

PGDM, 2020-22
Statistics for Business Analysis
DM-108

Trimester – I, End-Term Examination: October, 2020

Time allowed: 2 Hrs 30 Min
Max Marks: 50

Roll No: _____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means**. All other instructions on the reverse of Admit Card should be followed meticulously.

Section A

Attempt any two of the questions A1a, A1b and A1c

- A1a. As the prices of heating oil and natural gas increase, consumers become more careful about heating their homes. Researchers want to know how warm home- owners keep their houses in January and how the results from Wisconsin and Tennessee compare. The researchers randomly call 23 Wisconsin households between 7 pm and 9 P.M. on January 15 and ask the respondent how warm the house is according to the thermostat. The researchers then call 19 households in Tennessee the same night and ask the same question. The results follow.

Wisconsin				Tennessee			
71	71	65	68	75	75	74	71
70	61	67	69	74	73	74	70
75	68	71	73	72	71	69	72
74	68	67	69	74	73	70	72
69	72	67	72	69	70	67	
70	73	72					

For $\alpha=0.05$, is the average temperature of a house in Tennessee significantly higher than that of a house in Wisconsin on the evening of January 15? Assume the population variances are equal and the house temperatures are normally distributed in each population. **(CILO-1; 5 marks)**

- A1b. What is the average difference between the price of name-brand soup and the price of store-brand soup? To obtain an estimate, an analyst randomly samples eight stores. Each store sells its own brand and a national name brand. The prices of a can of name-brand tomato soup and a can of the store-brand tomato soup follow.

Store	Name Brand	Store Brand
1	54¢	49¢
2	55	50
3	59	52

4	53	51
5	54	50
6	61	56
7	51	47
8	53	49

Construct a 95% confidence interval to estimate the average difference. Assume that the differences in prices of tomato soup are normally distributed in the population. **(CILO-1; 5 marks)**

- A1c.** A study was conducted to develop a scale to measure stress in the workplace. Respondents were asked to rate 26 distinct work events. Each event was to be compared with the stress of the first week on the job, which was awarded an arbitrary score of 500. Sixty professional men and forty-one professional women participated in the study. One of the stress events was "lack of support from the boss." The men's sample average rating of this event was 650 and the women's sample average rating was 800. Suppose the population standard deviations for men and for women both were about 100. Construct a 95% confidence interval to estimate the difference in the population mean scores on this event for men and women

(CILO-1; 5 marks)

Attempt any two of the questions A2a, A2band A2c

- A2a.** A study of pollutants showed that certain industrial emissions should not exceed 2.5 parts per million. You believe a particular company may be exceeding this average. To test this supposition, you randomly take a sample of nine air tests. The sample average is 3.2 parts per million, with a sample standard deviation of 0.6. Does this result provide enough evidence for you to conclude that the company is exceeding the safe limit? Use $\alpha = .01$. Assume emissions are normally distributed. **(CILO-3; 5 marks)**
- A2b.** According to Zero Population Growth, the average urban U.S. resident consumes 3.3 pounds of food per day. Is this figure accurate for rural U.S. residents? Suppose 64 rural U.S. residents are identified by a random procedure and their average consumption per day is 3.6 pounds of food. Assume a population variance of 1.35 pounds of food per day. Use a 5% level of significance to determine whether the Zero Population Growth figure for urban U.S. residents also is true for rural U.S. residents on the basis of the sample data. **(CILO-3; 5 marks)**
- A2c.** Suppose the number of beds filled per day in a medium sized hospital is normally distributed. A hospital administrator tells the board of directors that, on the average, at least 185 beds are filled on any given day. One of the board members believes that the average is less than 185 and she sets out to test to determine if she is correct. She secures a random sample of 16 days of data (shown below). Use $\alpha = .02$ and the sample data to test the board

member's theory, Assume the number of filled beds per day is normally distributed in the population.

Number of beds occupied per Day			
173	149	166	180
189	170	152	194
177	169	188	160
199	175	172	187

(CILO-3; 5 marks)

Attempt any two of the questions A3a, A3b and A3c

A3a. An increasing number of consumers believe they have to look out for themselves in the marketplace. According to a survey conducted by the Yankelovich Partners. For *USA WEEKEND* magazine, 60% of all consumers have called an 800 or 900 telephone number for information about some product. Suppose a random sample of 20 consumers is contacted and interviewed about their buying habits.

- What is the probability that 13 or more of these consumers have called an 800 or 900 telephone number for information about some product?
- What is the probability that more than 17 of these consumers have called an 800 or 900 telephone number for information about some product?
- What is the probability that fewer than 5 of these consumers have called an 800 or 900 telephone number for information about some product?

(CILO-2; 5 marks)

A3b. Based on annual driving of 15,000 miles and fuel efficiency of 20 mpg, a car in the United States uses, on average, 750 gallons of gasoline per year. If annual automotive fuel usage is normally distributed, and if 29.12% of cars in the United States use less than 500 gallons of gasoline per year, what is the standard deviation? **(CILO-2; 5 marks)**

A3c. Suppose a subdivision on the south-west side of Denver, Colorado, contains 1,500 houses. The subdivision was built in 1983. A sample of 100 houses is selected randomly and evaluated by an appraiser. If the mean appraised value of a house in this subdivision for all houses is \$172,000, with a standard deviation of \$8,400, what is the probability that the sample average is greater than \$180,000? **(CILO-2; 5 marks)**

Section B

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. The overall mean SAT math score was 514.

SAT math scores for independent samples of students follow. The first sample shows the SAT maths test scores for students whose parents are college graduates with a bachelor's degree. The second sample shows the

SAT math test scores for students whose parents are high school graduates but do not have a college degree.

Where student's parents are College Grads:

480 520 660 540 555 600 480 590 485 530 520
420 530 585 450 470

Where student's parents are High School Grads:

435 590 480 500 520 530 500 470 420 480 395
530

- a. Formulate the hypothesis that can be used to determine whether the sample data support the hypothesis that children of College-Grad parents have a higher SAT score for maths than the overall average of 514 **(CILO-1; 4 marks)**
- b. Test the hypothesis at $\alpha = 0.1$ **(CILO-1; 3 marks)**
- c. What is the 90% interval estimate of the SAT maths scores for the children of College-Grad parents? **(CILO-1; 3 marks)**
- d. Formulate the hypothesis that can be used to determine whether the sample data support the hypothesis that students show a higher population mean maths score on the SAT if their parents attained a higher level of education. **(CILO-1; 4 marks)**
- e. Test the hypothesis in part (4) above, at $\alpha = 0.05$ and write down your conclusions **(CILO-1; 3 marks)**
- f. What is the 95% confidence interval for the difference in SAT scores in maths for the two groups of children? Interpret the result on the basis of the inclusion or otherwise of zero in the confidence interval. **(CILO-1; 3 marks)**