Math 247: Homework Set 3 (Spring, 2020) **Name:**_____

Non-StatCrunch _____/13 points StatCrunch _____ / 12 points

Requirements: In order to receive credit on homework problems, you must

- Briefly **summarize** the question asked by the problem. *Writing just a few words (e.g. "find mean and standard deviation") is fine; you don't have to write down the entire problem.*
- **Show your work**
  - If the question is conceptual, write the answer and BE SURE to include an explanation in your own answer if the problem asks for one.
  - If the problem involves computation by hand then clearly show your work.
- **Check your answers** in the back of the book. If your answer is incorrect, then you have to go back to *find and fix the error*.
- If the problem involves computation by **StatCrunch** then save your work in a Word document and **print it out**. **Write the answers to the follow-up questions** for that problem by typing or by writing it later by hand on the printout.

Self-Assessment: Determine total number of correctly done problems (they don't have to be done correctly the first time…just make sure you find and fix any errors in your work!) and put that score in the last column.

If you give credit for a problem that hasn't been completed, you will lose 1 point on the overall grade (for example, if you put down 9/9 in Assignment 1 but have completed only 6 problems, your entire score on the homework packet will lose 3 points). **Please be honest and accurate in your assessment.**

Homework is due on the day of the exam. **Even Answers**: See "**Select even answers**" on the last page

	Read this section:	Do these problems:	Completed/ Total (you fill in)
1	**Section 3.2:** What's Unusual? The Empirical Rule and z-scores	**3.2 Exercises**, page 123: 27, 29 (on #27 and 29, sketch the symmetric, bell-shaped curve to answer the question), 31, 33, 35, 37 (on #31 – 37, use z-scores to answer the questions)	☐ /6
2	**Section 6.2:** The Normal Model Note: **Use the StatCrunch Normal Distribution Calculator**	**6.2 Exercises,** page 291: 13, 15, 21, 23, 25, 27, 29, 31 ***For credit on these problems,*** *you must include a sketch of a normal distribution that illustrates the problem and solution.*	☐ /8
3	**Section 7.3:** The Central Limit Theorem for Sample Proportions	**7.3 Exercises,** page 347: 35, (on #35 you don't have to check the Conditions) 41b, 43ac	☐ /3
Note: The following assignments are drawn from Sections 8.1, 8.2, and 8.3. The order of problems has been rearranged to optimize the flow of the material. Please do them in the order given.			
4	**Setting Up Hypotheses (Section 8.1)**	8.1, page 395: 1, 2, 3, 4, 5, 6, 7, 13a	☐ /8

5	**Performing a Hypothesis Test (Section 8.2)**	8.2, page 398: **No technology required**: 30, 32 **Non-StatCrunch AND StatCrunch:** 35, 37, 39 **Instructions** on #35,37,39: First do all four steps of the Hypothesis Test by hand, as shown in your notes. Use the Normal Distribution Calculator to find the area (which will need to be doubled to get the P-value). Then do the "Calculate" step again using StatCrunch. StatCrunch may give slightly different numbers due to rounding. **Include a printout of the StatCrunch results for these 3 problems in your homework.**	☐ /5
6	**Interpreting P-values and graphs (Sections 8.1, 8.2, 8.3)**	8.1, page 398: 17 8.2, page 397: 26, 28, 33, 34 8.3, page 399: 43, 53	☐ /7
7	**Type I and Type II Errors and wrap up. (Sections 8.1, 8.3)**	8.1, page 396: 11 8.3, page 399: 46, 48, 55, 49, 59	☐ /6
8	**Section 7.4: Estimating Proportions with Confidence Intervals**	**7.4 Exercises,** page 349: 45, 46, 49 **By hand:** 47ac, 51 **StatCrunch:** 53, 55, 61 **Include a printout of the StatCrunch results for these 3 problems in your homework.**	☐ /8

Even Answers:

Chapter 7

7.2: A sample is a smaller group within a population. Every 10 years the Census Bureau tries to collect data on every single person living in the U.S.)

7.4: $\mu = 2.78, \quad \overline{x} = 2.93$

7.6: No, we can't make an inference about all college students' heights from this sample. A sample consisting of only basketball players will be neither random nor representative. These heights will be show a positive bias (consistently larger than the population values).

7.8: No, you would miss students who don't use the library. Not all students have an equal chance of being picked.

7.10: Without replacement.

7.12: Answers will vary. Be sure to give the numbers from the Random Number generator. You could also pull two names from a hat.

7.20: (a) Widely scattered shots would show variation. (b) See notes.

7.22: No, this sample would not be unbiased for a couple of reasons. (1) Your own age bias might lead you to approach people more similar to you in age (since you'd feel more comfortable. (2) The online students are usually older so there would be negative bias in your sample (younger ages) since you wouldn't be able to include them in your sample.

7.28: The larger the sample, the more normal (bell-shaped) the dotplot will be so we would know that graph C was from the largest sample and graph A was from the smallest (shows the most skewing).

7.46: We are 95% confident that the population proportion of adults (assume in the U.S) who think marriage is becoming obsolete is between 36.9% and 41.2%.

Chapter 8

8.2 In statistical inference, measurements are made on a sample, and generalizations are made to a population.

8.3 H_0: The proportion of criminals who attend boot camp who return to prison is less than 0.40. H_a: $p < 0.40$

8.4 H_0: The rate of infection with the new scrub is less than 4%. H_a: $p < 0.04$

8.5 a. i
b. i

8.6 a. iii
b. iii

8.26 a. $0.18(300) = 54$

b. Figure A is correct because the alternative is two-sided. The p-value equals 0.548 (two-tailed). This means that the probability of getting 50 or fewer or 58 or more who suffer from anxiety disorder in a random sample of 300 college students, if the population proportion is 0.18, is about 55%.

8.27 Figure B is correct because the alternative hypothesis should be one-sided, since the person should get better than half right if she or he can tell the difference.

8.28 Figure A is correct because we should use a two-sided alternative hypothesis. We are testing to see whether seat belt use has changed.

8.30 a. There should be about $0.04(250) = 10$ female CEOs out of 250.

b. *Step 1*: H_0: $p = 0.04$, H_a: $p \neq 0.04$.

Step 2: One-proportion z-test, $\alpha = 0.05$

Random Sample: Assumed

Large Sample: $np_0 = 250(0.04) = 10 > 10$ and $n(1-p_0) = 250(0.96) = 240 > 10$

Large Population: There are more than $10 \times 250 = 2500$ large companies in the population.

Independence: Assumed.

8.32 *Step 3*: $z = 1.61$; p-value = 0.107.

Step 4: Do not reject the null hypothesis because 0.107 is more than 0.05. We cannot reject the hypothesis that the proportion of women CEO's in large companies is 0.04.

8.34 Both of the sketches have shaded areas that could represent p-values because both are tail areas. Both represent one-sided hypotheses.

8.46 The first kind of error is saying the person can tell butter from margarine (rejecting the null hypothesis) when in fact she cannot. The second type of error is saying she cannot tell butter from margarine when in fact she can.

8.47 The first type of error is having the innocent person suffer (convicting an innocent person). The second type of error is "ten guilty persons escape" (letting guilty persons go free).

8.48 The significance level determines the probability of rejecting a null hypothesis when it is true, and so it is a guard against the first type of error.

8.54: No, it is considered a bad practice in statistical analysis