

一、單選題（每題3分）※ 注意：請於試卷上「選擇題作答區」依序作答。

1. Suppose you are told that  $P(A) = 0.4$ ,  $P(B) = 0.3$ , and  $P(A \cap B) = 0$ . It follows that A and B are:  
(A.) Independent but not mutually exclusive.  
(B.) Mutually exclusive but not independent.  
(C.) Neither mutually exclusive nor independent.  
(D.) Both mutually exclusive and independent.
2. If two events are not mutually exclusive, then the probability that at least one of the events will occur equals:  
(A.) The sum of the probabilities that each will occur.  
(B.) The sum of the probabilities that each will occur minus the probability that both will occur jointly.  
(C.) The product of the probabilities that each will occur.  
(D.) The difference between the probabilities of the two events.
3. Suppose that A and B are independent events, with  $P(A) = 0.2$  and  $P(B) = 0.7$ . What is the probability that neither A nor B will occur?  
(A.) 0.14  
(B.) 0.24  
(C.) 0.90  
(D.) None of the above
4. Which of the parameters associated with a binomial experiment will produce a probability distribution with the smallest standard deviation, given that the sample size  $n$  is the same for each situation?  
(A.)  $p = 0.5$   
(B.)  $p = 0.4$   
(C.)  $p = 0.3$   
(D.)  $q = 0.8$   
(E.)  $q = 0.1$
5. Suppose  $P(A) = 0.2$  and  $P(B) = 0.5$ . If  $P(A|B) = 0.4$ , then  
(A.) A and B are mutually exclusive  
(B.)  $P(A \cap B) = P(A)$   
(C.)  $P(A \cap B) = 0.2$   
(D.) A and B are independent.  
(E.) None of the above
6. Which of the following does NOT characterize the setting of a binomial random variable?  
(A.) The experiment consists of two identical trials.  
(B.) The trials are independent  
(C.) Each trial has two possible outcomes  
(D.) The chance of "success" on each trial is the same.

7. Suppose that 25% of all subscribers to a nationally circulated business magazine earn an income in excess of \$40,000. The magazine polls 20 subscribers at random to determine the income category into which each falls. What is the probability that none of the 20 subscribers earn more than \$40,000?
- (A.) 0.0032  
(B.) 0.20  
(C.) 0.5  
(D.) 0.05  
(E.) 0.25
8. The binomial distribution approaches the normal curve in shape when
- (A.)  $n$  increases and  $p$  approaches 1.  
(B.)  $n$  decreases and  $p$  approaches 0.  
(C.)  $n$  increases and  $p$  moves away from .5  
(D.)  $n$  decreases and  $p$  approaches .5  
(E.)  $n$  increases and  $p$  moves toward .5
9. Which of the following statements is true?
- (A.) all parameters have sampling distributions  
(B.) a parameter is a function of sample outcomes  
(C.) Chance will cause a statistic to vary from sample to sample  
(D.) the standard error of the mean will exceed the standard deviation of the population from which the samples are drawn.  
(E.) the sampling distribution of the mean has precisely the same scatter as the parent population from which the samples were drawn.
10. Suppose that statistics  $T$  is an unbiased estimator of  $\theta$  and a sample of size  $n$  is used to compute  $T$ . Which of the following is NECESSARILY true?
- (A.) the variances of the sampling distribution of  $T$  is  $\sigma/\sqrt{n}$   
(B.)  $T=\theta$   
(C.)  $E(\theta) = T$   
(D.)  $E(T)=\theta$   
(E.) variance ( $T$ ) < variance ( $\theta$ )
11. If a researcher is using a 95% level of confidence in calculating a confidence interval,
- (A.) 95% of the time the computed interval will include the sample means.  
(B.) 5% of the time such interval will not include the population value.  
(C.) in the long run, 95% of all sample means will fall within the interval.  
(D.) 95% of the time the interval will not include the population value.
12. For a given level of confidence, if the sample size is decreased,
- (A.) the probability that the interval will not include the parameter increases.  
(B.) the difference between the upper limit of the interval and the lower limit of the interval remains the same  
(C.) the difference between the upper limit of the interval and the lower limit of the interval increases.  
(D.) the different between the upper limit of the interval and the lower limit of the interval decrease.

13. Which of the following statements is true about confidence intervals for a fixed sample of size  $n$ ?
- (A.) if the population standard deviation is known, all 95% confidence intervals will have the same width.
  - (B.) if the population standard deviation is known, all 95% confidence intervals will have the same midpoint and the same width.
  - (C.) if the population standard deviation is not known, all 95% confidence intervals will have the same midpoint but different  $p$  widths.
  - (D.) if the population standard deviation is not known, all 95% confidence intervals will have different midpoint but equal width.
14. The parameter(s) for the  $t$ -distribution is (are)
- (A.)  $\mu$  and  $\sigma$
  - (B.) variance
  - (C.) degree of freedom
  - (D.)  $\chi^2$
15. In hypothesis testing,  $\alpha$  can be set as low as desired
- (A.) by increasing the sample size.
  - (B.) without having any effect on  $\beta$ .
  - (C.) only in very special situations, because most of the time researchers are limited in choice by the nature of the problem.
  - (D.) but at the expenses of increasing risk of a Type II error as  $\alpha$  is decreased.
16. the relationship between  $\alpha$  and  $\beta$  is that
- (A.) if  $n$  remains the same, as  $\alpha$  is increased,  $\beta$  decreases.
  - (B.) if  $n$  remains the same, as  $\alpha$  is increased,  $\beta$  increases.
  - (C.) if  $\alpha$  is held constant but  $n$  is increased,  $\beta$  will increase.
  - (D.) if  $\beta$  is held constant but  $n$  is increased,  $\alpha$  will remain the same.
17. in the case of  $p$ -values and their usage,
- (A.) the larger the  $p$ -value, the heavier is the weight of the sample evidence for rejecting the null hypothesis.
  - (B.) the smaller the  $p$ -value, the heavier is the weight of the sample evidence for rejecting the null hypothesis.
  - (C.) proper analysis requires the specification of  $\alpha$  prior to collection of the information
  - (D.) proper analysis requires the specification of  $\alpha$  and  $\beta$  prior to the collection of the sample information.
18. One of the properties of the chi-square distribution:
- (A.) a chi-square distribution has both negative and positive values
  - (B.) chi-square distribution are symmetrical
  - (C.) chi-square values are normally distributed
  - (D.) there are many chi-square distributions, one for each number of degree of freedom.

19. the inferences for  $\sigma$  and  $\sigma^2$  are based on the assumption that  
 (A.) the underlying population from which the sample measurements are drawn is normal.  
 (B.) the underlying population sampled is t-distributed.  
 (C.) the underlying population sampled is F-distributed.  
 (D.) the underlying population sampled is chi-square distributed.
20. if  $\bar{x}_1$  and  $\bar{x}_2$  are independent normally distributed random variables, then the distribution  
 (A.)  $\bar{x}_1 - \bar{x}_2$  will be t-distributed.  
 (B.)  $\bar{x}_1 - \bar{x}_2$  will be normally distributed.  
 (C.)  $x_1 - x_2$  will be normally distributed.  
 (D.)  $x_1 - x_2$  will be t-distributed.
21. in a test of independence for a contingency table, if the chi-square value falls in the critical region,  
 (A.) the null hypothesis of independence should be accepted.  
 (B.) the calculated chi-square value must be less than the chi-square value associated with the Type I error.  
 (C.) the calculated chi-square value must be close to 0.  
 (D.) the null hypothesis of independence is rejected.
22. the degree of freedom associated with a contingency table possessing r rows and c columns will always equal  
 (A.) the product of  $r \times c$ .  
 (B.) the product of  $(r-1) \times (c-1)$ .  
 (C.) the sum of  $r+c$ .  
 (D.) the product of  $r \times c$  less the sum of  $r+c$ .
23. See the ANOVA table shown below. What is the total number of observations?  
 (A.) 7  
 (B.) 9  
 (C.) 11  
 (D.) 13  
 (E.) none of the above

Source	df	SS	MS	F
Treatment	2	?	?	2
Error	?	?	25	
Total	?	325		

24. There are three basic assumptions for the F-test in ANOVA to be valid, and those assumptions are:  
 (A.) normality, large sample sizes, and equal group variances.  
 (B.) normality, independence, and equal variance.  
 (C.) large sample sizes, normality, and equal variances.  
 (D.) equal variance, large sample sizes, and independence.

25. which of the following is NOT one of the assumptions for regression analysis:

- (A.) the relationship between X and Y is linear
- (B.)  $E(e_i)=0$
- (C.) zero conditional mean:  $E(e_i|x_i)=0$
- (D.) homoscedasticity:  $\text{var}(e_i)=\sigma^2$
- (E.)  $E(e_i x_i) > 0$

二、簡答題 (共 25 分) ※ 注意：請於試卷上「非選擇題作答區」標明題號並依序作答。

某社會學家想瞭解為什麼職業聲望有高有低 (從最低 0 分到最高 78 分)，他利用社會變遷調查資料進行職業聲望的迴歸分析，得到以下的結果，請協助他解釋這個分析的結果。

Source	SS	df	MS	Number of obs	=	7,496
Model	237388.41	7	33912.63	F(7, 7488)	=	126.31
Residual	2010460.62	7,488	268.491002	Prob > F	=	0.0000
				R-squared	=	0.1056
				Adj R-squared	=	0.1048
Total	2247849.03	7,495	299.913146	Root MSE	=	16.386

	迴歸係數	S.E.	t-value	sig.	95% confidence interval	
女性受訪者(男性為參考組)	-7.60	0.38	-20.05	0.00	-8.34	-6.86
年齡	0.78	0.07	10.56	0.00	0.63	0.92
年齡的平方	-0.01	0.00	-11.30	0.00	-0.01	-0.01
父親籍貫 (以閩南為參考組)						
本省客家	1.60	0.57	2.80	0.01	0.48	2.73
大陸各省	4.49	0.64	6.96	0.00	3.23	5.75
原住民	-1.56	1.54	-1.01	0.31	-4.57	1.46
教育年數	0.33	0.02	16.40	0.00	0.29	0.37
常數項	18.94	1.69	11.18	0.00	15.62	22.26

- (1) 請問這個迴歸分析總共用了多少樣本？ ( 1 分)
- (2) 請解釋 R-squared 的意義。( 3 分)
- (3) 請問你從 ANOVA table 可以得到什麼結論？ ( 3 分)
- (4) 請問迴歸模型中的第一個自變項的 t-value=-20.05 是在檢驗什麼假設？ ( 3 分)
- (5) 請解讀年齡如何影響職業聲望分數？ ( 3 分)
- (6) 研究者以三個虛擬變數來分析族群對於職業聲望的影響，請解釋“本省客家人”的迴歸係數所代表的意義。( 3 分)
- (7) 請問迴歸模型的常數項代表什麼意義？ ( 3 分)
- (8) 請問教育年數的 95% confidence interval 告訴我們什麼？ ( 3 分)
- (9) 請問原住民的迴歸係數-1.56 代表什麼意義？ ( 3 分)

試題隨卷繳回