

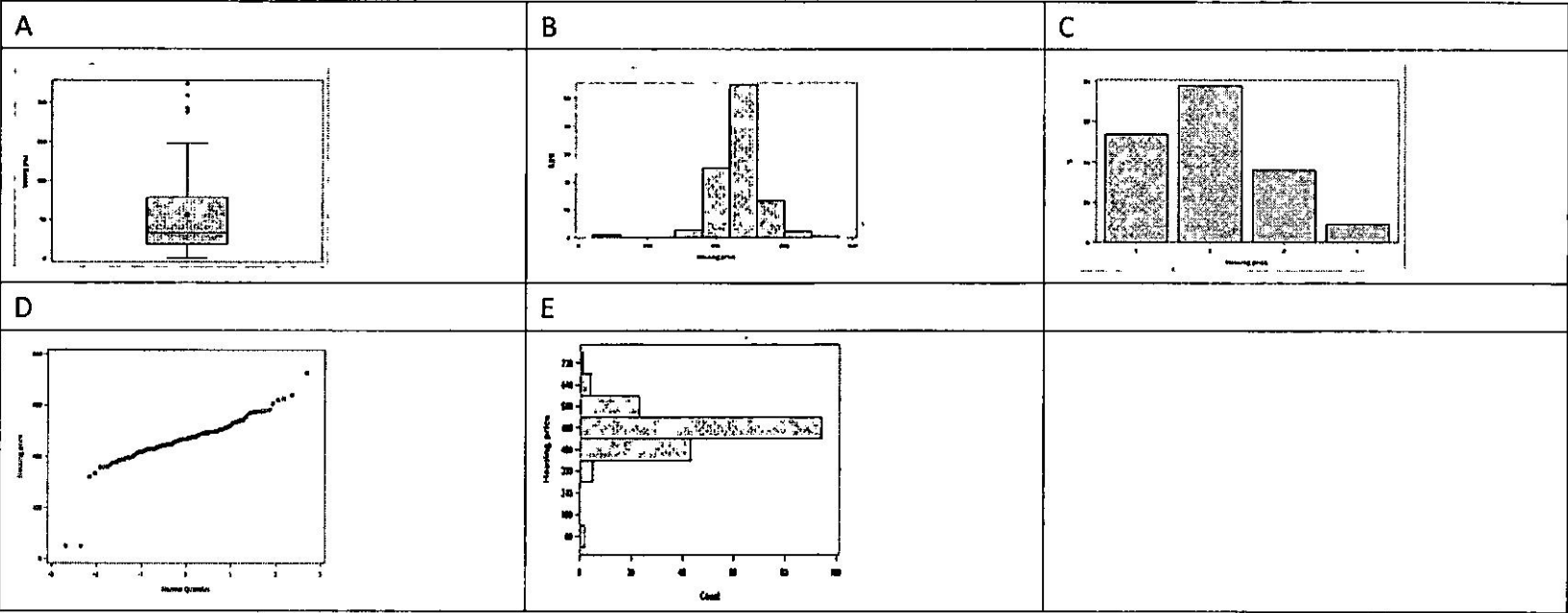
國立臺北大學 110 學年度碩士班一般入學考試試題

系（所）組別：都市計劃研究所甲組、乙組
科 目：統計學

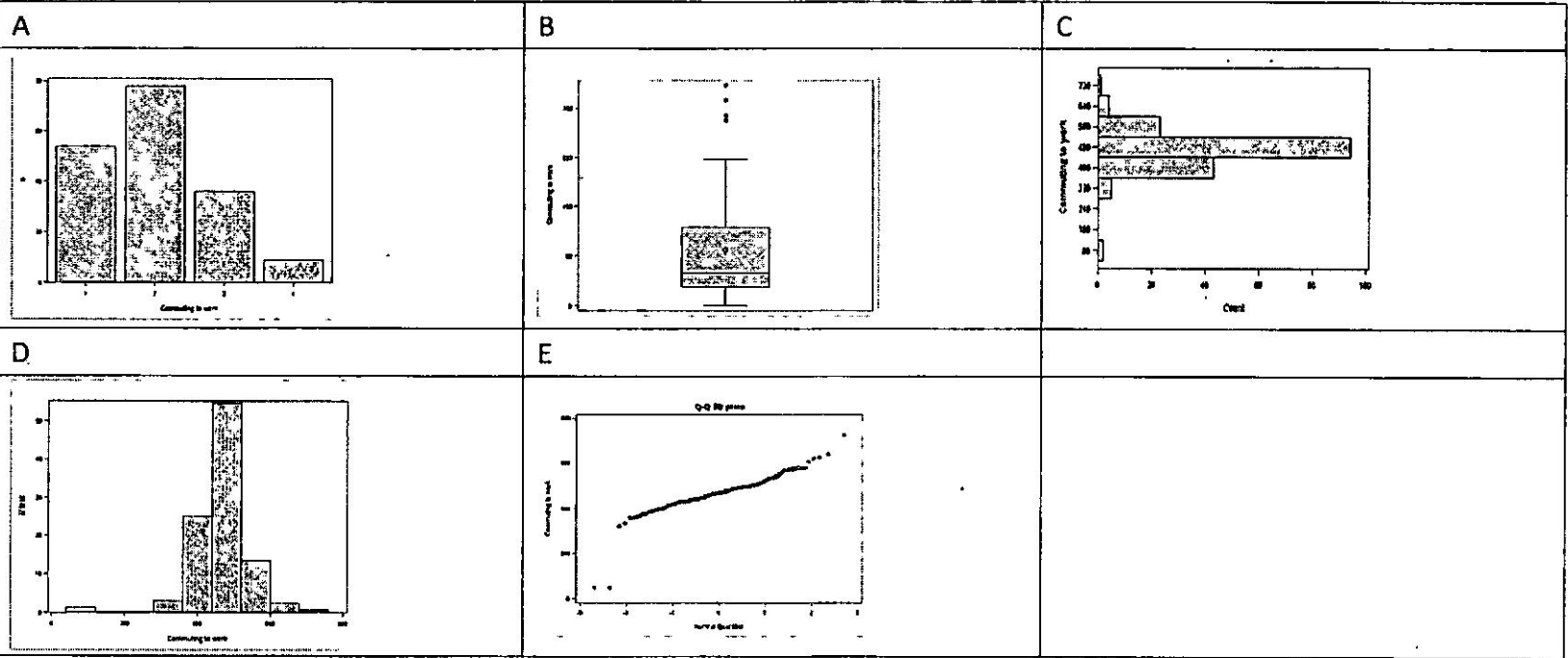
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一、Multiple choice (單選題) (100%)

1. Which is the most inappropriate statistical chart for displaying data for the housing price (unit: thousand dollars)?



2. Which of the following most appropriate statistical chart is to display data for the way of commuting to work?



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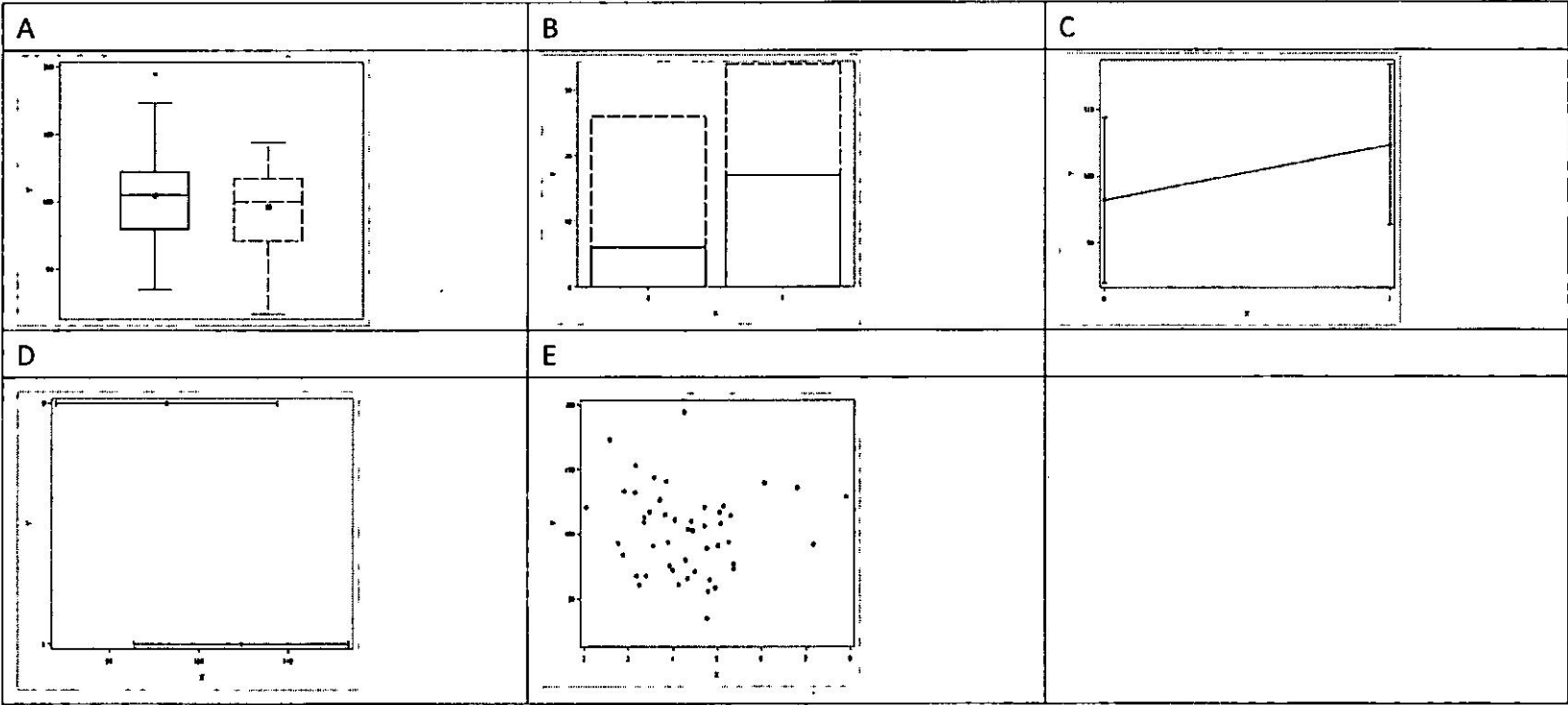
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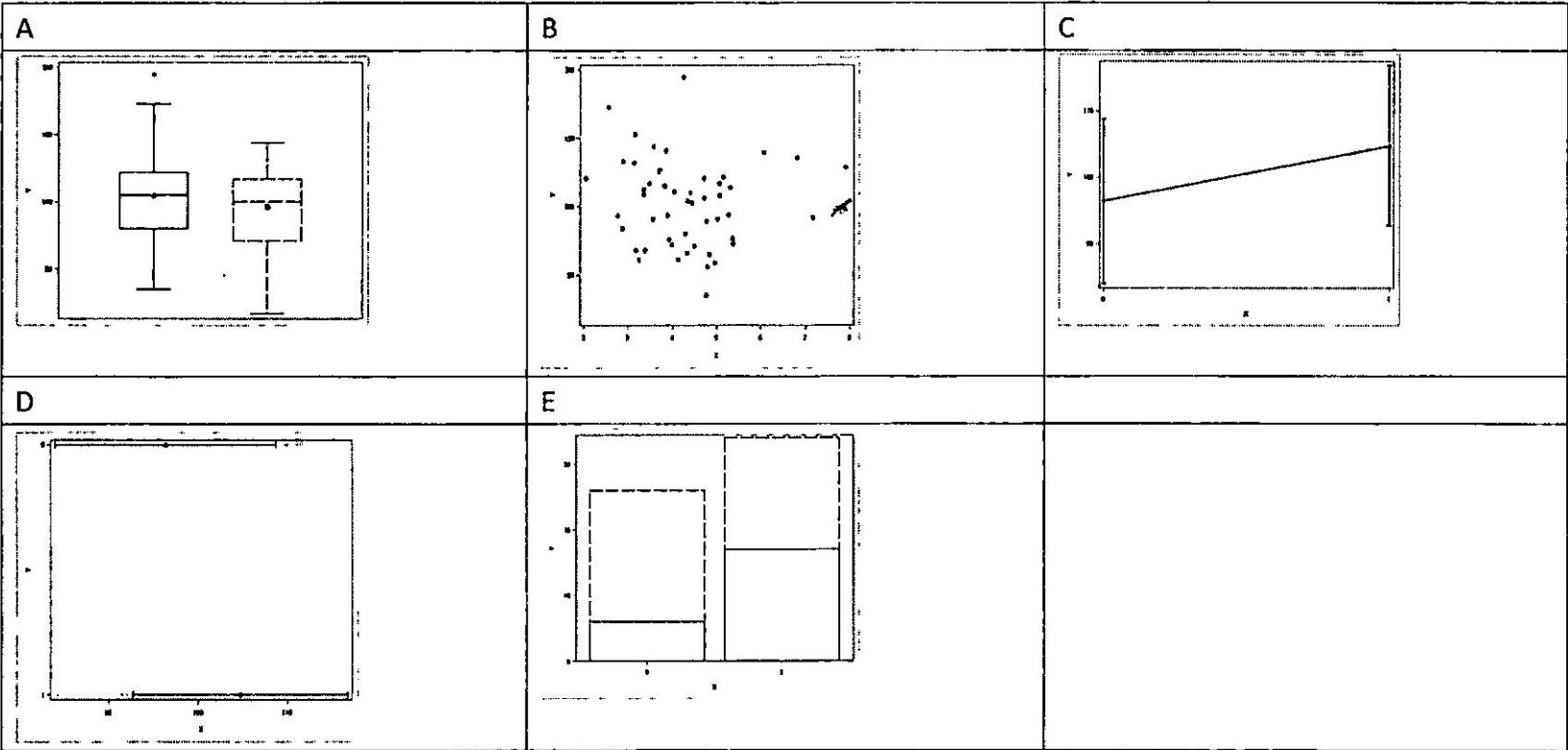
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3. Which of the following is the most appropriate statistical chart is to examine whether the way of commuting to work is different between gender?



4. Which of the following is the most appropriate statistical chart is to examine whether the housing price (unit: in thousands) is associated with the floor size (unit: in square meters)?



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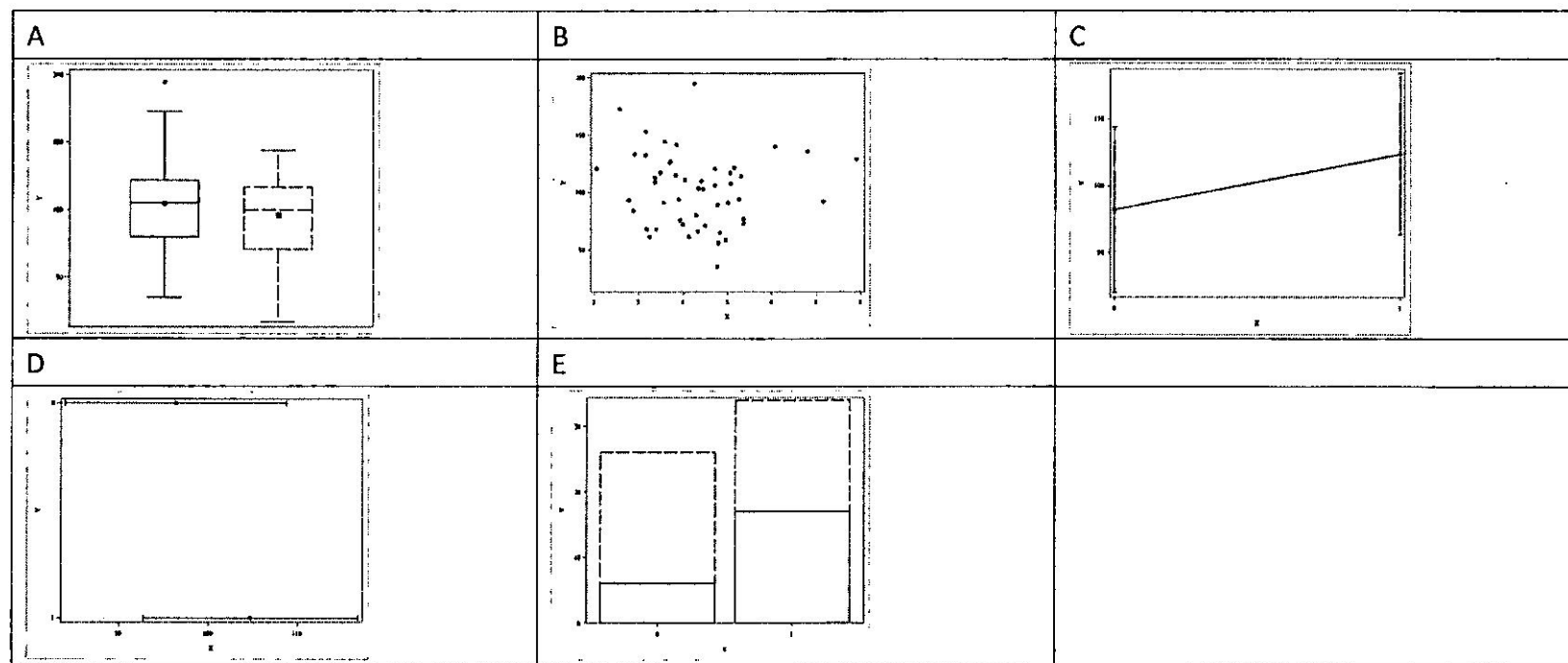
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5. Which is the least appropriate chart to explore the association between the housing price (unit: in thousands) and the location of the house such as metropolitan area and urban?



6. What is the data type of the location such as metropolitan area, suburban and urban?
- A. Count B. Interval C. Nominal D. Ordinal E. Ratio
7. What is the data type of the housing price (unit: in thousand dollars)?
- A. Count B. Interval C. Nominal D. Ordinal E. Ratio
8. What is the data type for the preference of a real estate agent measured in a five level likert scale (like very much, like, fair, dislike, very dislike)?
- A. Count B. Interval C. Nominal D. Ordinal E. Ratio
9. What of the following of information is not a necessary condition to obtain a box plot?
- A. First quartile B. Interquartile C. Mean D. Second quartile E. Third quartile
10. Which of the following is the most appropriate statistic to summarize the residential location such as metropolitan area, suburban and urban?
- A. Interquartile B. Mean C. Median D. Range E. None of the above
11. Which of the following is the least appropriate statistical statistic to summary the central tendency of the data for housing price (unit: thousand dollars)?
- A. Mean B. Median C. Midpoint D. Midrange E. Mode
12. Which of the following is the lease appropriate statistic to summary the variability of the data for housing price (unit: thousand dollars)?
- A. Correlation B. Interquartile C. Range D. Standard deviation E. Variance

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13. Which of the following is the most appropriate statistic to summary the association between the data for house price (unit: thousand dollars) and household income (unit: thousand dollars)?
A. Correlation B. Interquartile C. Mean D. Relative frequency E. Skewness
14. Which of the following is the most appropriate statistic to examine the shape of the distribution for the data of the household income (unit: thousand dollars)?
A. Correlation B. Interquartile C. Mean D. Relative frequency E. Skewness
15. Which of the following data can be summarized by the central tendency?
A. The commuting distance from home to school
B. The location such as metropolitan area, suburban and urban
C. The method of commute
D. The residential location
E. Type of districts

16. A survey for the method of commuting to school for 270 students in a particular city is conducted. The data is summarized as follows:

Grade	Method of Commutes		
	Metro	Bus	Walk
6 th	60	20	40
7 th	40	30	10
8 th	20	10	40

Determine the probability of the students who commute to school using metro or bus.

- A. 1/9 B. 2/9 C. 1/3 D. 4/9 E. 2/3
17. (Continued 16.) Given the respondents who were in 7th grade, determine the probability of the students who walked to school?
A. 1/27 B. 1/8 C. 7/27 D. 8/27 E. 1/3
18. What of the following properties is used to describe event A and event B are mutually exclusive ?
A. $P[A|B] = P[A]$
B. $P[B|A] = P[B]$
C. $P[A \cap B] = 0$
D. $P[A \cap B] = P[A]P[B]$
E. $P[A \cup B] = P[A] + P[B](1 - P[A])$
19. In a particular city, 20% of the people commute to work using metro, 30% walk to work, and 10% commute using both metro and walk. Determine the probability that an individual commutes to work based on either metro or walk?
A. 0.1 B. 0.2 C. 0.3 D. 0.4 E. 2/3
20. (Continued Question 19.) Given that a person who walks to work, what is the probability that this person does not need to take metro?
A. 0.1 B. 0.2 C. 0.3 D. 0.4 E. 2/3

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21. What of the following statement is correct?
- A. A random variable has to have positive numerical values.
 - B. The probability has to be greater than 0.
 - C. The probability has to be less than 1.
 - D. The probability of all possible values of a random variable has to equal 1.
 - E. The probability of independent events equals 0.

22. The probability distribution of random variable, X , is defined as follows:

X	0	1	2	3	4
Probability	0.3	0.25	0.1	0.3	?

What is the missing value?

- A. 0
 - B. 0.05
 - C. 0.1
 - D. 0.15
 - E. 0.2
23. At a recent survey, 5% of customers making the reservation in a Michelin star restaurant cancel the reservation, 10% of customers making the reservation in a chain restaurant cancel the reservation, 20% of customers making the reservation in a local restaurant cancel the booking. The market shares for Michelin star restaurant, chain restaurant and local restaurant are 15%, 40% and 45%. What is the probability that a customer cancels his/her reservation?
- A. 0.0075
 - B. 0.04
 - C. 0.09
 - D. 0.1375
 - E. 0.35
24. (Continued Question 23.) Given a customer who made the reservation but cancel the reservation, what is the probability that this customer makes the reservation in a Michelin star restaurant?
- A. 0.0075
 - B. 0.0545
 - C. 0.1375
 - D. 0.2909
 - E. 0.6545
25. Owing to the extravagant housing prices, the government would like to understand the rate of the empty house in the Taipei metropolitan area. From the past records, the rate of the empty house is 10%. The government randomly selects 900 houses and assigns an agent to visit the house. Let X denote the number of non-empty houses. What of the following condition is not necessary for X to be a binomial random variable?
- A. A house is considered as a trial.
 - B. Each trial has only two outcomes such as "empty" and "non-empty".
 - C. Each trial has the same probability of the vacant house.
 - D. Trials are uncorrelated.
 - E. Trials are independent.
26. (Continued Question 25.) Assume X is a binomial random variable. What of the following is an incorrect statement?
- A. The mean number of empty houses equals 90.
 - B. The mean number of non-empty houses equals 810.
 - C. The probability that all of the house are non-empty is $1 - 0.1^{900}$.
 - D. The standard deviation of X equals 9.
 - E. The variance of X equals 81.
27. Regarding a normal random variable X , what of the following statement is incorrect?
- A. The mean and median of X are equal.
 - B. The mean and mode of X are equal.
 - C. The normal curve is symmetry about mode.
 - D. The probability above the mean equals 1/2.
 - E. The standard deviation of X has to equal 1.

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28. A survey describes the distribution of total sleep time (in hours per day) among college students as approximately normal with mean $\mu = 7$ and standard deviation $\sigma = 1$. What is the 5 percentile of the distribution of total sleep time among all college students?
- A. 5.35 B. 6 C. 7 D. 8 E. 8.65
29. (Continued from Question 28.) If the survey asks this question to a random sample of $n = 100$ college students, what is the probability that $\bar{x} \geq \frac{43}{6}$ or $\bar{x} \leq \frac{41}{6}$ (or in words, that the sample mean differs from the population mean by at least 10 minutes)?
- A. 0.048 B. 0.096 C. 0.476 D. 0.546 E. 0.952
30. Regarding the well-known Central Limit Theorem, which of the following is not necessary condition?
- A. All observations in the sample are independent.
B. Each observation in the sample has equal mean.
C. Each observation in the sample has equal variance.
D. Each observation in the sample has to have a normal distribution.
E. The sample size of the sample has to be large.
31. Which of the following is not a necessary condition for a random sample?
- A. All observations are independent.
B. Each observation has equal mean.
C. Each observation has equal variance.
D. Each observation has a common distribution.
E. None of the above.
32. What of the following is not a property for the sample mean?
- A. The distribution of the sample mean is approximately normal when the sample size is large.
B. The mean of the sample mean equals the population mean.
C. The observations used to derive the sample mean are independent.
D. The population mean can be estimated by it.
E. The standard deviation of the sample mean has to equal the population standard deviation.
33. Which of the following is a correct statement when the sample size increases?
- A. The length of the confidence interval of the population mean increases.
B. The population mean increases.
C. The sample mean increases.
D. The standard deviation of the population decreases.
E. The standard deviation of the sample mean decreases.
34. The Tourism Bureau of Taiwan would like to estimate the mean amount of money spent by a tourist to within \$1000 with 90% confidence. If the amount of money spent by tourists is considered to be normally distributed with a standard deviation of \$2500, what sample size would be necessary for the Chamber of Commerce to meet its objective in estimating the mean spending amount?
- A. 5 B. 7 C. 17 D. 25 E. 44

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35. What of the following is not a correct statement about the t distribution?
- A. As the degrees of freedom increase, the t distribution is nearly identical to the standard normal distribution.
 - B. The mean of the t distribution equals 0.
 - C. The shape of t distribution depends on the degrees of freedom.
 - D. The t distribution has heavier tails than the standard normal distribution.
 - E. The t distribution is symmetric about 0.
36. What of the following is a correct property for the confidence interval?
- A. The confidence interval has the same length regardless of the size of the random sample.
 - B. The length of confidence interval tends to be shorter as the confidence level gets larger.
 - C. The length of confidence interval tends to be shorter as the mean gets larger.
 - D. The length of confidence interval tends to be shorter as the sample size increases.
 - E. The length of confidence interval tends to be shorter as the variance gets larger.
37. Which is the least appropriate statistical test to evaluate the association between the data for the level of education measured as less than high school (HS) and greater than HS and household income (unit: thousand dollars)?
- A. Chi-square test
 - B. Mann-Whitney test
 - C. One-way ANOVA
 - D. Regression
 - E. Two-independent sample T test
38. Which is the most appropriate statistical model or test to evaluate the association between the data for the house price (unit: thousand dollars) and household income (unit: thousand dollars)?
- A. Chi-square test
 - B. Mann-Whitney test
 - C. One-way ANOVA
 - D. Regression
 - E. Two-independent sample T test
39. What of the following is not a required assumption when building a regression model?
- A. The error variance has to equal the variance of the response variable.
 - B. The mean value of each error term equals to 0.
 - C. The observations are independent.
 - D. The observations have common variance.
 - E. The response variable has a common normal distribution.
40. In Japan, women are trained to be become housewife and are in charge of all the housework. From the past research, the average time use in housework is about 50 minutes per day. The following provides some summary statistics for a sample collected from a survey in Japan:

	N	Sample mean	Sample standard deviation
Women	600	63	45
95% CI for average: (59.40, 66.60)			

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Which of the following statement is the most appropriate statement?

- A. The average time use in housework for women in Japan is significantly different than that for past research.
 - B. The average time use in housework for women in Japan is significantly higher than that for past research.
 - C. The average time use in housework for women in Japan is significantly lower than that for past research.
 - D. The average time use in housework for women in Japan is not significantly different from that for the past research.
 - E. The information is not sufficient to make any inference.
41. Suppose the city government would like to build a new metro route. They would like to know whether the local resident agrees such a policy. They would like to use the survey to understand the resident's opinion. Let the probability of approving such a policy be denoted as p . What is the least sample size that the government needs to have the marginal error of $E=0.045$ with 95% confidence?
- A. 335 B. 475 C. 669 D. 949 E. 1898
42. A real-estate company would like to evaluate whether the performance in terms of the total house values sold by different branches for year 2019 is better than 2020. He randomly selects some branches and compare their performance in 2019 and 2020. Which is the most appropriate statistical test to answer this question?
- A. Chi-square test
B. F test
C. One-way ANOVA
D. Paired T test
E. Two-independent sample T test
43. Suppose a potential customer would like to evaluate whether the house price (unit: thousand dollars) in the rural area is much lower than that in the suburban. Let μ_1 and μ_2 denote the mean of the house price for urban and suburban areas. Also, let $\bar{x}_1$ and $\bar{x}_2$ denote the sample mean of the house price for suburban and rural areas. Which of the following statement is correct?
- A. $H_0: \mu_1 < \mu_2$ versus $H_a: \mu_1 \geq \mu_2$.
B. $H_0: \mu_1 = \mu_2$ versus $H_a: \mu_1 \neq \mu_2$.
C. $H_0: \mu_1 \geq \mu_2$ versus $H_a: \mu_1 < \mu_2$.
D. $H_0: \bar{x}_1 = \bar{x}_2$ versus $H_a: \bar{x}_1 \neq \bar{x}_2$.
E. $H_0: \bar{x}_1 \leq \bar{x}_2$ versus $H_a: \bar{x}_1 > \bar{x}_2$.
44. Which of the following is the correct statement about the null hypothesis that evaluates the association between the method of commute and gender?
- A. H_0 : the method of commute and gender are not significantly associated.
B. H_0 : the method of commute and gender are dependent.
C. H_0 : the method of commute and gender are independent.
D. H_0 : the method of commute and gender are significantly associated.
E. H_0 : the method of commute and gender are uncorrelated.
45. Which is the most appropriate test to evaluate the association between the method of commute and gender?
- A. Chi-square test
B. F test
C. Mann-Whitney test
D. Paired T test
E. Two-independent sample T test

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46. Assume the significant level is 0.05. According from a given test, H_0 is rejected. What is the most possible range for the p -value?
- A. Equals to 0.05.
 - B. Greater than or equal to 0.95.
 - C. Greater than or equal to 0.05.
 - D. Less than 0.05.
 - E. Less than 0.95.
47. Which of the following is a correct statement?
- A. In the test of $H_0: \mu = 100$ versus $H_a: \mu \neq 100$, the p -value is greater than greater than 0.01. Then a 99% confidence interval for $\mu =$ population mean IQ should be (120, 130).
 - B. For a fixed significance level α , the probability of a Type I error decreases when the sample size increases.
 - C. If we reject $H_0: \mu = 0$ in a study about change in weight on a new diet using a significance level of $\alpha = 0.05$, then we also reject it using $\alpha = 0.1$.
 - D. $P[\text{Type II error}] = 1 - P[\text{Type I error}]$
 - E. The p value is defined as the probability that H_0 is true.
48. An industrial plant claims to discharge no more than 1000 gallons of wastewater per hour, on the average, into a neighboring lake. An environmental action group took some random samples from the lake over a period of time to analyze the true mean discharge of wastewater per hour. Consider a one-sided hypotheses and use a significance level of $\alpha = 0.05$. Which of the following statement is correct?
- A. If H_0 is rejected, the probability that H_0 is actually true is 0.05.
 - B. If H_0 was true, the probability that the sample mean equals exactly the observed value would equal 0.05.
 - C. If the plant exceeds the limit, there is only a 5% chance that we will conclude that they do not exceed the limit.
 - D. If the plant does not exceed the limit, there is only 5% chance that we will conclude they exceed the limit.
 - E. All of the above.
49. Let p_F and p_M denote the probability of possessing real estates for female and male in Taiwan. Suppose that a 95% confidence interval for the difference $p_M - p_F$ equals (-0.05, 0.01). What of the following statement is correct?
- A. The probability of possessing real estates for male and female is not significantly different, since the confidence interval does contain 0.
 - B. We are 95% confident that the probability of possessing real estates is between -0.05 and 0.01.
 - C. We are 95% confident that the probability of possessing real estates for male is between -0.05 and 0.01 larger than that for male.
 - D. We are 95% confident that a minority of Taiwan residents possesses real estates.
 - E. We can conclude that the population proportions are equal.
50. Which of the following statement is when the one-way ANOVA provides relatively more evidence that $H_0: \mu_1 = \mu_2 = \dots = \mu_g$ is rejected, where μ_i are the population mean for the i th group, $i = 1, \dots, g$?
- A. The between-groups variation is smaller.
 - B. The within-groups variation is smaller.
 - C. The between-groups variation is larger.
 - D. The within-group variation is larger.
 - E. The total sum of square is unchanged.

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Table 1: Area under the standard normal curve

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.00	0.500	0.504	0.508	0.512	0.516	0.519	0.523	0.527	0.531	0.535
0.10	0.539	0.543	0.547	0.551	0.555	0.559	0.563	0.567	0.571	0.575
0.20	0.579	0.583	0.587	0.591	0.594	0.598	0.602	0.606	0.610	0.614
0.30	0.617	0.621	0.625	0.629	0.633	0.636	0.640	0.644	0.648	0.651
0.40	0.655	0.659	0.662	0.666	0.670	0.673	0.677	0.680	0.684	0.687
0.50	0.691	0.695	0.698	0.701	0.705	0.708	0.712	0.715	0.719	0.722
0.60	0.725	0.729	0.732	0.735	0.738	0.742	0.745	0.748	0.751	0.754
0.70	0.758	0.761	0.764	0.767	0.770	0.773	0.776	0.779	0.782	0.785
0.80	0.788	0.791	0.793	0.796	0.799	0.802	0.805	0.807	0.810	0.813
0.90	0.815	0.818	0.821	0.823	0.826	0.828	0.831	0.834	0.836	0.838
1.00	0.841	0.843	0.846	0.848	0.850	0.853	0.855	0.857	0.859	0.862
1.10	0.864	0.866	0.868	0.870	0.872	0.874	0.877	0.879	0.881	0.883
1.20	0.884	0.886	0.888	0.890	0.892	0.894	0.896	0.898	0.899	0.901
1.30	0.903	0.904	0.906	0.908	0.909	0.911	0.913	0.914	0.916	0.917
1.40	0.919	0.920	0.922	0.923	0.925	0.926	0.927	0.929	0.930	0.931
1.50	0.933	0.934	0.935	0.937	0.938	0.939	0.940	0.941	0.942	0.944
1.60	0.945	0.946	0.947	0.948	0.949	0.950	0.951	0.952	0.953	0.954
1.70	0.955	0.956	0.957	0.958	0.959	0.959	0.960	0.961	0.962	0.963
1.80	0.964	0.964	0.965	0.966	0.967	0.967	0.968	0.969	0.969	0.970
1.90	0.971	0.971	0.972	0.973	0.973	0.974	0.975	0.975	0.976	0.976
2.00	0.977	0.977	0.978	0.978	0.979	0.979	0.980	0.980	0.981	0.981
2.10	0.982	0.982	0.983	0.983	0.983	0.984	0.984	0.985	0.985	0.985
2.20	0.986	0.986	0.986	0.987	0.987	0.987	0.988	0.988	0.988	0.989
2.30	0.989	0.989	0.989	0.990	0.990	0.990	0.990	0.991	0.991	0.991
2.40	0.991	0.992	0.992	0.992	0.992	0.992	0.993	0.993	0.993	0.993
2.50	0.993	0.994	0.994	0.994	0.994	0.994	0.994	0.994	0.995	0.995
2.60	0.995	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996
2.70	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.997	0.997
2.80	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.998
2.90	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998
3.00	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999

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