

國立清華大學104學年度碩士班考試入學試題

系所班組別：服務科學研究所 甲組

考試科目 (代碼)：統計學 (4701)

共 6 頁，第 1 頁 *請在【答案卷、卡】作答

Please answer all 10 questions. In each question, select the correct answer(s).

Below are data for 14 restaurants in Taipei in 2014. For each restaurant we have the average price of a meal in NT\$ (**Price**), the number of hours that the restaurant is open each week (**Hours**), and whether it is located downtown (**Downtown=1**) or not (**Downtown=0**).

Price (NTD)	Hours (per Week)	Downtown
255.6	65	0
186.3	66	0
417	60	0
157.5	70	0
239.4	55	0
264	52	0
188.1	64	0
555	45	1
485.4	52	1
365.7	53	1
768.6	75	1
559.8	72	1
377.1	48	1
445.5	60	1

Suppose that this sample is representative of all restaurants in Taipei in 2014. We want to test whether, on average, prices in downtown restaurants are higher than in restaurants that are not downtown.

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共 6 頁，第 2 頁 *請在【答案卷、卡】作答

1. [10%] Which of the following set of hypotheses is the appropriate for answering this question? We use μ to denote the average price of restaurants in Taipei.
 - a. $H_0: \mu_{\text{downtown}} = \mu_{\text{not-downtown}}$ and $H_1: \mu_{\text{downtown}} \neq \mu_{\text{not-downtown}}$
 - b. $H_0: \mu_{\text{downtown}} \leq \mu_{\text{not-downtown}}$ and $H_1: \mu_{\text{downtown}} > \mu_{\text{not-downtown}}$
 - c. $H_0: \mu_{\text{downtown}} > \mu_{\text{not-downtown}}$ and $H_1: \mu_{\text{downtown}} \leq \mu_{\text{not-downtown}}$
 - d. $H_0: \mu_{\text{downtown}} \geq \mu_{\text{not-downtown}}$ and $H_1: \mu_{\text{downtown}} < \mu_{\text{not-downtown}}$

2. [10%] Which of the following sample statistics are **necessary** for computing the test statistic?
 - a. average price of all restaurants
 - b. average price of downtown restaurants
 - c. prices for each of the 14 restaurants
 - d. standard deviation of downtown prices
 - e. sample size of downtown restaurants

3. [10%] Compute the test statistic (assume equal variances of prices in downtown and non-downtown restaurants in Taipei). Choose the value of the test statistic:
 - a. < -3
 - b. in the interval $[-3, 0)$
 - c. in the interval $[0, 2)$
 - d. in the interval $[2, 4]$
 - e. > 4

4. [10%] If you know that the average meal price at this Taipei restaurant is less than NT\$400, what is the probability that it is located downtown?
 $P(\text{Downtown}=1 \mid \text{Price} < 400) =$
 - a. in the interval $[0, 0.2)$
 - b. in the interval $[0.2, 0.4)$
 - c. in the interval $[0.4, 0.6)$
 - d. in the interval $[0.6, 0.8)$
 - e. in the interval $[0.8, 1]$

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Below is a linear regression model for Price, with the independent variables Hours, Downtown and their interaction. Use the output to answer the following questions.

Regression Statistics	
Multiple R	0.8716
R Square	0.7598
Adjusted R Square	0.6877
Standard Error	98.4313
Observations	14

ANOVA					
	df	SS	MS	F	Significance F
Regression	3	306392.2937	102130.8	10.5412	0.001937263
Residual	10	96887.21484	9688.721		
Total	13	403279.5086			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	624.595	389.535	1.603	0.140	-243.342	1492.533
Hours (per Week)	-6.167	6.283	-0.982	0.349	-20.167	7.832
Downtown	-581.048	439.009	-1.324	0.215	-1559.220	397.124
Hours*Downtown	14.198	7.163	1.982	0.076	-1.763	30.158

5. [10%] Using the regression model, predict the average meal price at a new restaurant that will work 50 hours a week and will be located downtown. The predicted price (in NT\$) is...
- \$316
 - \$250
 - \$330
 - \$624
 - \$445

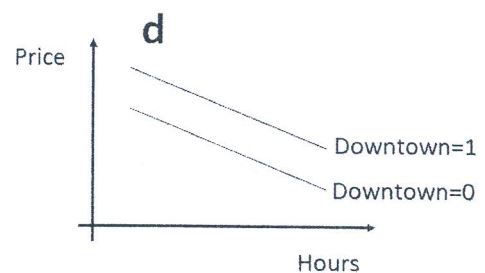
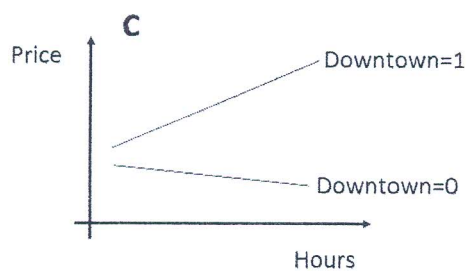
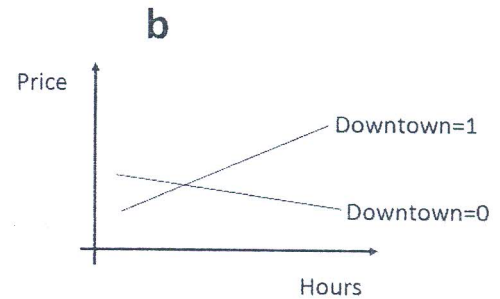
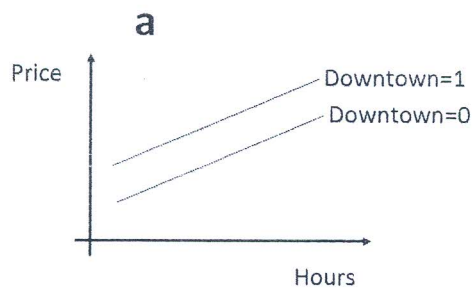
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6. [10%] The 97% confidence interval for the parameter for Downtown...
- a. includes the value 0
 - b. includes only positive values
 - c. includes only negative values
7. [10%] For a restaurant located downtown, increasing the opening hours by 10 hours is associated with an average price that is...
- a. higher by \$60
 - b. lower by \$60
 - c. higher by \$80
 - d. lower by \$80
 - e. higher by \$580
8. [10%] Which of the following four charts best describes the estimated regression model shown in the output?



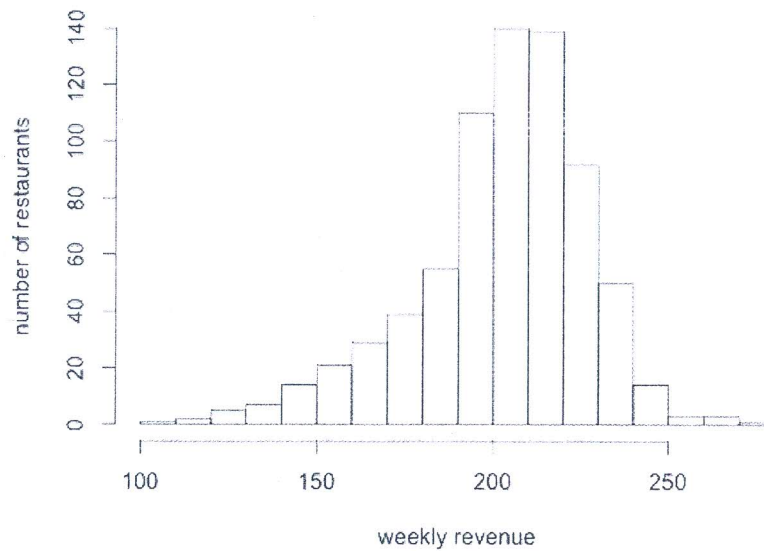
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The histogram below shows the distribution of weekly revenues (in thousands of NT\$) of a sample of Taipei restaurants in 2014.



9. [10%] Based on the histogram, which of the following statements is correct?
- The median of weekly revenues $<$ average of weekly revenues
 - The median of weekly revenues $>$ average of weekly revenues
 - The median of weekly revenues $=$ average of weekly revenues
 - It is impossible to tell the relationship between the median and average

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10. [10%] We draw 1000 random samples of 10 restaurants each, and compute the average weekly revenue for each sample. If we draw a histogram of the 1000 average weekly revenues, which of the following histogram shapes will we see?

