Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Statistical Analysis	STAT 271	Final Exam
Semester:	Spring Semester --Term 181	
Date:	December 17, 2018	
Time Allowed:	**180 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	Page 7	Page 8	Total
Questions	**8**	**8**	**9**	**8**	**9**	**30**	**8**	**80**
Marks								

8 points

1. A company wants to determine the linear relationship between the selling price of their product in SAR and the number of units sold in thousands.

Price (SAR)	12	14	16	18	20
Units Sold	54	57	49	48	42

a. Find the sample correlation between Price and Units Sold. **(2 points)**

b. Using $\alpha = 0.05$, test the claim that there is a relationship (correlation) between Price and Units Sold. **Give a conclusion (4 points)**

c. Find the coefficient of determination. **Interpret this value**. **(2 points)**

8 points

2. Flower Marketing Research, Inc., bases charges to a client on the assumption that telephone surveys can be completed within 15 minutes or less. If more time is required, a premium rate is charged. With a sample of 35 surveys, a population standard deviation of 4 minutes, and a level of significance of .01
   a. What is your interpretation of the Type II error for this problem? **(2 points)**

   b. What is the probability of making a Type II error when the actual mean time is 17 minutes? **(3 points)**

   c. Find the power of this test when the actual mean time is 18 minutes. **Give a precise interpretation of the power of this test. (3 points)**

9 points

3. 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 of 3.2 minutes. What is the p-value? **(3 points)**

   c. At $\alpha = .05$, what is your conclusion? **(2 points)**

   d. Compute a 95% confidence interval for the population mean. **(2 points)**

8 points

4. The average standard deviation for the annual return of large cap stock mutual funds is 18.2% (The Top Mutual Funds, AAII, 2004). The sample standard deviation based on a sample of size 36 for the Vanguard PRIMECAP mutual fund is 22.2%.

   a. Construct a hypothesis test that can be used to determine whether the standard deviation for the Vanguard fund is greater than the average standard deviation for large cap mutual funds. With a .05 level of significance, what is your conclusion? **(5 points)**

   b. Find the 95% confidence interval for the population standard deviation. **(3 points)**

9 points

5. M&M/MARS, makers of M&M® Chocolate Candies, conducted a national poll in which more than 10 million people indicated their preference for a new color. The tally of this poll resulted in the replacement of tan-colored M&Ms with a new blue color. In the brochure "Colors," made available by M&M/MARS Consumer Affairs, the distribution of colors for the plain candies is as follows:

Brown	Yellow	Red	Orange	Green	Blue
30%	20%	20%	10%	10%	10%

In a follow-up study, samples of 1-pound bags were used to determine whether the reported percentages were indeed valid. The following results were obtained for one sample of 506 plain candies.

Brown	Yellow	Red	Orange	Green	Blue
177	135	79	41	36	38

Use $\alpha = .05$ to determine whether these data support the percentages reported by the company.

30 points

6. Data from a sample of 10 pharmacies are used to examine the relation between prescriptions sales volumes and the percentage of prescription ingredients purchased directly from the supplier. The sample data are shown here:

Pharmacy	Sales Volume ($1000)	% Ingredients Purchased
1	25	10
2	55	18
3	50	25
4	75	40
5	110	50
6	138	63
7	90	42
8	60	30
9	10	5
10	100	55

a. Estimate the fitted regression line. **(3 points)**

b. What proportion of observed variation in Sales Volume can be attributed to Ingredients Purchased? **(5 points)**

c. Calculate s_{ε} and s_{b_1}. **(4 points)**

d. Obtain a 90% confidence interval for. **Give a precise interpretation of this value. (4 points)**

e. Setup an ANOVA table to test $H_0 : \beta_1 = 0$ vs $H_A : \beta_1 \neq 0$, for $\alpha = 0.10$. **Give a precise conclusion. (6 points)**

f. Obtain a 90% confidence interval for $\mu_{y|x=40}$, the average sales volume when Ingredients Purchased is 40%. **Give a precise interpretation. (4 points)**

g. Obtain a 90% confidence interval for $y_{|x=40}$, the average sales volume when Ingredients Purchased is 40%. **Give a precise interpretation. (4 points)**

8 points

7. In recent years, a growing array of entertainment options competes for consumer time. By 2004, cable television and radio surpassed broadcast television, recorded music, and the daily newspaper to become the two entertainment media with the greatest usage (The Wall Street Journal, January 26, 2004). Researchers used a sample of 15 individuals and collected data on the hours per week spent watching cable television and hours per week spent listening to the radio.

Individual	Television	Radio	Individual	Television	Radio
1	22	25	9	21	21
2	8	10	10	23	23
3	25	29	11	14	15
4	22	19	12	14	18
5	12	13	13	14	17
6	26	28	14	16	15
7	22	23	15	24	23
8	19	21			

a. Use a .05 level of significance and test for a difference between the population mean usage for cable television and radio. **(5 points)**

b. What is the 95% confidence interval for the difference in the means? **(3 points)**