

Prince Sultan University

Deanship of Educational Services

Department of Mathematics
and General Sciences



COURSE DETAILS:

Statistics and Probability Theory		STAT 271	Major 1
Semester:	Spring Semester --Term 182		
Date:	February 19, 2019		
Time Allowed:	90 minutes		

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section/Time	
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 2	Page 3	Page 4	Page 5	Page 6	Total
Questions	15	10	20	15	20	80
Marks						

1. The results of a state mathematics test for random samples of students taught by two different teachers at the same school are shown below.

**Sample Statistics for State
Mathematics Test Scores**

Teacher 1	Teacher 2
$\bar{x}_1 = 473$	$\bar{x}_2 = 459$
$s_1 = 39.7$	$s_2 = 24.5$
$n_1 = 8$	$n_2 = 18$

- a. Can you conclude that there is a difference in the mean mathematics test scores for the students of the two teachers? Use $\alpha = 0.10$. Assume the populations are normally distributed and the population variances are not equal. **(10 points)**
- b. Find a 95% confidence interval for the mean difference in the test scores. **(5 points)**

2. **Losing Weight** A nutritionist claims that a particular exercise program will help participants lose weight after one month. The table shows the weights of 12 adults before participating in the exercise program and one month after participating in the exercise program. At $\alpha = 0.10$ can you conclude that the exercise program helps participants lose weight?

Participant	1	2	3	4	5	6
Weight before exercise program	157	185	120	212	230	165
Weight after exercise program	150	181	121	206	215	169

Participant	7	8	9	10	11	12
Weight before exercise program	207	251	196	140	137	172
Weight after exercise program	210	232	188	138	145	172

3. **Consumer Spending** In a survey of 433 females, 72% have reduced the amount they spend on eating out. In a survey of 577 males, 65% have reduced the amount they spend on eating out.

a. At $\alpha = 0.01$, can you reject the claim that there is no difference in the proportion of females who have reduced the amount they spend on eating out and the proportion of males who have reduced the amount they spend on eating out? **(10 points)**

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

c. Find the 95% confidence interval for the difference in the population proportions. **(5 points)**

4. a. Determine β for the following test of hypothesis, given that $\mu = 310$:

$$H_0 : \mu = 300$$

$$H_A : \mu > 300$$

The statistics practitioner knows that the population standard deviation is 50, the significance level is 5%, and the sample size is 81. **Find and Interpret the Power of the test. (10 points)**

- c. Repeat part (the above question) with $n = 36$. **(3 points)**

- d. Describe the effect of β of decreasing n . **(2 points)**

5. A manufacturer wishes to compare the current assembly process for one of this products with a proposed method that supposedly reduces the average assembly time. Eight workers are randomly selected from the assembly plant and are asked to assemble units of this product. The following are the observed times in minutes.

Worker	1	2	3	4	5	6	7	8
Current Process	38	32	41	35	42	32	45	37
Proposed Process	30	32	34	37	35	26	38	32

- a. At the $\alpha = 0.05$ level, is there reason to believe that the average assembly time for the current method exceeds that of the proposed method by more than 2 minutes? **(10 points)**
- b. Estimate the p -value for this test. **(5 points)**
- c. Determine a 95% confidence interval for the difference in the mean assembly times. **(5 points)**