Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Statistics Analysis STAT 271 MAJOR I	
Semester:	Spring Semester --Term 172
Date:	March 7, 2018
Time Allowed:	**90 minutes**

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	
Instructor's Name:	Dr. Eric Benson

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 1	Page 2	Page 3	Page 4	Page 5	Total
Questions	**15**	**15**	**20**	**15**	**15**	**80**
Marks						

15 points

1. A consumer research group is interested in testing an automobile manufacturer's claim that a new economy model will travel at least 25 miles per gallon of gasoline.
   a. Setup the null and alternative hypothesis for this test. **(2 points)**

   b. With a 0.02 level of significance and a sample of 30 cars, what is the rejection rule based on the value of $\bar{x}$ for the test to determine whether the manufacturer's claim should be rejected? Assume that σ is 3 miles per gallon. **(3 points)**

   c. What is the probability of committing a Type II error if the actual mileage is 23 miles per gallon? **(5 points)**

   d. What is the power of the test if the actual mileage is 25.5 miles per gallon? **(5 points)**

15 points

2. The College Board provided comparisons of Scholastic Aptitude Test (SAT) scores based on the highest level of education attained by the test taker's parents. A research hypothesis was that students whose parents had attained a higher level of education would on average score higher on the SAT. During 2003, the overall mean SAT verbal score was 507 (The World Almanac, 2004). SAT verbal scores for independent samples of students follow. The first sample shows the SAT verbal test scores for students whose parents are college graduates with a bachelor's degree. The second sample shows the SAT verbal test scores for students whose parents are high school graduates but do not have a college degree. **Population variances are unequal and unknown.**

Student's Parents			
College Grads		**High School Grads**	
485	487	442	492
534	533	580	478
650	526	479	425
554	410	486	485
550	515	528	390
572	578	524	535
497	448		
592	469		

a. Formulate the hypotheses that can be used to determine whether the sample data support the hypothesis that students show a higher population mean verbal score on the SAT if their parents attained a higher level of education. **(4 points)**

b. What is the point estimate of the difference between the means for the two populations? **(4 points)**

c. Test the hypothesis using $\alpha = 0.05$, what is your conclusion? **(7 points)**

20 points

3. A manufacturer produces both a deluxe and a standard model of an automatic sander designed for home use. Selling prices obtained from a sample of retail outlets follow.

	Model Price ($)			Model Price ($)	
Retail Outlet	Deluxe	Standard	Retail Outlet	Deluxe	Standard
1	39	27	5	40	30
2	39	28	6	39	34
3	45	35	7	35	29
4	38	30			

a. The manufacturer's suggested retail prices for the two models show a $10 price differential. Use a .05 level of significance and test that the mean difference between the prices of the two models is $10. **(10 points)**

b. What is the 95% confidence interval for the difference between the mean prices of the two models? **(10 points)**

15 points

4. In a test of the quality of two television commercials, each commercial was shown in a separate test area six times over a one-week period. The following week a telephone survey was conducted to identify individuals who had seen the commercials. Those individuals were asked to state the primary message in the commercials. The following results were recorded.

	Commercial A	Commercial B
Number Who Saw Commercial	150	200
Number Who Recalled Message	63	60

a. Use $\alpha = 0.05$ and test the hypothesis that there is no difference in the recall proportions for the two commercials. **(5points)**

b. Compute the p-value for this test. **(5 points)**

c. Compute a 95% confidence interval for the difference between the recall proportions for the two populations. **(5 points)**

15 points

5. CCN and ActMedia provided a television channel targeted to individuals waiting in supermarket checkout lines. The channel showed news, short features, and advertisements. The length of the program was based on the assumption that the population mean time a shopper stands in a supermarket checkout line is 8 minutes. A sample of actual waiting times will be used to test this assumption and determine whether actual mean waiting time differs from this standard.

   a. Formulate the hypotheses for this application. **(2 points)**

   b. A sample of 120 shoppers showed a sample mean waiting time of 8.5 minutes. Assume a population standard deviation $\sigma = 3.2$ minutes. What is the p-value? **(5 points)**

   c. At $\alpha = 0.05$, what is your conclusion? **(4 points)**

   d. Compute a 95% confidence interval for the population mean. Does it support your conclusion? **(4 points)**