選擇題 (選擇一個最適當的答案。第 1 到 32 題 每題 3 分， 第 33 題 為 4 分)

1. 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

2. Which of the following is not a measure of central location?
   a. mean
   b. median
   c. variance
   d. mode

3. Of five letters (A, B, C, D, and E), two letters are to be selected at random.　How many possible selections are there?
   a. 20
   b. 7
   c. 5!
   d. 10

4. If two events are independent, then
   a. they must be mutually exclusive
   b. the sum of their probabilities must be equal to one
   c. their intersection must be zero
   d. None of these alternatives is correct.

5. If X and Y are mutually exclusive events with $P(X) = 0.295$, $P(Y) = 0.32$, then $P(X \mid Y) =$
   a. 0.0944
   b. 0.6150
   c. 1.0000
   d. 0.0000

6. The variance for the binomial probability distribution is
   a. $var(x) = P(1 - P)$
   b. $var(x) = nP$
   c. $var(x) = n(1 - P)$
   d. $var(x) = nP(1 - P)$

7. X is a random variable with the probability function:
   $f(X) = X/6$　　for $X = 1, 2$ or 3
   The expected value of X is
   a. 0.333
   b. 0.500
   c. 2.000
   d. 2.333

8. For a uniform probability density function,
   a. the height of the function can not be larger than one
   b. the height of the function is the same for each value of x
   c. the height of the function is different for various values of x
   d. the height of the function decreases as x increases

9. Z is a standard normal random variable.　The $P(-1.20 \leq Z \leq 1.50)$ equals
   a. 0.0483
   b. 0.3849
   c. 0.4332
   d. 0.8181

10. A population has a standard deviation of 16.　If a sample of size 64 is selected from this population, what is the probability that the sample mean will be within ±2 of the population mean?
    a. 0.6826
    b. 0.3413
    c. -0.6826
    d. Since the mean is not given, there is no answer to this question.

11. The point estimator with the smaller variance is said to have
    a. smaller relative efficiency
    b. greater relative efficiency
    c. smaller relative consistency

(背面仍有題目,請繼續作答)

         d.   greater relative consistency

12.   Stratified random sampling is a method of selecting a sample in which
         a.   the sample is first divided into strata, and then random samples are taken from each stratum
         b.   various strata are selected from the sample
         c.   the population is first divided into strata, and then random samples are drawn from each stratum
         d.   None of these alternatives is correct.

13.   A population has a mean of 180 and a standard deviation of 24.   A sample of 64 observations will be taken.   The probability that the sample mean will be between 183 and 186 is
         a.   0.1359
         b.   0.8185
         c.   0.3413
         d.   0.4772

14.   For the interval estimation of μ when σ is known and the sample is large, the proper distribution to use is
         a.   the normal distribution
         b.   the t distribution with n degrees of freedom
         c.   the t distribution with n - 1 degrees of freedom
         d.   the t distribution with n - 2 degrees of freedom

15.   A sample of 100 elements from a population is selected, and the standard deviation of the sample is computed.   For an interval estimation of μ, the proper distribution to use is the
         a.   normal distribution
         b.   t distribution with 100 degrees of freedom
         c.   t distribution with 101 degrees of freedom
         d.   t distribution with 102 degrees of freedom

16.   Whenever using the t distribution in estimation, we must assume that
         a.   the sample size is at least 30
         b.   the sampling distribution is approximately normal
         c.   the population is approximately normal
         d.   the finite population correction factor is necessary

17.   It is known that the population variance equals 484.   With a 0.95 probability, the sample size that needs to be taken if the desired margin of error is 5 or less is
         a.   25
         b.   74
         c.   189
         d.   75

18.   Which of the following does **not** need to be known in order to compute the p-value?
         a.   knowledge of whether the test is one-tailed or two-tailed
         b.   the value of the test statistic
         c.   the level of significance
         d.   None of these alternatives is correct.

Exhibit A
A random sample of 16 students selected from the student body of a large university had an average age of 25 years and a standard deviation of 2 years.   We want to determine if the average age of all the students at the university is significantly different from 24.   Assume the distribution of the population of ages is normal.

19.   Refer to Exhibit A.   The standardized test statistic is
         a.   1.96
         b.   2.00
         c.   1.645
         d.   0.05

20.   Refer to Exhibit A.   At 95% confidence, it can be concluded that the mean age is
         a.   not significantly different from 24
         b.   significantly different from 24
         c.   significantly less than 24
         d.   significantly less than 25

21.   To construct an interval estimate for the difference between the means of two populations which are normally distributed and have equal variances, we must use a t distribution with (let n_1 be the size of

sample 1 and n_2 the size of sample 2)
a. $(n_1 + n_2)$ degrees of freedom
b. $(n_1 + n_2 - 1)$ degrees of freedom
c. $(n_1 + n_2 - 2)$ degrees of freedom
d. $n_1 - n_2 + 2$

Exhibit B
In order to estimate the difference between the average daily sales of two branches of a department store, the following data has been gathered.　Assume the two populations are normally distributed and have equal variances.

	Downtown Store	North Mall Store
Sample size	12 days	14 days
Sample mean	$36,000	$32,000
Sample standard deviation	$1,200	$1,000

22. Refer to Exhibit B.　A point estimate for the difference between the two sample means is

a. 2
b. 200
c. 4000
d. 32000

23. Refer to Exhibit B.　A 95% interval estimate for the difference between the two population means is

a. 3109.90 to 4890.10
b. 32000 to 36000
c. 12 to 14
d. 1000 to 1200

24. In order not to violate the requirements necessary to use the chi-square distribution, each expected frequency in a goodness of fit test must be
a. at least 5
b. at least 10
c. no more than 5
d. less than 2

25. When an analysis of variance is performed on samples drawn from K populations, the mean square between treatments (MSTR) is
a. $SSTR/n_T$
b. $SSTR/(n_T - 1)$
c. $SSTR/K$
d. $SSTR/(K - 1)$
e. None of these alternatives is correct.

26. An ANOVA procedure is applied to data obtained from 6 samples where each sample contains 20 observations.　The degrees of freedom for the critical value of F are
a. 6 numerator and 20 denominator degrees of freedom
b. 5 numerator and 20 denominator degrees of freedom
c. 5 numerator and 114 denominator degrees of freedom
d. 6 numerator and 20 denominator degrees of freedom

Exhibit C

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Between Treatments	2,073.6	4		
Between Blocks	6,000	5	1,200	
Error		20	288	
Total		29		

（背面仍有題目，請繼續作答）

27. Refer to Exhibit C.   The null hypothesis for this ANOVA problem is
   a. $\mu_1=\mu_2=\mu_3=\mu_4$
   b. $\mu_1=\mu_2=\mu_3=\mu_4=\mu_5$
   c. $\mu_1=\mu_2=\mu_3=\mu_4=\mu_5=\mu_6$
   d. $\mu_1=\mu_2= ... =\mu_{20}$

28. Refer to Exhibit C.   The mean square between treatments equals
   a. 288
   b. 518.4
   c. 1,200
   d. 8,294.4

29. In a regression model involving more than one independent variable, which of the following tests must be used in order to determine if the relationship between the dependent variable and the set of independent variables is significant?
   a. t test
   b. F test
   c. Either a t test or a chi-square test can be used.
   d. chi-square test

30. In a regression and correlation analysis if $r^2 = 1$, then
   a. SSE must also be equal to one
   b. SSE must be equal to zero
   c. SSE can be any positive value
   d. SSE must be negative

31. Regression analysis was applied between sales (Y in $1,000) and advertising (X in $100), and the following estimated regression equation was obtained.

   $$\hat{Y} = 80 + 6.2\ X$$

   Based on the above estimated regression line, if advertising is $10,000, then the point estimate for sales (in dollars) is
   a. $62,080
   b. $142,000
   c. $700
   d. $700,000

Exhibit D
For the following data the value of SSE = 0.4130.

y Dependent Variable	x Independent Variable
20	3
25	5
32	8
43	12

32. Refer to Exhibit D.   The slope of the regression equation is
   a. 120.348
   b. 12.1965
   c. -2.5435
   d. 2.5435

33. Refer to Exhibit D.   The coefficient of determination (r^2) equals
   a. 0.0014
   b. 0.005
   c. 0.9986
   d. 1.0014