King Fahd University of Petroleum and Minerals
Department of Mathematics

CODE 000

STAT 211 BUSINESS STATISTICS I
Semester 223, Final Exam
Aug 16, 2023

CODE 000

Time allowed 150 minutes.

Name:____ ID:________________

Check that this exam has 24 questions.

Important Instructions:

1. All types of smart watches or mobile phones are NOT allowed during the examination.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. The following data are the overall miles per gallon of 2022 small SUV's (Q3.11)

16	17	18	18	18	19	19	19	20
20	21	21	21	21	21	21	22	22
23	24	25	25	26	26	28	29	34

If A is the mean and B is the median, then A – B =

A. 1
B. - 1
C. 2
D. - 2
E. 0

$$\bar{x} = 22 \;\; \& \;\; \check{x} = 21 \;\; \rightarrow \;\; A - B = 22 - 21 = 1$$

2. Suppose that 50% of the time item A is available in a store while the item B is available 30% of the time. The probability that both items A and B are available assuming that availability of the item A has nothing to do with that of item B equal to (Q4.19)

A. 0.15
B. 0
C. 1
D. 0.5
E. 0.1

$$P(A \cap B) = P(A)P(B) = (0.5)(0.3) = 0.15$$

3. Suppose that 50% of the time item A is available in a store while the item B is available 30% of the time. The probability that both items A and B are available assuming that if the item A available, then with probability 0.2, the item B will be available equal to (Q4.18)

A. 0.1
B. 0.15
C. 0.4
D. 0.6
E. 0

$$P(B|A) = \frac{P(A \cap B)}{P(A)} \;\; \rightarrow \;\; P(A \cap B) = P(A)P(B|A) = (0.5)(0.2) = 0.1$$

4. The distribution for the number of emergency calls to a city's 911 emergency number in a one-hour time period is likely to be described by a

A. Poisson distribution
B. binomial distribution
C. Hypergeometric distribution
D. Uniform distribution
E. Normal distribution

$$X\ r.v\ refer\ to\ number\ of\ emergency\ calls\ per\ one\ hour$$
$$X \sim Poisson\ distribution$$

5. The following table contains the probability distribution of the number of traffic accidents daily in a small city. (Q 5.2)

X	0	1	2	3	4	5
P(X=x)	0.1	0.2	0.45	0.15	K	0.05

Where K is a positive real number, then the expected number of accidents per day equal to

A. 2
B. 2.5
C. 1
D. 1.5
E. 3

$$\sum P(X=x)=1 \quad \rightarrow k=0.05 \ \rightarrow \ \mu=\sum xP(X=x)=2$$

6. The average starting salary for this year's graduates at a large university (LU) is \$20000 with a standard deviation of \$8000. Furthermore, it is known that the starting salaries are normally distributed. If 189 of the recent graduates have salaries of at least \$32240, how many students graduated this year from this university? (Q 6.8 modified)

A. 3000 students
B. 202 students
C. 2851 students
D. 203 students
E. 189 students

$$P(X>32240)=P\left(Z>\frac{32240-20000}{8000}\right)$$
$$=P(Z>1.53)$$
$$=P(Z<-1.53)=0.063$$

and

$$P(X>32240)=0.063=\frac{f}{n}=\frac{189}{n} \qquad \rightarrow \qquad n=\frac{189}{0.063}=3000\ students$$

7. The volume of a shampoo filled into a container is uniformly distributed between 374 and 380 milliliters. the probability that the container is filled with exactly 375 milliliters (Q 6.23 modified))

A. 0
B. 0.8333
C. 0.1667
D. 1
E. 0.5

$$X \sim Uniform\ over\ (374{,}380)$$
$$P(X = 0) = 0$$

8. The U.S. Census Bureau announced that the mean sales price of new houses was $87 thousand and standard deviation $36 thousand. If a statistical sample of size 100 houses is selected at random, what is the probability that the mean prices for those sampled will exceed $75 thousand? (Q 7.20)

A. About 1.00
B. - 0.333
C. 0.6293
D. 0.3707
E. There is no way to determine this without more information

$$P(\bar{X} > 75) = P\left(Z > \frac{(75 - 87)\sqrt{100}}{36}\right) = P(Z > -3.33) = 1$$

9. A random sample has been taken from a normal distribution and the following confidence intervals constructed using the same data: (37.53, 49.87) and (35.59, 51.81). What is the value of the sample mean?

A. 43.7
B. 6.17
C. 37.53
D. 49.87
E. 51.23

$$The\ sample\ mean\ is\ given\ by: \bar{X} = \frac{37.53 + 49.87}{2} = 43.7$$

10. A random sample of 50 households was selected for a telephone survey. The key question asked was, “Do you or any member of your household own a cellular telephone that you can use to access the Internet?” Of the 50 respondents, 20 said yes and 30 said no. If the population proportion is 0.45, the standard error of the proportion is equal to (Q7.24, b)

A. 0.0703
B. 0.0693
C. 0.4
D. 0.45
E. 0

$$\sigma_{\hat{p}} = \sqrt{\frac{0.45 * (1 - 0.45)}{50}}$$

11. In a recent report, it was stated that the proportion of employees who carpool to their work is 0.14 and that the standard deviation of the sampling proportion is 0.0259. However, the report did not indicate what the sample size was. What was the minimum sample size?

A. 180
B. 100
C. 460
D. 200
E. 160

$$\sigma_{\hat{p}} = 0.0259 = \sqrt{\frac{0.14 * (1 - 0.14)}{n}}$$

$$n = \frac{0.14 * (1 - 0.14)}{(0.0259)^2} = 179.48$$

12. Suppose that a random variable X has a continuous uniform distribution with probability distribution

$$f(x) = \frac{1}{4} \quad 2 \le x \le 6$$

A random sample of size 16 was selected, the standard error of the sample mean equal to

A. 0.288
B. 1.155
C. 0.083
D. 1.333
E. 4

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{\sqrt{\frac{(b-a)^2}{12}}}{\sqrt{16}} = \frac{\sqrt{\frac{(6-2)^2}{12}}}{\sqrt{16}} = \sqrt{\frac{1}{12}} = 0.288$$

13. In an application to estimate the mean number of miles that downtown employees commute to work roundtrip each day, the following information is given for a sample of size 20 with mean 4.33 and standard deviation 3.5. If the desired confidence level is 95%, the appropriate critical is: (Q8.12)

A. 2.093
B. 1.96
C. 2.086
D. 0.05
E. 0.025

$$t_{0.025,19} = 2.0930$$

14. In an effort to estimate the mean dollars spent per visit by customers of a food store, the manager has selected a random sample of 100 cash register receipts. The mean of these was \$45.67 with a sample standard deviation equal to \$12.3. Assuming that he wants to develop a 90% confidence interval estimate, which of the following is the margin of error that will be reported?

A. About $\pm$ \$2.02
B. Nearly $\pm$\$50.20
C. $\pm$1.645
D. About $\pm$\$1.43
E. $\pm$0.05

$$e = \pm z_{0.05}\frac{s}{\sqrt{n}} = \pm 1.645\frac{12.3}{\sqrt{100}} = \pm 2.0233$$

15. A quality control manager wants to estimate, with 90% confidence, the mean life of light bulbs to within ±20 hours. From past studies, the standard deviation is estimated as 100 hours. Based on this information, the minimum sample size is: (Q8.39)

A. 68
B. 9
C. 97
D. 10
E. 30

$$n \geq \left(\frac{z_{0.05}s}{e}\right)^2 = \left(\frac{(1.645)(100)}{20}\right)^2 = 68$$

Most major airlines allow passengers to carry two pieces of luggage onto the plane. One regional airline is considering changing its policy to allow only one carry – on per passenger. Before doing so, it decided to collect some data. A random sample of size 1000 passengers was selected and number of bags carried on the plane was noted. 345 passengers had more than one bag. (Q8.31 with modification)

Solve the next 2 questions

16. the point estimator for the proportion of the traveling population that would have been impacted had the "one – bag" limit been in effect.

A. 0.345
B. 0.5
C. 0.655
D. 0
E. 1

$$\hat{p} = \frac{345}{1000} = 0.345$$

17. The domestic version of Boeing 747 has a capacity for 568 passengers. Determine a 95% confidence interval of the number of passengers that you expect to carry more than one-piece of luggage on the plane. Assume the plane is at its passenger capacity.

A. Between 180 and 213
B. Between 182 and 211
C. Between 321 and 370
D. Between 316 and 375
E. Between 100 and 200

$$0.345 \pm (1.96)\sqrt{\frac{(0.345)(1-0.345)}{1000}}$$
$$0.315536 < p < 0.374464$$
$$179.22 < X < 212.69$$

18. If you are interesting for the difference between the means of two independent populations presuming equal variances with samples of size 20 each. The number of degrees of freedom is equal to (Q 10.2,b)

A. 38
B. 39
C. 19
D. 18
E. 40

$$n_1 + n_2 - 2 = 20 + 20 - 2 = 38$$

19. You want to have 90% confidence of estimating the proportion of office workers who respond to e-mail within an hour to within ±5%. Because you have not previously undertaken such a study, there is no information available from past data. Determine the sample size needed.

A. 271
B. 385
C. 52
D. 73
E. Can't be determined without more information.

$$n = \left(\frac{1.645}{0.05}\right)^2 \frac{1}{4} \rightarrow \quad n = 271$$

20. A cell phone service provider has selected a random sample of 20 of its customers in an effort to estimate the mean number of minutes used per day. The results of the sample included a sample mean of 34.5 minutes and a sample standard deviation equal to 11.5 minutes. Based on this information, a 95 percent confidence level given by:

A. 29.11 --- 39.88
B. 30.05 --- 38.95
C. 29.46 --- 39.54
D. 30.27 --- 38.73
E. 27.14 --- 41.86

$$t_{0.025,19} = 2.093$$
$$34.5 \pm (2.093)\frac{11.5}{\sqrt{20}}$$
$$29.1179 < \mu < 39.8821$$

21. Two samples each of size 25 are taken from independent populations assumed to be normally distributed with equal variances. The first sample has a mean of 35.5 and standard deviation of 3 while the second sample has a mean of 33 and standard deviation of 4. the pooled variance is (10.2, a)

A. 12.5
B. 3.535
C. 225
D. 7
E. 25

22. A major retail clothing store is interested in estimating the difference in mean monthly purchases by customers who use the store's in-house credit card versus using a Visa, Mastercard, or one of the other major credit cards. To do this, they have randomly selected a sample of customers who have made one or more purchases with each of the types of credit cards. The following represents the results of the sampling:

	In-House Credit Card	National Credit Card
Sample Size:	86	113
Mean Monthly Purchases:	\$45.67	\$39.87
Standard Deviation:	\$10.90	\$12.47

Based on these sample data, what is the lower limit for the 95 percent confidence interval estimate for the difference between population means?

A. Approximately \$2.54
B. About \$5.28
C. Approximately \$4.85
D. Approximately \$3.41
E. Approximately \$5.51

$$(45.67 - 39.87) \pm (1.96)\sqrt{\frac{10.9^2}{86} + \frac{12.47^2}{113}}$$

23. A survey of 500 shoppers was taken in a large metropolitan area to determine various information about consumer behavior. Among the questions asked was, "Do you enjoy shopping for clothing?" Of 240 males, 136 answered yes. Of 260 females, 224 answered yes. A 99% confidence interval estimate for the difference between the proportion of females and males who enjoy shopping for clothing is (Q 10.29)

A. Between 19.5% and 39.4%
B. Between 21.9% and 37.0%
C. Between 23.2% and 35.8%
D. Between – 19.5% and 39.4%
E. Between – 21.9% and 37.0%

$$\left(\frac{224}{260} - \frac{136}{240}\right) \pm 2.575\sqrt{\frac{\frac{136}{240}\left(1 - \frac{136}{240}\right)}{240} + \frac{\frac{224}{260}\left(1 - \frac{224}{260}\right)}{260}}$$

24. The prices of two competitive companies (Company I and Company II) need to be studied in order to have a comparative analysis between the two companies. The following prices data have been obtained for these two types of companies from a town market:

	Company I	Company II
The sample size	15	17
The sample mean	33.4	32.4
The sample standard deviation	1.3	1.5

Assuming both populations are approximately normal with equal variances, the length of a 93% confidence interval for the difference between the true mean prices of two companies equals to

A. 1.877
B. 0.938
C. 1.808
D. 0.904
E. 1.644

$$l = 2e = 2(1.8789)\left(\sqrt{\frac{14(1.3)^2 + 16(1.5)^2}{15 + 17 - 2}}\right)\sqrt{\frac{1}{15} + \frac{1}{17}} = 1.877$$