

招生學年度	102	招生類別	碩士班
系所班別	企業管理學系碩士班(甲組)、運籌管理研究所碩士班(甲組、乙組)、財務金融學系碩士班		
科目	統計學		
注意事項	本考科可使用掌上型計算機		

Multiple Choice: 25 questions, 4 points each.

Some quantiles of the standard normal distribution are $z_{0.95} = 1.645$, $z_{0.975} = 1.96$, and $z_{0.995} = 2.576$.

The z-score of a random variable X with mean μ and standard deviation σ is defined as $\frac{X - \mu}{\sigma}$.

1. A manufacturer of balloons claims that p , the proportion of its balloons that burst when inflated to a diameter of up to 12 inches, is no more than 0.05. Some customers have complained that the balloons are bursting more frequently. If the customers want to conduct an experiment to test the manufacturer's claim, which of the following hypotheses would be appropriate?

- (1) $H_0: p \neq 0.05$, $H_1: p = 0.05$ (2) $H_0: p \leq 0.05$, $H_1: p > 0.05$
 (3) $H_0: p = 0.05$, $H_1: p \neq 0.05$ (4) $H_0: p \geq 0.05$, $H_1: p < 0.05$

2. Lauren is enrolled in a very large college calculus class. On the first exam, the class mean was 75 and the standard deviation was 10. On the second exam, the class mean was 70 and the standard deviation was 15. Lauren scored 85 on both exams. Assuming the scores on each exam were approximately normally distributed, on which exam did Lauren score better relative to the rest of the class?

- (1) She scored much better on the first exam. (2) She scored much better on the second exam.
 (3) She scored about equally well on both exams. (4) It is impossible to tell because the class size is not given.

3. The number of sweatshirts a vendor sells daily has the following probability distribution.

Number of Sweatshirts x	0	1	2	3	4	5
$P(x)$	0.3	0.2	0.3	0.1	0.08	0.02

If each sweatshirt sells for \$25, what is the expected daily total dollar amount taken in by the vendor from the sale of sweatshirts?

- (1) \$5.00 (2) \$7.60
 (3) \$35.50 (4) \$38.00

4. The correlation between two scores X and Y equals 0.8. If both the X scores and the Y scores are converted to z-scores, then the correlation between the z-score for X and that for Y would be

- (1) -0.8 (2) -0.2
 (3) 0.0 (4) 0.8

5. Suppose that the distribution of a set of scores has a mean of 47 and a standard deviation of 14. If 4 is added to each score, what will be the mean and the standard deviation of the distribution of new scores?

- | | | |
|-----|------|--------------------|
| | Mean | Standard Deviation |
| (1) | 51 | 14 |
| (2) | 51 | 18 |
| (3) | 47 | 14 |
| (4) | 47 | 16 |

6. Which of the following statements is true for two events, each with probability greater than 0?

- (1) If the events are mutually exclusive, they must be independent.
 (2) If the events are independent, they must be mutually exclusive.
 (3) If the events are not mutually exclusive, they must be independent.
 (4) If the events are mutually exclusive, they cannot be independent.

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Table 1

Miles (per day)	Frequency
1-3	29
4-6	12
7-9	18
10-12	2
13-15	16

7. Approximate the mean of the grouped data in Table 1.
- (1) 12.7 (2) 15.2
(3) 6.6 (4) 4.1
8. Approximate the sample standard deviation of the grouped data in Table 1.
- (1) 13.5 (2) 4.58
(3) 20.7 (4) 15.6
9. The random variable X represents the number of boys in a family of three children. Assuming that boys and girls are equally likely, find the mean and standard deviation for the random variable X .
- Mean Standard Deviation
- (1) 1.50 0.87
(2) 1.50 0.75
(3) 2.25 0.75
(4) 2.25 0.87
10. A fair coin is tossed three times. What is the probability that it lands on heads exactly one time?
- (1) 0.125 (2) 0.250
(3) 0.333 (4) 0.375
11. A national achievement test is administered annually to 3rd graders. The test has a mean score of 100 and a standard deviation of 15. If Jane's z-score is 1.20, what was her score on the test?
- (1) 88 (2) 100
(3) 118 (4) 112
12. Suppose we want to estimate the average weight of an adult male in Dekalb County, Georgia. We draw a random sample of 100 men from a population of 1,000,000 men and weigh them. We find that the average man in our sample weighs 180 pounds, and the standard deviation of the sample is 30 pounds. What is the 95% confidence interval of the average weight of an adult male in Dekalb County?
- (1) 180 ± 1.86 (2) 180 ± 3.0
(3) 180 ± 5.88 (4) 180 ± 30
13. The number of adults living in homes on a randomly selected city block is described by the following probability distribution.

Number of adults, x	1	2	3	4
Probability, $P(x)$	0.25	0.50	0.15	???

What is the standard deviation of the probability distribution?

- (1) 0.50 (2) 0.62
(3) 0.79 (4) 0.89

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14. Let Y denote a random variable with moment-generating function $m(t) = \frac{1}{6}e^{3t} + \frac{1}{3}e^{6t} + \frac{1}{2}e^{10t}$.

Find $E(Y)$.

- (1) 7.5 (2) 9
(3) 6.5 (4) 8

15. Customers arrive at a department store checkout counter according to a Poisson distribution with a mean of 2 per minute. In a given 0.5-minute period, what is the probability that two or more customers will arrive at the counter?

- (1) $2e^{-1}$ (2) $1 - 2e^{-1}$
(3) $1 - e^{-2}$ (4) $1 - 3e^{-2}$

16. Suppose X and Y are independent random variables. The variance of X is equal to 16; and the variance of Y is equal to 9. Let $Z = X - Y$. What is the standard deviation of Z ?

- (1) 2.65 (2) 5.00
(3) 7.00 (4) 25.0

17. Molly earned a score of 1046 on a national achievement test. The mean test score was 850 with a standard deviation of 100. What proportion of students had a higher score than Molly? (Assume that test scores are normally distributed.)

- (1) 0.05 (2) 0.025
(3) 0.005 (4) 0.01

18. Assume that blood pressure readings are normally distributed with a mean of 120 and a standard deviation of 8. If 100 people are randomly selected, find the approximate probability that their mean blood pressure will be greater than 121.32.

- (1) 0.05 (2) 0.025
(3) 0.005 (4) 0.01

19. Given the null hypothesis $H_0: \mu \geq 18$ and its associated p -value = 0.07. Do you reject or fail to reject H_0 at the 0.05 level of significance?

- (1) There is sufficient evidence to support null hypothesis.
(2) There is sufficient evidence to reject null hypothesis.
(3) There is not sufficient evidence to support null hypothesis.
(4) There is not sufficient evidence to reject null hypothesis.

20. Please test the claim about the population proportion $p = 0.250$ given $n = 48$ and $\hat{p} = 0.231$. Use the level of significance $\alpha = 0.01$.

- (1) There is sufficient evidence to support null hypothesis.
(2) There is sufficient evidence to reject null hypothesis.
(3) There is not sufficient evidence to support null hypothesis.
(4) There is not sufficient evidence to reject null hypothesis.

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21. If the data for a test of significance is significant at the 0.01 level, then it will also be significant at the 0.05 level.

- (1) always (2) sometimes
(3) never (4) there is no enough information to answer it

Refer to the following ANOVA table for two-factor study (some information is missing).

Source of Variation	SSE	Degrees of freedom	MSE
Between treatments	1580		
Factor A	1544	2	772
Factor B	12	1	12
Interactions		2	
Error			
Total	1642	11	

22. Compute the test statistic for interactions between factors A and B

- (1) 30.68 (2) 1.16
(3) 75 (4) impossible to determine

23. Suppose you estimate the model $Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$, and obtain $\sum_{i=1}^{25} (y_i - \bar{y})^2 = 3.65$ and

$$\sum_{i=1}^{25} (y_i - \hat{y}_i)^2 = 2.45 .$$

Compute adjusted R^2

- (1) 0.6712 (2) 0.3288
(3) 0.2677 (4) 0.7323

24. Using the data from question 23, what are the degrees of freedom of the F -test for testing $H_0: \beta_1 = \beta_2 = 0$.

- (1) (1, 24) (2) (2, 23)
(3) (2, 22) (4) (1, 23)

25. Suppose you estimate the model $Y = \alpha + \beta x + \varepsilon$, and obtain

$$\sum_{i=1}^{10} x_i = 10, \quad \sum_{i=1}^{10} y_i = 20,$$

$$\sum_{i=1}^{10} x_i^2 = 100, \quad \sum_{i=1}^{10} y_i^2 = 150,$$

$$\sum_{i=1}^{10} x_i y_i = 35$$

Compute the least square estimate $\hat{\alpha}$

- (1) 1.83 (2) 0.17
(3) -1.83 (4) -0.17