**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Math 127 Exam 3 Fall 2017**

**Version Venus**

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

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

**Permitted Materials:** One-sheet of handwritten or typed notes. No copies of published materials.

The datasets are found on [www.statcrunch.com](http://www.statcrunch.com). No other webpages.

Any calculator is permitted or use the calculator found on the computers.

No cell phones on the desk. No cell phone calculators.

You must staple your sheet of notes to the exam.

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

* Show all work when appropriate. StatCrunch can be used for everything unless you are explicitly asked to show a calculation.
* Points are in parentheses for each problem.
* This test is graded out of 100 points and counts for 25% of your Math 127 grade.
* The graded exams are kept on file for at least one year and students are welcome to come collect them whenever I am available in my office.
* An answer key should be posted on Blackboard by Friday, December 15 after the testing is completed.
* Final letter grade cutoffs should be posted to Blackboard by Friday, December 15 around 5 pm. Your numerical “Course Grade” on Blackboard is your final grade in Math 127 and you will know your letter grade based on my announcement. 89.5% is a guaranteed A. 79.5% for a B. 69.5% for a C. 59.5% for a D.
* Letter grades will be posted to MyCecil, but students may see WIP for a few days.
* Good luck on this exam. It has been my pleasure to work with you this semester.

**1.**  Let’s suppose we know with certainty that 73% of all Cecil students were born in Maryland. We will cook up the sampling distribution model for  and then use the model to answer a few hypothetical questions.

Presume the sample size is *n* = 100 random Cecil students.

**1a. (1)** First, we need the mean and standard deviation for the Normal model for the sample proportion:

**1b. (2)** Second, take a hypothetical sample of 100 Cecil students. What’s the probability that we get 80% or more being born in Maryland?

**1c. (2)** Third, for the sampling distribution Normal model, determine the 9th percentile: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**1d. (2)** Fourth, suppose a sample of *n* = 100 had 68 students from Maryland. Convert the sample proportion to a *z*-score:

**1e. (2)** Fifth, suppose we take an unbiased sample of 100 Cecil students and the sample proportion gave us a *z*-score of *z* = 1.505. Do the algebra to solve backwards for that sample proportion.

**2. (1)** We are testing  and you are given the test statistic of

*t* = 2.314 with *n* = 40 and df = 39. Give the P-value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3. (2)** You ran a 95% confidence interval for a proportion and got (14.15%, 20.94%). Give the margin of error: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name one action you could take to reduce the margin of error: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4. (1)** You ran a 99% confidence interval for a population mean and got (205.65 lbs., 215.35 lbs.). Determine the sample mean: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5. (2)** You’d like to estimate Professor Kupe’s true mean thyroid hormone (T3) to within 20 nanograms. You can live with 95% confidence. It is reasonable to assume the standard deviation is about 25 nanograms, because typical ranges for healthy adults are (80 – 180 ng / dl).

How many times do you recommend he get blood work drawn? Solve for the sample size.

**6. (2)** Let’s get to the bottom of this Alabama Senate Special Election (Roy Moore (R) vs. Doug Jones (D)). We’d like to know the proportion of likely Alabama voters who support Roy Moore. We will collect our own unbiased data, but most internet sites today (Friday, December 8, 2017) have Moore at about 48%. We need 99% confidence and we will use a margin of error of 3%.

Solve for the sample size we’ll need for our last minute data collection in Alabama.

**7.** Here’s your  model problem. Pretend with certainty we know that the mean IQ of all *N* = 2861 Cecil students is 101.17 and we assume the standard deviation to be 15 points.

**7a. (2)** Determine the mean and standard deviation of the model if we took a sample of size *n* = 10 students.

**7b. (1)** Why can we blow off the “*sample size at least 30*” condition for the Normal model to kick in?

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**7c. (2)** P(10 Cecil students have a mean IQ over 110) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**7d. (2)** P(10 Cecil students have a mean IQ under 100) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**7e. (2)** Give a range of values for  that would ***not*** be surprising if you took a sample of *n* = 10 Cecil students.

**8. (1)** Which hypothesis is presumed true before you collect your data? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9. (1)** Which hypothesis is presumed true if you got a P-value of 0.0007? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**10. (1)** What kind of mistake could you make if the null hypothesis is true? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**11. (1)** All things held constant, except crank up the sample size. P-value would:

Increase Decrease Stay the Same

**12. (1)** All things held constant, except crank up the sample size. Margin of error would:

Increase Decrease Stay the Same

**13.** Use the “**ZZZ Retired - Calendar Year 2017 Personality Types**” dataset. Do we have evidence more than half of all Cecil College students are “***S***” = “***Sensing***”?

**13a. (2)**Hypotheses: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13b. (3)**Check conditions #1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#4 Who cares, *n* = 405 < 10% of Cecil College population size

**13c. (2)**Summarized Data: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13d. (2)**Test Statistic: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13e. (2)**P-value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13f. (2)** Decision: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13g. (2)**Conclusion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**13h. (2)**Interpret the test statistic with a sentence in context: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**13i. (2)** Interpret the standard error of 0.0248 = 2.48% with a sentence in context: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**13j. (2)**If you made a mistake, what type? \_\_\_\_\_\_\_\_ Explain the reality of the situation if that did happen:

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**14. (12)**Use the “**ZZZ Retired -** **Calendar Year 2017 Food Bank**” dataset. Run the appropriate test to determine if the mean “***Calories***” for non-perishable foods exceeds 100 calories per serving. Points awarded for hypotheses, summarized data, test statistic, P-value, decision, and conclusion.

**15. (12)**Use the “**ZZZ Retired -** **Calendar Year 2017 Large Survey”** dataset. Test if, on average, “***Males***” watch more “***TV***” than “***Females***” do. Run the two-sample test. Points awarded for hypotheses, summarized data, test statistic, P-value, decision, and conclusion.

**16. (12)**Use the “**ZZZ Retired -** **Calendar Year 2017 Large Survey”** dataset. Test if a higher proportion of “***Female***” students have “***Student Loans***” when compared to the “***Male***” students. Points awarded for hypotheses, summarized data, test statistic, P-value, decision, and conclusion.

**17. (12)**Confidence interval questions. Use 95% confidence for all intervals.

Use the “**ZZZ Retired -** **Calendar Year 2017 Large Survey**” dataset.

CI for the true proportion of all Cecil students who have been in the “***Military***”:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CI for the true difference in proportions for “***Males***” vs. “***Females***”, “***Favor***” the “***Death Penalty***”:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CI for the true mean “***Credit Card Debt***”, all Cecil students:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CI for the true difference in means, “***Males***” vs. “***Females***”, for amount of “***Sleep***”:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_