**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Math 127 – Exam 3 – Fall 2016**

**Oath: “*I will not discuss the exam contents with anyone on planet Earth until the answer key is posted to Blackboard.”***

**Sign Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**The penalty for cheating on this exam is a grade of 0% for Math 127 Exam 3.**

**VERSION KARDASHIAN**

**Testing Center Staff Instructions**

**1. One sheet of handwritten or typed notes is OK.**

**Students may not use the “pink sheet” or any copied or scanned answer keys or Math 127 department documents.**

**2. Collect the sheet of notes and staple it to the test when submitted.**

**3. Any calculator is OK. No cell phones.**

**4.** [**www.statcrunch.com**](http://www.statcrunch.com) **is required. All other webpages are prohibited.**

**5. Test must be completed in one sitting, but it is untimed. Very short bathroom breaks are permitted.**

**Student Instructions**

**1. This test is graded out of 100 points and counts for 25% of your Math 127 grade.**

**2. Show work when necessary or points will be deducted. If you only report an answer and it is wrong, you will receive no credit.**

**3. Points are in parentheses for each question.**

**4. Good luck, do your best, it was a pleasure working with you this semester.**

**1.** Short Answer Hypothesis Test / Confidence Interval Problems. Use the “**Retired - Calendar Year 2016 Large Survey**” dataset for this question. We learned five types of hypothesis tests, and for **1a – 1e** below, there is one example of each.

**1a. (2)** Test if the mean “***Age***” of all Cecil College students is more than 22. Test statistic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**1b. (2)** Test if, on average, “***Female***” “***Ideal Children***” exceeds “***Male***” “***Ideal Children***”. P-value: \_\_\_\_\_\_\_\_\_\_\_\_\_

**1c. (2)** Test if a higher proportion of “***Christian***” students are most motivated by “***Love***” when compared to the “***Catholic***” students. Test statistic: \_\_\_\_\_\_\_\_\_\_\_\_\_

**1d. (2)** Test if a majority of our students have a “***Credit Card***”. P-value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**1e. (2)** Test if the typical student at Cecil has, on average, more “***Student Loan Debt***” than “***Credit Card Debt***” by creating a new variable “***Student Loan Debt***” – “***Credit Card Debt***” and testing if the mean of the differences is positive. Test Statistic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2.** A test was run by medical researchers to determine if the proportion of patients experiencing sleeplessness using “***Tirosint***” was larger than the proportion using “***Levoxyl***”. The test was run at  and the researchers failed to reject the null hypothesis.

**2a. (2)** If the test was run at the level, what would the researchers do? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2b. (2)** What kind of error could the researchers have made using? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2c. (2)** If the researchers used the data to make either 99% or 95% intervals for the true difference in proportions, would that interval include the value 0%? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.** A 95% interval for the proportion of Cecil students who have taken English 101 at a different school was (19.8%, 23.2%).

**3a. (2)** Calculate margin of error: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3b. (2)** Calculate the sample proportion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Space to Calculate:**

**3c. (2)** A 94% interval would be: Skinnier Wider Of Equal Length Can’t Tell

**4. (2)** A 99% interval for the true mean “***Household Size***” of Cecil College students was (??????, 4.12) and the margin of error was 0.89. Calculate the lower bound.

**5. (2)** We run a hypothesis test for a proportion and the test statistic ends up being 0. Then certainly, the value of  would be equal to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**6. (2)** About half of adults are single in the USA, according to Forbes back in 2014. We will conduct a study here in the county, and need to compute the required sample size. We require 98% confidence and a margin of error of 3%. Show calculation.

**7. (2)** The average age people get married has jumped to 28 nationwide. Is it younger here in Cecil County? We will collect a sample to investigate, and we will use 95% confidence. Our estimate can be within one year of the true value, and we will use an estimated standard deviation of two years for our calculation. Show work.

**8. (1)** Statistically significant data means: We reject H0 We fail to reject H0

**9. (1)** Type II errors can occur when: We reject H0 We fail to reject H0

**10. (1)** Big test statistics go with when: We reject H0 We fail to reject H0

**11. (1)** Big P-values go with when: We reject H0 We fail to reject H0

**12. (1)** P-value = 0.0404, , and: We reject H0 We fail to reject H0

**13. (1)** HA: *p* > 0.44, and 95% CI (0.4392, 0.4818), and: We reject H0 We fail to reject H0

**14.** Let us presume the proportion of all Cecil students who place importance in “***Astrological Sign***” is 28% for the whole school. We will cook up the sampling distribution model for the sample proportion for samples of size *n* = 275. No dataset for this problem.

**14a. (2)** Determine the mean and standard deviation for the model. Round your standard deviation to three places. Show calculation.

**14b. (2)** What is the probability that a sample of 275 students has 83 or more students that place importance in “***Astrological Sign”?*** Draw a shaded model to support.

**14c. (2)** The 95th percentile of the distribution is 0.3244 = 32.44%. Clearly interpret this value with a sentence in the context of the problem:

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**15.** IQ scores of Cecil College students follow a Normal(101, 15) model. We will cook up the sampling distribution for the sample mean for samples of size *n* = 9.

**15a. (2)** Mean and standard deviation of the  model:

**15b. (2)** Why is the  model Normal? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**15c. (2)** P(Sample of 9 students have a mean IQ over 105) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**15d. (2)** P(Sample of 9 students have a mean IQ under 100) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**15e. (2)** 93rd Percentile of the sampling distribution: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**15f. (2)** Two cutpoint IQ values of that, if the sample mean exceeded those values, would lead you to believe that at Cecil College, N(101, 15) is **not** the correct IQ model.

Cutpoint #1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Cutpoint #2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**16.** Test if the mean “***Copyright***” for books written by “***Females***” is newer than the mean “***Copyright***” for books written by “***Males***”. Use “***Females***” as sample #1. “**Retired - Calendar Year 2016 Library Data**”.

Ignore the “***Cannot Determines***”.

Uncheck the “***Pool Variances***” box.

**16a. (2)** Hypotheses: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**16b. (2)** Appropriate summary statistics:

**16c. (0)** Test Statistic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**16d. (2)** P-value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**16e. (2)** Decision: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Just use an  so we all decide the same thing)

**16f. (2)** Conclusion, in context: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**16g. (2)** Interpret the test statistic of *t* = 1.73 with a sentence in context: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**16h. (2)** Interpret the P-value with a sentence in context: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**16i. (2)** If a Type I error were made, explain in context what that would mean: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**16j. (2)** Interpret the standard error of the difference in sample means, SE = 2.58 years: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**17.** Test if more than 10% of the “***Males***” think “***Contraception Is Wrong***” with a one-sample test. Use the “**Retired -** **Calendar Year 2016 Large Survey**”. Points awarded for hypotheses, summarized data, test statistic, P-value, decision, conclusion.

**17a. (2)** Check conditions first. Thoroughly.

**17b. (12)**Now finish off the test:

**18.** Use a 99% confidence interval to determine if the mean “***Number of Tattoos***” for only the “***Females***”

exceeds 1, “**Retired - Calendar Year 2016 Large Survey**” dataset.

**18a. (2)** Hypotheses: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**18b. (2)** 99% CI: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**18c. (2)** Decision: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**18d. (2)** Conclusion in context: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**19. (6)** Do we have statistical evidence that at Cecil College, a higher proportion of “***Females***” “***Own***” their home, compared to the “***Males***”? Variable = “***Living Situation***” and use the “**Retired - Calendar Year 2016 Large Survey**”.

Run the test. All we need is the concluding remark with a P-value included in your write up.

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Do products typically have more “***Sugar Grams***” compared to “***Fat Grams***”?

Use the “**Retired - Calendar Year 2016 Food Bank**” dataset.

We will presume this is an unbiased sample of all grocery store products.

Run the appropriate hypothesis test to determine if we have evidence for or against the above question.

Points awarded for correct hypotheses, summarized data, test statistic, P-value, decision, and conclusion.