

(一) 單選題 (共 25 題, 每題 2 分, 合計 50 分)

1. The nominal scale of measurement has the properties of the
 - a. ordinal scale
 - b. only interval scale
 - c. ratio scale
 - d. None of these alternatives is correct.
2. Statistical inference
 - a. refers to the process of drawing inferences about the sample based on the characteristics of the population
 - b. is the same as descriptive statistics
 - c. is the process of drawing inferences about the population based on the information taken from the sample
 - d. is the same as a census
3. A statistics professor asked students in a class their ages. On the basis of this information, the professor states that the average age of all the students in the university is 24 years. This is an example of
 - a. a census
 - b. descriptive statistics
 - c. an experiment
 - d. statistical inference
4. A tabular method that can be used to summarize the data on two variables simultaneously is called
 - a. simultaneous equations
 - b. crosstabulation
 - c. a histogram
 - d. an ogive
5. In a scatter diagram, a line that provides an approximation of the relationship between the variables is known as
 - a. approximation line
 - b. trend line
 - c. line of zero intercept
 - d. line of zero slope
6. In a cumulative percent frequency distribution, the last class will have a cumulative percent frequency equal to
 - a. one
 - b. 100
 - c. the total number of elements in the data set
 - d. none of the above
7. Since the population size is always larger than the sample size, then the sample statistic
 - a. can never be larger than the population parameter
 - b. can never be equal to the population parameter
 - c. can be smaller, larger, or equal to the population parameter
 - d. can never be smaller than the population parameter
8. The variance of a sample of 169 observations equals 576. The standard deviation of the sample equals

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- a. 13
 - b. 24
 - c. 576
 - d. 28,461
9. If a six sided die is tossed two times and "3" shows up both times, the probability of "3" on the third trial is
- a. much larger than any other outcome
 - b. much smaller than any other outcome
 - c. $1/6$
 - d. $1/216$
10. If A and B are independent events with $P(A) = 0.4$ and $P(B) = 0.6$, then $P(A \cap B) =$
- a. 0.76
 - b. 1.00
 - c. 0.24
 - d. 0.20
11. Which of the following is a required condition for a discrete probability function?
- a. $\sum f(x) = 0$
 - b. $f(x) \geq 1$ for all values of x
 - c. $f(x) < 0$
 - d. $\sum f(x) = 1$
12. A continuous random variable may assume
- a. any value in an interval or collection of intervals
 - b. only integer values in an interval or collection of intervals
 - c. only fractional values in an interval or collection of intervals
 - d. only the positive integer values in an interval
13. A probability distribution showing the probability of x successes in n trials, where the probability of success does not change from trial to trial, is termed a
- a. uniform probability distribution
 - b. binomial probability distribution
 - c. hypergeometric probability distribution
 - d. normal probability distribution
14. Which of the following is not a characteristic of the normal probability distribution?
- a. The mean, median, and the mode are equal
 - b. The mean of the distribution can be negative, zero, or positive
 - c. The distribution is symmetrical
 - d. The standard deviation must be 1
15. Consider a binomial probability experiment with $n = 3$ and $p = 0.1$. Then, the probability of $x = 0$ is
- a. 0.0000
 - b. 0.0001
 - c. 0.001
 - d. 0.729
16. A population consists of 500 elements. We want to draw a simple random

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- sample of 50 elements from this population. On the first selection, the probability of an element being selected is
- 0.100
 - 0.010
 - 0.001
 - 0.002
17. As the sample size increases, the
- standard deviation of the population decreases
 - population mean increases
 - standard error of the mean decreases
 - standard error of the mean increases
18. A population has a mean of 75 and a standard deviation of 8. A random sample of 800 is selected. The expected value of \bar{x} is
- 8
 - 75
 - 800
 - None of these alternatives is correct.
19. An estimate of a population parameter that provides an interval of values believed to contain the value of the parameter is known as the
- confidence level
 - interval estimate
 - parameter value
 - population estimate
20. The level of significance is the
- maximum allowable probability of Type II error
 - maximum allowable probability of Type I error
 - same as the confidence coefficient
 - same as the p -value
21. Your investment executive claims that the average yearly rate of return on the stocks she recommends is more than 10.0%. You plan on taking a sample to test her claim. The correct set of hypotheses is
- $H_0: \mu < 10.0\%$ $H_a: \mu \geq 10.0\%$
 - $H_0: \mu \leq 10.0\%$ $H_a: \mu > 10.0\%$
 - $H_0: \mu > 10.0\%$ $H_a: \mu \leq 10.0\%$
 - $H_0: \mu \geq 10.0\%$ $H_a: \mu < 10.0\%$
22. For a two-tailed test at 86.12% confidence, $Z =$
- 1.96
 - 1.48
 - 1.09
 - 0.86
23. When developing an interval estimate for the difference between two sample means, with sample sizes of n_1 and n_2 ,
- n_1 must be equal to n_2
 - n_1 must be smaller than n_2
 - n_1 must be larger than n_2
 - n_1 and n_2 can be of different sizes,

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24. Independent simple random samples are taken to test the difference between the means of two populations whose standard deviations are not known. The sample sizes are $n_1 = 25$ and $n_2 = 35$. The correct distribution to use is the
- Poisson distribution
 - t distribution with 60 degrees of freedom
 - t distribution with 59 degrees of freedom
 - t distribution with 58 degrees of freedom
25. The sampling distribution of $p_1 - p_2$ is approximated by a
- normal distribution
 - t-distribution with $n_1 + n_2$ degrees of freedom
 - t-distribution with $n_1 + n_2 - 1$ degrees of freedom
 - t-distribution with $n_1 + n_2 + 2$ degrees of freedom

(二) 問答題 (共 3 道題, 合計 50 分)

- (1). A professor believes that the final examination scores in statistics are normally distributed. A sample of 40 final scores has been taken. You are given the sample below. The mean of the scores is 83.1, and the standard deviation is 10.43.

56	63	65	68	72	72	73	75	77	78
78	79	80	80	80	80	80	80	81	81
82	84	84	86	86	87	88	90	90	92
92	93	93	94	95	96	97	98	100	100

- State the null and alternative hypotheses. (5分)
- Compute the test statistic and draw conclusion of the test with $\alpha = 0.01$, given that $\chi_{5,0.01}^2 = 15.086$. (10分)

- (2) Consider the following data for two variables x and y.

X	y
1	1
4	6
7	9
8	7
9	4
10	3

- An estimated regression equation of the form $\hat{y} = b_0 + b_1x$ was developed for the above data and the results are shown below. Comment on the adequacy of this equation for predicting y. Let $\alpha = 0.05$. (10分)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.3052
R Square	0.0932
Adjusted R Square	-0.1335
Standard Error	3.0857
Observations	6

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ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression					
n	1	3.9130	3.9130	0.4110	0.5564
Residual	4	38.0870	9.5217		
Total	5	42			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.3043	2.9297	1.1279	0.3224
X	0.2609	0.4069	0.6411	0.5564

b. Now, another regression equation of the form $\hat{y} = b_0 + b_1x + b_2x^2$ was developed for the above data and results are shown below. Comment on the adequacy of this equation for predicting y . Let $\alpha = 0.05$ (10分)

SUMMARY
OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.9508
R Square	0.9041
Adjusted R Square	0.8401
Standard Error	1.1588
Observations	6

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	37.9713	18.9856	14.1376	0.0297
Residual	3	4.0287	1.343		
Total	5	42			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-2.6808	1.6196	-1.655	0.1964
x	3.6803	0.6960	5.2879	0.0132
x-squared	-0.3133	0.0622	-5.036	0.0151

(3) Information regarding random samples of annual salaries (in thousands of dollars) of doctors in three different specialties is shown below.

	Pediatrics	Radiology	Pathology
Sample size	12	10	11
Average salary	120	186	240
Sample variance	16	18	20

- a. State the null and alternative hypotheses to be tested. (5分)
 b. Show the ANOVA table and conduct the test with $F_{0.05} = 3.32$. (10分)