Lab Assignment #21

This lab is due at 9:35 AM on Monday, 4/22 and is worth 12 points. This may be done individually, or in a group of 2 or 3 or 4 people.

The purpose of this project is to practice statistical inference for quantitative variables. Three problems are presented, each involving some aspect of education. Use chapters 8 through 11 of your book to analyze these 3 problems. Please use one **Introduction** for the entire report, one **Data Collection** section, a 3-part **Results/Discussion** section, a **Summary**, and an **Appendix** containing all of the original numbers. See Hippos handout for a sample report.

Your calculations and/or scratchwork, including t-statistics, should go in the appendix. The null and alternative hypotheses, p-values, and conclusions for each part should go in the results/discussion section. I need a value or range for p. It is not enough to state only that $p < \alpha$ or $p > \alpha$.

Additionally, be sure to note which method (one-sample, matched-pairs, two-sample; one- or two-tailed alternative hypothesis) you use for each problem and why that method is appropriate. Ask if you are not sure.

Part 1: The people who operate **an SAT prep class** want to demonstrate that the class improves high school students' SAT math score. To prove this, before and after scores are used from the last 20 students in the class. Assume that these students are a random sample of all high school students. Do the data show, at a 5% significance level, that the average score change is positive for the population of all high school students? In other words, is this preparation class effective, on average, for raising SAT math score?

Before	After
534	563
612	636
723	722
428	454
533	537
696	707
584	583
610	607
536	536
486	487
525	509
661	665
718	721
579	606
432	440
456	448
529	541
547	566
668	687
587	601

Part 2: A researcher wants to know if the average **6th-grade class size** of public California schools is less than 30. A random sample of 25 schools across the state reveals the following class sizes:

24, 29, 26, 31, 29, 28, 31, 27, 26, 25, 29, 31, 27,
28, 33, 33, 28, 30, 27, 30, 32, 31, 30, 22, 33

Do these numbers prove that the average class size for 6th-grade classes is less than 30? Use a 2.5% significance level.

Part 3: Union representatives wants to compare **the salaries of teachers in rural vs. suburban schools**. The team has no hypothesis about which group will have the higher average salary. A random sample of 10 rural teachers and 10 suburban teachers gives the following data:

Rural	Suburban
$60,333	$54,886
$57,087	$62,402
$53,234	$57,239
$54,014	$68,249
$56,830	$59,711
$59,643	$69,226
$53,634	$55,794
$58,397	$59,871
$64,134	$54,225
$56,993	$66,365

Test the claim that average rural salary equals average suburban salary at a 10% significance level. Also, create a 90% confidence interval for the difference in salaries between the two groups, and explain what this interval means.

* You may write this report individually, or work in a group. If so, your group will turn in one report together. Include all of your names.