.V. viewers, 40% said they watch network news programs. Find the margin of error for this survey if we want 95% confidence in our estimate of the proportion of T.V. viewers who watch network news programs.
a) .0112   b) .0128   c) .00731   d) .00975

2. A textbook reports that 22% of male fireflies are unable to produce light due to a genetic mutation. An entomologist claims that this percentage is smaller than 22%. She studies the genetic make-up of a sample of fireflies and finds that 19% are unable to produce light due to a genetic mutation. Which of the following is the most appropriate set of hypotheses to test the entomologist's claim (circle one)?

a) H_0: p=.22 vs H_a: p<.22   b) H_0: p=.19 vs H_a: p<.22   c) H_0: p=.19 vs H_a: p<.19
d) H_0: $\hat{p}$=.22 vs H_a: $\hat{p}$<.22   e) H_0: $\hat{p}$=.19 vs H_a: $\hat{p}$<.19

3. A psychologist claims that more than 3.7 percent of the population suffers from professional problems due to extreme shyness. Pick the correct null and alternative hypotheses to test this.

a) H_0: μ>.037 H_1: μ=.037   b) H_0: p>.037 H_1: p=.037
c) H_0: μ=.037 H_1: μ>.037   d) H_0: p=.037 H_1: p>.037

4. The test statistic in a right tailed test is z=.52. Find the p-value
a) .3015   b) .1950   c) .1915   d) .5530

5. The test statistic for a two-tailed test is z=1.95. Find the p-value.
a) .0512   b) .0244   c) .3415   d) 1.9488

6. If we were to test the hypotheses H_o: μ=6 versus H_a: $\mu\neq6$ at the significance level is .05 and reject H_0, then the p-value must be
a) less than .05   b) greater than .05   c) can't tell based on this information

7-8: The significance level and p-value of a hypothesis test are given. Decide whether the null hypothesis should be rejected

7. significance level=.10, P-value=.17
a) Reject the null hypothesis   b) Do not reject the null hypothesis

8. significance level=.01, P-value=.006
a) Reject the null hypothesis   b) Do not reject the null hypothesis
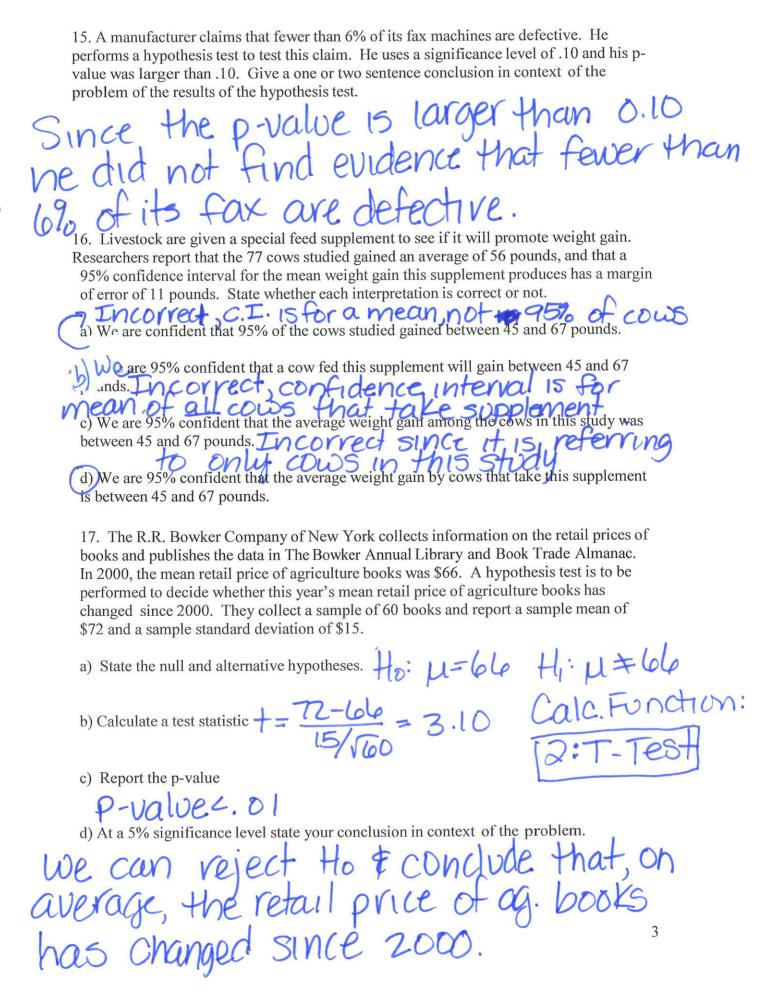
9. Circle True or False (2 points each)

True   False   a) The smaller the p-value, the greater the evidence against H_0.
True   False   b) A large p-value proves that the null hypothesis is true.
True   False   c) The sample mean is always at the center of a confidence interval for the population mean.

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10. In an opinion poll, 36% of 250 people sampled said that they were strongly opposed to a state lottery. The sample proportion is
a) 72   b) 36   c) 250   d) 1.96   e) 0.05

11. You wish to estimate the proportion of all voters in California who plan to vote in favor of a certain ballot measure. Obtain a sample size that will ensure a margin of error of .015 for a 95% confidence interval. From a pilot study we know that $\hat{p}$ will be around .57.

$$n = \frac{z^2 \hat{p}\hat{q}}{E^2} = \frac{1.96^2 \times .57 \times .43}{.015^2} = 4184.7$$

$$\Rightarrow \boxed{4185}$$

12. A nutrition laboratory tests 40 reduced sodium hot dogs, finding the mean sodium content is 310 mg and standard deviation of 36 mg.
a) Calculate a 95% confidence interval for the mean sodium content for this type of hot dog.

$$310 \pm 2.03 \frac{36}{\sqrt{40}} = (298.4, 321.6)$$

b) Interpret your confidence interval. Calc Function: $\boxed{8: TInterval}$

We can be 95% confident that, on average, reduced sodium hotdogs will have between 298.4 & 321.6 mg of sodium.

13. Suppose a 95% confidence interval for the proportion of patients who recovered completely from a complicated surgery was (.74, .86).

a) Give the margin of error. $E = \frac{.86 - .74}{2} = .06$

b) Give the point estimate, $\hat{p}$. $\hat{p} = \frac{.86 + .74}{2} = .8$

14. A researcher wishes to estimate the proportion of adults in the city of Darby who are vegetarian. In a random sample of 770 adults from this city, 6.7% were vegetarians. Find and interpret a 95% confidence interval for the proportion of all adults in the city of Darby that are vegetarians. Calc. Function: $\boxed{A: 1 PropZInt}$

$$.067 \pm 1.96 \sqrt{\frac{.067 \times .933}{770}} = (.0493, .0847)$$

We can be 95% confident that between 4.93 & 8.47% of Darby residents are vegetarians.

15. A manufacturer claims that fewer than 6% of its fax machines are defective. He performs a hypothesis test to test this claim. He uses a significance level of .10 and his p-value was larger than .10. Give a one or two sentence conclusion in context of the problem of the results of the hypothesis test.

Since the p-value is larger than 0.10 he did not find evidence that fewer than 6% of its fax are defective.

16. Livestock are given a special feed supplement to see if it will promote weight gain. Researchers report that the 77 cows studied gained an average of 56 pounds, and that a 95% confidence interval for the mean weight gain this supplement produces has a margin of error of 11 pounds. State whether each interpretation is correct or not.

Incorrect, C.I. is for a mean, not 95% of cows

a) We are confident that 95% of the cows studied gained between 45 and 67 pounds.

b) We are 95% confident that a cow fed this supplement will gain between 45 and 67 pounds. Incorrect, confidence interval is for mean of all cows that take supplement

c) We are 95% confident that the average weight gain among the cows in this study was between 45 and 67 pounds. Incorrect since it is referring to only cows in this study

d) We are 95% confident that the average weight gain by cows that take this supplement is between 45 and 67 pounds.

17. The R.R. Bowker Company of New York collects information on the retail prices of books and publishes the data in The Bowker Annual Library and Book Trade Almanac. In 2000, the mean retail price of agriculture books was $66. A hypothesis test is to be performed to decide whether this year's mean retail price of agriculture books has changed since 2000. They collect a sample of 60 books and report a sample mean of $72 and a sample standard deviation of $15.

a) State the null and alternative hypotheses. $H_0: \mu = 66$ $H_1: \mu \neq 66$

b) Calculate a test statistic $t = \dfrac{72-66}{15/\sqrt{60}} = 3.10$ Calc. Function: $\boxed{2:\text{T-Test}}$

c) Report the p-value

p-value < .01

d) At a 5% significance level state your conclusion in context of the problem.

We can reject H_0 & conclude that, on average, the retail price of ag. books has changed since 2000.

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18. It has been stated that about 6% of children in the US suffer from asthma. Parents in a certain town are worried that children in their town have a higher rate of asthma. In a sample of 400 randomly selected children from this town, 26 of them had asthma. Is this evidence to support that their town has a higher incidence of asthma? Use a significance level of .05.

a) The parameter of interest in this study is:

    a) $\hat{p}$, the proportion of children in the sample that have asthma

    b) p, the proportion of children in the town that have asthma

    c) $\hat{p}$, the proportion of children in the town that have asthma

b) State the null and alternative hypotheses for the test. **Calc Function:**

$$H_0: p = .06 \qquad H_1: p > .06$$

5:1PropZtest

c) Calculate the test statistic and p-value.

$$\hat{p} = 26/400 = .065 \qquad z = \frac{.065 - .06}{\sqrt{\frac{.06 \times .94}{400}}} = .42 \qquad \text{p-value} =$$

$$1 - .6628$$

d) In one or two complete sentences give a conclusion.

$$= .3372$$

The p-value is larger than .05 so we can not reject H_0. We can't conclude that the rate of autism is higher than 6%.

19. Many cities and states are finding it more difficult to offer low-cost college educations. In 2008-2009 the mean cost of *all* two-year colleges was $2380. A random sample of 35 two-year colleges in the United States found that the average tuition for these colleges was $2429. The standard deviation, s, was $1160. Conduct a hypothesis test to see if, on average, the cost of two-year colleges have increased from 2008-2009. Use a significance level of 0.05, α=.05.

a) State the null and alternative hypotheses.

$$H_0: \mu = 2380 \qquad H_1: \mu > 2380$$

b) The p-value for the above test was 0.402. State a conclusion in context of the problem.

Since the p-value is > .05 we can not reject H_0. Therefore, we did not find that the average price of two-year colleges has increased.

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