

All answers are exact unless indicated specifically in the question. For all questions, you may assume the necessary conditions and assumptions for inference and regression analysis are met. As always, pay very close attention to rounding instructions! NOTA is "None of the Above". All calculations can be done using your graphing calculator. Good luck!

1. Find the mean of the following dataset: 94, 90, 15, 51, 41, 73, 5, 34, 99, 20

- A. 46 B. 50 C. 52.2 D. 94 E. NOTA

2. Find the standard deviation of the following discrete random variable:

X	30	40	50	60	70	80	90	100
P(X)	.1	.15	.2	.1	.12	.2	.05	.08

- A. $\frac{\sqrt{207699}}{100}$ B. $\frac{\sqrt{43139}}{10}$ C. $10\sqrt{6}$ D. $5\sqrt{21}$ E. NOTA

3. Smith High wants to survey the students about the midterm exam schedule. The administration breaks up the student population by grade level and randomly selects 100 students from each grade level to survey. What type of sample is the school using?

- A. simple random sample C. cluster sample E. NOTA
B. systematic sample D. stratified sample

4. Every Saturday, John trains for his upcoming triathlon. In the triathlon, John swims, then rides a bike and finishes with a run. Assume each part of the triathlon is normally distributed and independent. The swim has a mean of 35 minutes with a standard deviation of 5 minutes. The bike ride has a mean of 100 minutes with a standard deviation of 20 minutes. The run has a mean of 70 minutes with a standard deviation of 10 minutes. Find the probability that John's triathlon time will be between 198 minutes and 220 minutes. Round your final answer to four decimal places.

- A. 0.4102 B. 0.3772 C. 0.3637 D. 0.3624 E. NOTA

5. You want to estimate the mean income for a population of accountants with a 82% confidence interval. Assume the population standard deviation is $\sigma = \$5000$. If you want the margin of error to be \$500, find the minimum sample size needed, rounded to the nearest whole person.

- A. 180 B. 179 C. 84 D. 83 E. NOTA

6. There are 100 seniors at Jones High. 37 seniors take Biology, 29 take Chemistry and 41 take Physics. 15 of the seniors take Biology only, 10 take Chemistry only and 20 take Physics only. 30 seniors don't take any of the three classes. A senior is selected at random. Find the probability that the senior is in Chemistry, given that they are not in Biology.

- A. $\frac{29}{63}$ B. $\frac{16}{63}$ C. $\frac{14}{63}$ D. $\frac{13}{63}$ E. NOTA

7. 45% of students at Hoover High are male. 60% of female students at Hoover High participate in extracurricular activities. 50% of all students at Hoover High participate in extracurricular activities. A student at Hoover High is randomly selected. Find the probability that the student is male and does not participate in extracurricular activities.

- A. 0.225 B. 0.28 C. 0.32 D. 0.4 E. NOTA

8. The following is information about student desks based on a simple random sample of 225 desks. The hypotheses are $H_o: \mu = 225$, $H_a: \mu < 225$. Assume the population standard deviation is $\sigma = 30$. The test rejects H_o at the 5% level of significance. Given that $\mu = 220$ is actually the true mean for our scenario, compute the power at this true mean. Calculate the final answer to four decimal places.

- A. 0.6381 B. 0.7054 C. 0.8038 D. 1.0000 E. NOTA

9. A study was conducted to see the effects of learning on speaking Spanish. Ten children were randomly selected and were tested before the Spanish class began and then after the six week Spanish class was concluded. The claim is that the class will cause the students' Spanish speaking skill to improve. Data is listed below for the before and after class Spanish speaking proficiency. Assume that the distribution of the population of the differences is approximately normal.

Subject	1	2	3	4	5	6	7	8	9	10
Before	52	60	64	66	68	71	74	80	85	90
After	58	63	66	69	70	69	76	82	88	88

Find the p value of the test to determine if the class improved students' Spanish speaking. Round the final answer to three decimal places.

- A. 0.016 B. 0.352 C. 0.691 D. 0.923 E. NOTA

10. A test is given. The results of the test form an approximately normal distribution with a mean of 65 and a standard deviation of 10. A student is randomly selected. Find the probability that the student scored greater than 80 on the test, given that the student scored less than 90 on the test. Round your final answer to four decimal places.

- A. 0.0606 B. 0.0610 C. 0.0668 D. 0.0672 E. NOTA

11. Another test is given. The results of this test have a mean of 56 and a standard deviation of 12. The teacher curves the test to produce a new mean of 75 and a standard deviation of 8. Bill scored an 81 on the test after the curve was applied. The curve is of the form $(New\ Score) = a + b \cdot (Old\ Score)$ for real number a and b . What was Bill's original score?

- A. $\frac{225}{2}$ B. $\frac{275}{3}$ C. 65 D. 60 E. NOTA

12. Mike wants to see if chips sell better in certain sections of his grocery store. Mike builds six displays of chips, each one in a different section of the store, to see if each display sells equally. The number of bags of chips sold in each location is below:

Location	1	2	3	4	5	6
Bags sold	120	150	135	140	160	123

Find the χ^2 test statistics associated with a χ^2 goodness of fit (GoF) test used to determine if each location sold chips equally. Round your final answer to two decimal places.

- A. 8.62 B. 8.61 C. 8.60 D. 8.59 E. NOTA

13. Mr. Wiggins wants to determine if there is a difference between his morning class pass rate and his afternoon class pass rate for his Calculus class. Out of the 100 morning students, 83 passed his class and out of the 100 afternoon students, 79 passed his class. Mr. Wiggins is going to run an 86% confidence interval to find the true difference in the passing rates between the two classes. Round the critical value to three decimal places. If the confidence interval has a positive point estimate, find each endpoint of the confidence interval to five decimal places.

- A. $(-0.04277, 0.12277)$ C. $(-.04157, .12158)$ E. NOTA
B. $(-0.04198, 0.12197)$ D. $(-.04178, .12178)$

14. 30% of adults have Type A blood. Each time a volunteer comes into the blood bank, they are tested to determine their blood type. The blood bank is counting the number of volunteers that come to give blood before their first volunteer with Type A blood in for the day each day. Find the standard deviation of this daily practice.

- A. $\frac{\sqrt{21}}{3}$ B. $\frac{\sqrt{70}}{3}$ C. $\frac{\sqrt{130}}{3}$ D. $\frac{10\sqrt{7}}{3}$ E. NOTA

15. An experiment is to be conducted to compare two new types of cat food, Whisker Feast and Purr Pantry, with normal cat food, Cat Chow. The purpose of the experiment is to compare weight gain of cats fed each type of food. The researchers mix cat food using each type of food at each of two calcium levels, 10% and 20%. They feed each diet to 30 cats and record their weight gain after 28 days. Each treatment group has the same number of cats, and each cat will receive exactly one food variety and one level of calcium (10% and 20%) twice each day for the 28-day experiment. How many cats are needed to do the experiment?

- A. 90 B. 120 C. 150 D. 180 E. NOTA

16. Which of the following statements are true?

- I. $P(\text{Type I error}) + P(\text{Type II error}) = 1$
II. When the alternative hypothesis is actually true, $P(\text{Type II error}) + \text{Power} = 1$
III. A Type I error occurs when you reject the null hypothesis, but the null hypothesis should not be rejected because the null hypothesis is actually true.

- A. I only B. II only C. I and II D. I, II and III E. NOTA

17. Given the random variables A and B and their parameters $\mu_A = 68, \sigma_A = 7, \mu_B = 84, \sigma_B = 10, \rho = 0.7$, find the standard deviation of the random variable $(6A - 3B)$. Hint: For random variables X and Y with true correlation coefficient ρ , $Var(X \pm Y) = Var(X) + Var(Y) \pm 2\rho\sqrt{Var(X)Var(Y)}$.

- A. 12 B. $12\sqrt{6}$ C. $6\sqrt{74}$ D. 30 E. NOTA

18. Jennifer would like to know what she earned on her math final exam. Her teacher tells her the following information: The least-squares regression line between her math midterm exam (M) and her math final exam (F) has the equation $\hat{F} = 3M - 120$. Jennifer earned a 64 on the math midterm exam and her residual for the linear equation is 8. What did Jennifer earn on her math final exam?

- A) 80 B) 72 C) 64 D) 60 E) NOTA

19. 92% of the participants in this year's Boston Marathon finished the race. 100 participants are randomly selected. Find the probability that between 85 and 94 participants, inclusive, finished the race. Round your final answer to four decimal places.

- A) 0.8143 B) 0.8068 C) 0.6910 D) 0.6835 E) NOTA

20. Alachua county school board is interested in the AP pass rate between their high schools. From both Eastside High School and Gainesville High School, 100 student who took AP statistics last year were randomly selected. 65 of the students at Eastside and 75 of the students at Gainesville passed an AP exam. Assume all test conditions have been met. Find the standard error that would be used to determine if there was a difference between the two schools in the proportion of AP students who passed an AP exam.

- A) $\frac{\sqrt{166}}{300}$ B) $\frac{5\sqrt{42}}{21}$ C) $\frac{\sqrt{42}}{100}$ D) 0.02 E) NOTA

21. The results of an Algebra test form an approximately normal distribution. Jennifer scored an 86 on the test and 16 percent of the class scored higher than Jennifer. Brad scored an 62 on the test and 31 percent of the class scored lower than Brad. Round all z-scores needed for the problem to two decimal places before doing any calculations. Let the mean of the test be M and the standard deviation of the test be S. Find the value of $(M - S)$.

- A) $\frac{9214}{149}$ B) $\frac{8038}{149}$ C) $\frac{1988}{37}$ D) 54 E) NOTA

22. Given that events A and B are independent, $P(A) = 0.65$, $P(A \cup B) = 0.79$, find the exact value of: $P(B'|A) + P(A'|B)$.

- A) $\frac{187}{104}$ B) $\frac{619}{520}$ C) $\frac{53}{100}$ D) $\frac{19}{20}$ E) *NOTA*

The following information applies to questions 23 and 24:

Paul is running a game at the school carnival to raise money for the math club. Players spin a wheel and either win or lose money. The outcomes are shown below:

Win/Lose	Win \$7	Lose \$10	Lose \$7	Lose \$12
P(Win/Lose)	0.4	0.1	0.2	0.3

23. A player spins the wheel once. Find the expected value of their spin.

- A) Lose \$5.50 B) Lose \$4 C) Lose \$3.20 D) Lose \$2 E) *NOTA*

24. Paul provides players an incentive to continue to spin the wheel. For each successive game they play, the winning prize continues to increase by \$1. For example, on your second spin, you can win \$8, on your third spin you can win \$9, etc. Scarlett plays X games. The Xth game is fair. Find the value of X.

- A) 10 B) 9 C) 8 D) 7 E) *NOTA*

25. There is a positive linear relationship between the number of apples students eat per week and their math average. The response variable is the math average, x , and the explanatory variable is the number of apples students eat per week, y . The mean number of apples students eat per week is 3 with a standard deviation of 2 and the mean math average is 75 with a standard deviation of 12. The coefficient of determination between the variables is 0.4225. Find the line of best fit between the variables in slope intercept form.

- A) $\hat{y} = \frac{39}{10}x + \frac{633}{10}$ B) $\hat{y} = \frac{39}{10}x - \frac{579}{2}$ C) $\hat{y} = \frac{13}{120}x + \frac{2987}{40}$ D) $\hat{y} = \frac{13}{120}x - \frac{41}{8}$ E) *NOTA*

26. Mr. Taylor wants to determine if there is a difference between his morning Statistics class and his afternoon Statistics class. The results of the exam on significance testing provides the following results. The mean of the morning class is 80 with a standard deviation of 5 and was taken by 25 students. The mean of the afternoon class is 75 with a standard deviation of 8 and was taken by 25 students. Assume all test conditions have been met. Find the 90% confidence interval to determine if there was a difference between the two classes. Round each endpoint of the interval to five decimal places. Assume there is a positive point estimate for the interval.

- A) (1.77191, 8.22809) C) (1.77191, 8.22080)
 B) (1.77169, 8.22830) D) (1.77169, 8.22831) E) *NOTA*

27. Regarding linear regression, which of the following statements about outliers are true?

- I. Outliers must always have large residuals.
- II. A point may not be an outlier even though its x value is an outlier in the x variable direction and the y value is an outlier in the y variable direction.
- III. Removal of an outlier sharply affects the regression line by changing the slope by a large amount.

A) I and II B) I and III C) II and III D) I, II, III E) NOTA

28. Given $H_0: \mu = 45$, $H_a: \mu < 45$. After running the significance test, you conclude that $\mu < 45$. In truth, the actual population mean is $\mu = 41$. What can you conclude from this?

- A) You have drawn a correct conclusion.
- B) A Type I error has been committed.
- C) A Type II error has been committed.
- D) The results of the test are not significant.
- E) NOTA

29. Find the proportion of the values in a normal distribution that are outliers according to the 1.5IQR rule. Round the final answer to five decimal places.

A) 0.00349 B) 0.00368 C) 0.00698 D) 0.00736 E) NOTA

30. A test for the flu is positive 97% of the time for people who have the flu. The test is also positive 2% of the time for those who do not have the flu. Suppose 8% of the population has the flu. What is the probability that a randomly selected person has the flu, given that the person tests positive for the flu? Round your answer to three decimal places.

A) 0.096 B) 0.808 C) 0.904 D) 0.990 E) NOTA