

※本大題請於試卷內之「選擇題作答區」依序作答。

Multiple choice questions (4% for each)

- The standard error of the mean is equal to
 - the sample variance divided by the sample size.
 - the sample standard deviation divided by the square root of the sample size.
 - the sample variance divided by the square root of the sample size.
 - twice the square root of the sample size.
 - twice the square root of the sample variance.
- A calculated range of values that we estimate contains the true mean of a population with a known degree of certainty is called a
 - standard error.
 - standard deviation.
 - median.
 - Students t-value.
 - confidence interval.
- We can infer a statistically significant difference between two population means when
 - our estimates of the two means are different.
 - the variances of the two means do not overlap.
 - the standard deviations of the two means do not overlap.
 - the 95% confidence intervals for the two means do not overlap.
 - the 95% confidence intervals for the two means are of different widths.
- The "Mann-Whitney test"
 - assumes that data from the populations being compared are normally distributed.
 - is identical in calculation to a t-test.
 - is based on ranked data rather than actual measurements.
 - is a procedure for measuring concentrations of dissolved nitrates in freshwater.
 - is a procedure for measuring levels of calcium and potassium in soils.

5. Given the following data, determine the interquartile range:

Quadrats	1	2	3	4	5	6	7	8	9	10	11	12
Number of nymphs	2	4	5	18	32	45	67	71	76	79	85	126

- 2 to 126
- 5 to 79
- 45 to 67
- 18 to 71
- 5 6 40

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6. Which of the following is NOT an assumption of the t-test?
- A. Each sample is drawn from a population with a normal distribution.
 - B. The two populations being compared have equal variances.
 - C. The two populations being compared have equal means.
 - D. All of each sample is drawn from a population with a normal distribution, the two populations being compared have equal variances, and the two populations being compared have equal means are assumptions.
 - E. None of each sample is drawn from a population with a normal distribution, the two populations being compared have equal variances, and the two populations being compared have equal means are assumptions.
7. A normal distribution is assumed for which of the following statistical tests?
- A. Student's t-test
 - B. 95% confidence intervals
 - C. regression analysis
 - D. All of the choices are correct.
 - E. both Student's t-test and 95% confidence intervals
8. In a normal distribution, _____ of the observations fall within one standard deviation of the mean.
- A. 31.7%
 - B. 68.3%
 - C. 95.5%
 - D. 98.3%
 - E. 99.7%
9. The average yearly rainfall in a city is 55 cm. Assume yearly rainfalls are normally distributed, what is the standard deviation if 15% of the years have rainfalls above 60 cm?
- A. 4.83
 - B. 5.18
 - C. 6.04
 - D. 8.93
 - E. The standard deviation cannot be computed from the information given.
10. A ecological research team tests for effective reduction in a sample of pest control using three different dosages of a new chemical. Which of the following is true?
- A. There are three explanatory variables.
 - B. There is one explanatory variable with three levels of response.
 - C. Effective reduction is the only explanatory variable, but there are three response variables corresponding to the different dosages.
 - D. There are three levels of a single explanatory variable.
 - E. Each explanatory level has an associated level of response.
11. Professor Lee's statistics class had a standard deviation of 11.2 on a standardized test, while Professor Lin's class had a standard deviation of 5.6 on the same test. Which of the following is the most reasonable

conclusion concerning the two classes' performance on the test?

- A. Professor Lee's class is less heterogeneous than Professor Lin's.
- B. Professor Lin's class is more homogeneous than Professor Lee's.
- C. Professor Lee's class performed twice as well as Mr. Lin's.
- D. Professor Lin's class did not do as well as Mr. Lee's.
- E. Professor Lee's class had the higher mean, but this may not be statistically significant.

12. An ecologist hypothesizes that scores on a drug test are normally distributed with a mean of 70 and a standard deviation of 10. In a random sample of size 100, scores are distributed in the table below. What is the χ^2 statistic for a good-of-fit test?

Score	Below 60	60-70	70-80	Above 80
Number of people	10	40	35	15

- A. 5.071
- B. 2.758
- C. 26.000
- D. 1.945
- E. 0.128

13. Which of following can affect the value of the correlation coefficient r ?

- A. A change in measurement units.
- B. A change in which the variables' are renamed.
- C. Adding the same constant to all values of the dependent variable.
- D. All of the above can affect r value.
- E. None of the above can affect the r value.

14. Which of the following would result in the narrowest confidence interval?

- A. Small sample size and 95% confidence.
- B. Small sample size and 99% confidence.
- C. Large sample size and 95% confidence.
- D. Large sample size and 99% confidence.
- E. This cannot be answered due to no information of the standard deviation.

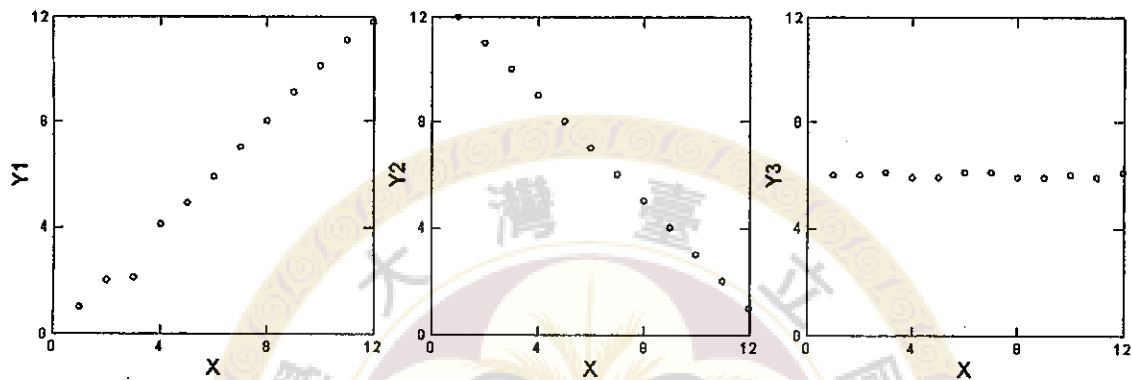
15. If all the other variables remain constant, which of the following will increase the power of a hypothesis test?

- I. Increasing the sample size.
- II. Increasing the signify level.
- III. Increasing the probability of a Type II error.

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- A. I only.
- B. II only.
- C. III only.
- D. I and II.
- E. All are true.

16. Consider the following three scatterplots:



What is the relationship among r_1 , r_2 , and r_3 , the correlation coefficient associated with the first, second, and third scatterplots, respectively.

- A. $r_1 < r_2 < r_3$
- B. $r_1 < r_3 < r_2$
- C. $r_1 < r_2 < r_3$
- D. $r_2 < r_3 < r_1$
- E. $r_3 < r_2 < r_1$

※本大題請於試卷內之「非選擇題作答區」標明題號依序作答。

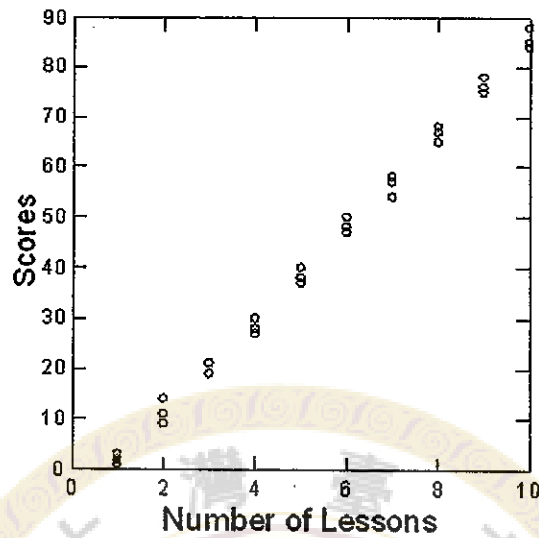
Questions

1. Explain the following terms (4% for each):

- A. ANOVA
- B. the coefficient of variation
- C. Standard error

2. (24%) An university offers a 10-lesson program of study to improve students' environmental awareness (measured as scores). A survey is made of a random sampling of 30 students. A scatterplot of improvement in total score versus number of lessons taken is as follows:

接次頁



Below is the computer output of the regression analysis using a statistical package:

Dependent Variable	SCORE
N	30
Multiple R	0.998

Effect	Coefficient	Standard Error	Std. Coefficient
CONSTANT	-7.756	0.614	0.000
LESSONS	9.295	0.099	0.998

Analysis of Variance					
Source	SS	df	Mean Squares	F-Ratio	p-Value
Regression	21,383.031	1	21,383.031	8,813.156	0.000
Residual	67.935	28	2.426		

Using the above information to answer the following questions:

- What is the equation of the regression line predicts score improvement as a function of number of lessons?
- Interpret, in context, the slope of the regression line.
- What is the meaning of r^2 in context of the study.
- Give the value of the correlation coefficient.
- Perform a test of significance for the slope of the regression line.

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