以下共 40 題選擇題， 每題 2.5 分
※注意：請於試卷上「選擇題作答區」內依序作答。

1. The classification of student designation (freshman, sophomore, junior, senior) is an example of
a. a discrete random variable
b. a categorical random variable
c. a parameter
d. an estimation

2. When extreme values are present in a set of data, which of the following descriptive summary measures are most appropriate?
a. Interquartile range and median
b. variance and CV
c. CV and range
d. mean and standard deviation

3. The dean mailed a survey to a total of 500 students. The sample included 125 students randomly selected from each of the freshman, sophomore, junior, and senior classes on campus last term. What sampling method was used?
a. simple random sample
b. systematic sample
c. cluster sample
d. stratified sample

4. The joint probabilities shown in a table with two rows, A_1 and A_2 and two columns, B_1 and B_2, are the following: $P(A_1 \text{ and } B_1)=0.1$, $P(A_1 \text{ and } B_2)=0.3$, $P(A_2 \text{ and } B_1)=0.05$, and $P(A_2 \text{ and } B_2)=0.55$. Then $P(A_1|B_1)$ is
a. 0.1
b. 0.25
c. 0.33
d. 0.67

5. A certain electronic system contains 10 components. Suppose that the probability that each individual component fail is 0.2 and that the components fail independently of each other (Bernoulli trial). Given that at least one of the components has failed, what is the probability that at least two of the components have failed?
a. 0.2684
b. 0.4247
c. 0.6993
d. 0.8926

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6. Suppose that three independent random variables X_1, X_2, X_3 form a random sample from the uniform distribution on the interval [0,1]. The value of $E[(X_1-2X_2+X_3)^2]$ should be

a. -0.46

b. 0

c. 0.5

d. 1.46

7. On average, 20% of the emergency room patients at a hospital are students. In a random sample of four patients, what is the probability that three of them are students?

a. 0

b. 0.0064

c. 0.016

d. 0.0256

8. In a shipment of 10 mobile phones, 2 are damaged and 8 are good. If you take a random sample of three mobile phones from the 10 phones, what is the probability that all of them are in good condition?

a. 0.467

b. 0.512

c. 0.541

d. 0.7

9. Cars arrive at a gas station at a mean rate of 1.7 cars per minute. What is the probability of observing no car arriving at the gas station within a period of 60 seconds?

a. 0

b. 0.1827

c. 0.2804

d. 0.5882

10. After a fierce campaign for launching a new product, an advertiser would like to estimate the awareness rate of the new product to within 5 percent with 95% confidence. A random sample will be drawn from the target customers. The sample size for this task should be at least

a. 192

b. 385

c. 625

d. 1060

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11. When the necessary conditions are met, a two-tail test is being conducted to test the difference between two population proportions, but your statistical software provides only a one-tail area of 0.058 as part of its output. The p-value for this test should be

a. 0.029

b. 0.058

c. 0.116

d. 0.942

12. After calculating the sample size needed to estimate a population proportion to within 0.05, you have been told that the maximum allowable error must be reduced to 0.025. If the original calculation led to a sample size of 1000, the sample size will now have to be

a. 500

b. 2000

c. 4000

d. 8000

13. In testing the null hypothesis $H_0: p_1 - p_2 = 0$, if H_0 is false, the test could lead to

a. a Type I error

b. a Type II error

c. both Type I error and Type II error

d. neither a Type I error nor a Type II error

14. The lower limit of a confidence interval at 95% level of confidence for the population proportion if a sample of size 200 had 40 successes is

a. 0.1254

b. 0.1446

c. 0.1535

d. 0.2465

15. For a given sample size, if the level of significance α is decreased, the power of the test

a. will decrease

b. will increase

c. will remain the same

d. cannot be determined

16. A 98% confidence interval estimate for a population mean is determined to be 75.38 to 86.52. If the confidence level is reduced to 95%, the confidence interval for the population mean
a. becomes narrower
b. becomes wider
c. remain the same
d. none of the above

17. In developing an interval estimate for a population mean, the population standard deviation σ was assumed to be 10. The interval estimate was 50.92±2.14. Had σ equaled 20, the interval estimate would be
a. 50.92±1.07
b. 50.92±4.28
c. 50.92±8.56
d. 101.84±8.56

18. Two samples are selected at random from two independent normally distributed populations. Sample 1 has 49 observations and has a mean of 10 and a standard deviation of 5. Sample 2 has 36 observations and has a mean of 12 and a standard deviation of 3. The standard error of the sampling distribution of the sample mean difference is
a. 0.1853
b. 0.4306
c. 0.7331
d. 0.8719

19. The manager of a department store is thinking about establishing a new billing system for the store's credit customers. She determines that the new system will be cost-effective only if the mean monthly account is more than $170 at a 5% significant level. A random sample of 400 monthly accounts is drawn, for which the sample mean is $178. The manager knows that the accounts are approximately normally distributed with standard deviation of $65. What is the approximate probability of a Type II error in this case if the actual mean account is 188?
a. 0
b. 0.05
c. 0.10
d. 0.18

20. A sample of size 100 selected from one population has 60 successes, and a sample of size 150 selected from a second population has 95 successes. The test statistic for testing the equality of the population proportions equal to

a. -0.5319

b. 0.7293

c. -0.4190

d. 0.2702

Use the following information to answer questions 21 through 24.

Employees of MNM Corporation are about to undergo a retraining program. Management is trying to determine which of three programs is the best. They believe that the effectiveness of the programs may be influenced by sex. A factorial experiment was designed. You are given the following information. (α = .05)

Factor A: Program	Factor B: Sex	
	Male	Female
Program A	320	380
	240	300
Program B	160	240
	180	210
Program C	240	360
	290	380

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F
Factor A	36,150	2	18,075	F
Factor B	16,133	1	16,133	G
Interaction	1,517	B	D	H
Error	A	C	E	
Total	62,300	11		

21. What are the value of "B" and "C"?

a. 1, 7

b. 2, 6

c. 3, 5

d. 4, 4

22. What is the value of "E"?

a. 1214.28

b. 1416.66

c. 1700

d. 2125

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23. What is the critical value for testing Factor A?

a. 4.74

b. 5.14

c. 5.79

d. 6.94

24. The conclusion is that

a. All the results are significant.

b. Except the type of program, type of sex and interaction are significant.

c. Except the type of sex, type of program and interaction are significant.

d. Except the interaction, type of program and sex are significant.

e. None of the above answers is correct.

25. Application of the least squares method results in values of the Y intercept and the slope which minimizes the sum of the squared deviations between

a. the observed values of the independent variable and the estimated values of the independent variable

b. the actual values of the independent variable and estimated values of the dependent variable

c. the observed values of the dependent variable and the estimated values of the dependent variable

d. None of the above answers is correct.

26. Larger values of r^2 imply that the observations are more closely grouped about

a. the average value of the independent variables

b. the average value of the dependent variables

c. the least squares line

d. the origin

e. None of the above answers is correct.

27. In simple linear regression analysis, which of the following is not true?

a. The F test and the t test yield the same results.

b. The F test and the t test may or may not yield the same results.

c. The relationship between X and Y is represented by means of a straight line.

d. The value of $F = t^2$.

e. None of the above answers is correct.

28. In a regression and correlation analysis if $r^2 = 1$, then

a. SSE must also be equal to one

b. SSE must also be equal to zero

c. SSE can be any positive value

d. SSE must be negative

e. None of the above answers is correct.

29. In regression analysis, an outlier is an observation whose

a. mean is larger than the standard deviation

b. residual is zero

c. mean is zero

d. residual is much larger than the rest of the residual values

Use the following information to answer questions 30 through 32.

A sample of 30 houses which were sold in the last year was taken. The value of the house (Y) was estimated. The independent variables included in the analysis were the number of rooms (X_1), the size of the lot (X_2), the number of bathrooms (X_3), and a dummy variable (X_4), which equals 1 if the house has a garage and equals 0 if the house dose not have a garage. The following results were obtained: ($\alpha = .05$)

Predictor	Coefficient	Stdev
Constant	15,232.5	8,462.5
X_1	2,178.4	778.0
X_2	7.8	2.2
X_3	2,675.2	2,229.3
X_4	1,157.8	463.1

Analysis of Variance

Source of Variance	Degree of Freedom	Sum of Squares	Mean Squares
Regression	A	204,242.88	51,060.72
Error (Residuals)	B	205,890.00	8,235.60

30. What is the value of multiple coefficient of determination?

a. 0.4979

b. 0.5020

c. 0.992

d. 6.2

e. None of the above answers is correct.

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31. What are the value of "A" and "B"?
a. 5, 24
b. 5, 25
c. 4, 25
d. 4, 26
e. None of the above answers is correct.

32. Which description below is wrong?
a. F test for the model is significant.
b. X_1 a significant factor to predict Y.
c. X_2 a significant factor to predict Y.
d. X_3 a significant factor to predict Y.
e. X_4 a significant factor to predict Y.

33. In multiple regression analysis, the word **linear** in the term "general linear model" refers to the fact that
a. the relationship between the Y and X_is is linear
b. $\beta_0, \beta_1, \dots \beta_p$, all have exponents of 1
c. $\beta_0, \beta_1, \dots \beta_p$, all have exponents of at least 1
d. $\beta_0, \beta_1, \dots \beta_p$, all have exponents of less than 1
e. None of the above answers is correct.

34. Which of the following tests is used to determine whether an additional variable makes a significant contribution to a multiple regression model?
a. a t test
b. a Z test
c. an F test
d. a chi-square test
e. None of the above answers is correct.

35. The following regression model Y= $\beta_0 + \beta_1 X_1 + \beta_2 X_1^2 + \varepsilon$ is known as

a. first-order model with one predictor variable
b. second-order model with two predictor variables
c. second-order model with one predictor variable
d. None of the above answers is correct.

36. When dealing with the problem of nonconstant variance, the reciprocal transformation means using
a. 1/X as the independent variable instead of X
b. X^2 as the independent variable instead of X
c. Y^2 as the dependent variable instead of Y
d. 1/Y as the dependent variable instead of Y
e. None of the above answers is correct.

37. A nonparametric test for the equivalence of two populations would be used instead of a parametric test for the equivalence of the population parameters if

a. the sample are very large

b. the samples are not independent

c. no information about the population is available

d. The parametric test is always used in this situation.

e. None of the above answers is correct.

Use the following information to answer questions 38 through 40.

Forty-one individuals from a sample of 60 indicated they oppose abortion. We are interested in determining whether or not there is a significant difference between the proportions of opponents and proponents of legalized abortion.

38. The null hypothesis that is being tested is

a. $H_0: \mu = 5$

b. $H_0: \mu = 0.5$

c. $H_0: P = 5$

d. $H_0: P = 0.5$

e. None of the above answers is correct.
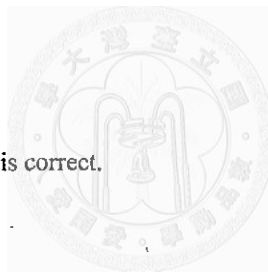
39. The test statistics is

a. 3.87

b. 2.84

c. 60

d. 0.5

e. 0.68

40. The conclusion is that

a. there is no significant difference between the proportions

b. there is a significant difference between the proportions

c. there could be a difference in proportions, depending on the sample size

d. None of the above answers is correct.

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