King Fahd University of Petroleum & Minerals
Mathematics & Statistics Department

STAT 319: Probability & Statistics for Engineers & Scientists

Term 152 (1)
Final Exam
Wednesday 11/05/2016
8:00 – 10:30 AM

Please circle your instructor name:

Al-Momani    Al-Sawi    Riaz    Saleh    Samuh

Std. Name: _____________________  Std. ID: _____________  Serial No.: _____________
MULTIPLE CHOICE QUESTIONS

In the following multiple-choice questions, select the best answer.

**Q1**. To test $H_0 : P = 0.9$ versus $H_1 : P \neq 0.9$ based on a random sample of $n = 100$ and number of successes $X = 92$, the value of the test statistic is

A. 0.92.

B. $-0.67$.

C. 0.74.

D. $-0.74$.

E. 0.67.

**Q2**. A sample of size 1000 has mean 60 and standard deviation 5 from a bell-shaped distribution. The interval $(55,70)$ contains approximately

A. 60 observations.

B. 950 observations.

C. 815 observations.

D. 750 observations.

E. 890 observations.

**Q3**. As the sample size ................ the variation of the sampling distribution of the sample mean .................

A. decreases, decreases.

B. increases, decreases.

C. decreases, remains the same.

D. increases, remains the same.

E. None of the choices.
Q4]... The events $A$ and $B$ are independent events and $P(A) = 0.4$, $P(B^c) = 0.3$, then $P(A \cup B) =$

A. 0.4.
B. 0.58.
C. 0.7.
D. 0.82.
E. None of the choices.

Q5]... In a large shipment, there are 10% defective items. You select items until you get one defective. The probability that you need to select 5 items before you get the one that is defective is

A. $(0.1)^5$.
B. 0.065.
C. 0.00009.
D. 0.059.
E. $(0.9)^5$.

Q6]... The listed occupations of stockholders of a national computer company included 19% who were homemakers. If six of these stockholders are randomly selected, what is the probability that none is homemaker?

A. 0.011.
B. 0.568.
C. 0.282.
D. 0.083.
E. 0.073.
Q7] . . . The mean for the exponential distribution equals the mean for the Poisson distribution only when the former distribution has a mean equal to

A. 0.5.
B. 1.0.
C. 0.25.
D. 2.0.
E. The means of the two distributions can never be equal.

Q8] . . . Assume that you have a sample of size 10 produces a standard deviation of 3, selected from a normal distribution with mean of 4. Find $c$ such that $P\left(\frac{(\bar{X} - 4)\sqrt{n}}{3} < c\right) = 0.99$.

A. 2.575.
B. 2.821.
C. 2.326.
D. 1.645.
E. 2.33.

Q9] . . . A random sample of size 16 selected from a normal population with mean 75 and variance of 288. A second random sample of size 9 is taken independently from another normal population with mean 80 and variance of 162. Let $\bar{X}_1$ and $\bar{X}_2$ be the two sample means. The probability that $\bar{X}_1 + \bar{X}_2$ exceeds 158 equal to

A. 0.3085.
B. 0.6915.
C. 0.7385.
D. 0.4235.
E. 0.5.
Q10]... A hypothesis test is conducted using $\alpha = 0.05$, the null hypothesis will be rejected for one of the following $p$-values:

A. 0.06.
B. 0.04.
C. 0.251.
D. 0.10.
E. 0.15.

Q11]... A 95% confidence interval for the population mean is calculated to be (75.29, 81.45). If the confidence level is reduced to 90%, the confidence interval will:

A. most likely, no longer include the true value of the population mean.
B. remain the same.
C. become wider.
D. double in size.
E. become narrower.

Q12]... Zip fit Tire Company stocks three brands of tire: brand A; brand B and brand C. 40% are Brand A, 35% are brand B and 25% are brand C. The percentage of defective tires are 2% of brand A, 1% of brand B and 3% of brand C. If the company selects a tire and finds it defective find the probability that it is a brand C tire?

A. 0.3947.
B. 0.0190.
C. 0.8043.
D. 0.1913.
E. 0.7001.
Q13]... In a random sample of size 1000 houses in a city, it is determined that 228 are heated by oil. The 99% confidence interval for the percentage of houses that are heated by oil given by

A. (0.185, 0.247).
B. (0.202, 0.254).
C. (0.127, 0.259).
D. (0.194, 0.262).
E. None of the choices.

Q14]... Which of the following measures is (are) influenced or affected by outliers?

A. Mean.
B. Median.
C. Mode.
D. Range.
E. Mean and Range.

Q15]... If a histogram is skewed to the left, the median is. ..................... the mean.

A. greater than.
B. less than.
C. equal to.
D. twice.
E. thrice.
To investigate the relationship between yield of potatoes, \( Y \), and the level of fertilizer application, \( X \), an experimenter divides the field into eight plots of equal size and applies different amounts of fertilizer to each. You are given the following information:

\[
\begin{align*}
\sum_{i=1}^{8} X_i &= 22, & \sum_{i=1}^{8} X_i^2 &= 71, & \sum_{i=1}^{8} Y_i &= 248, & \sum_{i=1}^{8} Y_i^2 &= 7800, & \sum_{i=1}^{8} X_i Y_i &= 707, & \text{SSE} &= 52.475.
\end{align*}
\]

Answer the following two questions:

**Q16**. . . The least squares line is

A. \( \hat{Y} = 50.381 - 7.048X \).

B. \( \hat{Y} = 24.452 - 2.381X \).

C. \( \hat{Y} = 2.381 + 24.452X \).

D. \( \hat{Y} = 2.381 - 24.452X \).

E. \( \hat{Y} = 24.452 + 2.381X \).

**Q17**. . . For testing the significance of regression, the (test statistics, \( p \)-value) are:

A. \( (2.609, 0.02 < p \text{-value} < 0.05) \).

B. \( (2.609, 0.01 < p \text{-value} < 0.025) \).

C. \( (-7.722, p \text{-value} < 0.0005) \).

D. \( (-7.722, p \text{-value} < 0.001) \).

E. \( (7.722, p \text{-value} < 0.0005) \).

**Q18**. . . To conduct a test of hypothesis for dependent samples we assume that

A. Both sample sizes are large.

B. The distribution of the difference between the paired observations is normal.

C. The samples are unrelated.

D. The population standard deviations are equal.

E. The population standard deviations are known.
Q19]... You have created a 95% confidence interval for \( \mu \) with result \((10, 15)\). What decision will you make if you test \( H_0 : \mu = 16 \) versus \( H_1 : \mu \neq 16 \) at \( \alpha = 0.05 \)?

A. Perform an upper (or right) sided test.
B. Don’t reject \( H_0 \).
C. Perform a lower (or left) sided test.
D. Reject \( H_0 \).
E. We can’t tell what our decision will be from the information given.

Q20]... Suppose the least squares line \( \hat{Y} = 5 + 3.09X \) produced \( SSE = 4739.03 \). For simplicity, someone decided to use \( \hat{Y} = 5 + 3X \) instead of \( \hat{Y} = 5 + 3.09X \), then the SSE will be:

A. decreases.
B. remain the same.
C. increases.
D. We can’t tell.
E. None of the choices.

Q21]... In regression analysis, if the dependent variable increases as the independent variable increases then the coefficient of correlation will be in the range:

A. \(-0.05\) to \(+0.5\).
B. \(-1\) to \(0\).
C. \(-0.05\) to \(0\).
D. \(0\) to \(+1\).
E. None of the choices.
Q22]... When testing $H_0 : \mu_1 - \mu_2 = 0$ versus $H_1 : \mu_1 - \mu_2 \neq 0$, the observed value of $z$-score was $-2.13$. The $p$-value for the test would be

A. 0.0166.
B. 0.0332.
C. 0.9668.
D. 0.9834.
E. None of the above.

Q23]... Which of the following statements is **ALWAYS** true. In a two-sample test of means for independent samples, the $z$ distribution is used when

A. Both sample sizes are large.
B. Both populations are positively skewed.
C. Both populations are normal.
D. The population standard deviations are unknown but equal.
E. $np$ and $n(1 - p)$ are both greater than 5.

24]... In a two-sided test for the population proportion, if the null hypothesis is rejected when the alternative is true, then:

A. Type I error is committed.
B. Correct decision is made.
C. Type II error is committed.
D. One-sided test should be used instead of a two-tail test.
E. It is unclear whether a correct or incorrect decision has been made.
Q25]... If a teacher is trying to prove that new method of teaching STAT is more effective than traditional one ($\mu_{\text{new}} - \mu_{\text{traditional}}$), he will conduct:

A. a two-sided test.
B. a lower (or left) sided test.
C. an upper (or right) sided test.
D. a point estimate of the population parameter.
E. a two-sided confidence interval.

Q26]... Suppose it is calculated that $\hat{\beta}_0 = 4$ and $\hat{\beta}_1 = 2$ for a particular estimated regression line with one independent variable. If the independent variable has a value of 2, what value should be expected for the dependent variable?

A. 10.
B. 8.
C. –1.
D. 0.
E. None of the choices.

Q27]... In regression analysis, the least squares estimator $\hat{\beta}_1$ represents

A. the $Y$-intercept.
B. an estimate for the mean response.
C. the predicted value of $Y$.
D. the estimated average change in $Y$ per unit change in $X$.
E. All of the choices.
Q28]... In regression analysis, if the coefficient of determination is equal to 0.64 and the best fit equation is \( \hat{Y} = 0.4 - 2X \), then the correlation coefficient equals to

A. 0.8.
B. 0.64.
C. -0.8.
D. -0.64.
E. 0.16.

Q29]... In regression analysis, the coefficient of determination \( R^2 \) measures the amount of variation in \( Y \) that is

A. explained by the variation in \( X \).
B. caused by the variation in \( X \).
C. explained by the variation in \( \epsilon \).
D. unexplained by the variation in \( X \).
E. None of the choices.

Q30]... If the coefficient of correlation is 0.90, the percentage of the variation in the dependent variable \( Y \) that is unexplained by the variation in the independent variable \( X \) is:

A. 19%.
B. 90%.
C. 81%.
D. 10%.
E. None of the choices.