一. 計算題：

參考用

1. 15%

In a study to determine the acceptability of a new package design, a firm decided to issue the product only in its current package to one store (store *B*) and only in its newly designed package to another store (store *A*). In the past when both stores sold the product in its current package, weekly sales were almost identical. Over a period of 15 weeks sales of the product showed the sales patterns given in the table. (0 implies that the sales in store *A* and store *B* were equal for that week.) The firm must decide whether or not to begin marketing its product with the new package design. Decide on an appropriate null and alternative hypothesis for the firm, and use the data to test the hypothesis. Explain your conclusions.

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Store with Greatest Sales	*B*	0	*A*	*A*	*B*	*A*	*B*	*B*	*A*	*A*	*A*	*A*	0	*A*	*A*

2.

A magazine subscription service in a city containing 25,000 households is interested in estimating the average number of magazine subscriptions held by the residents of each household. Suppose that we let x equal the number of magazine subscriptions held by the residents of a sample household. In a random sample of 401 households selected from the city,

$$\sum_{i=1}^{401} x_i = 785 \quad \text{and} \quad \sum_{i=1}^{401} x_i^2 = 2{,}015$$

6%

a. Find a point estimate for the average number of magazine subscriptions per resident household in the city. Does the estimate supply the reader with any measure of confidence in its closeness to μ, the unknown mean number of magazine subscriptions per resident household in the entire city? Provide another estimate that bounds μ with a certain degree of confidence, and discuss the meaning of this estimate.

6%

b. If a separate sample of 401 households was collected, would the estimate for μ based on the new sample be the same as the estimate computed in part a?

6%

c. If the two sets of sample observations are combined, what will be the effect on the width of the resulting confidence interval estimate (for a fixed confidence level)?

6%

d. Use the sample results to find an estimate for the *total* number of magazine subscriptions held by all the residents of the city.

6%

e. The director of the magazine subscription service has issued the following statement: "We shall undertake an extensive sales campaign in the city unless there is sufficient evidence to indicate that the average number of subscriptions per household is 1.8 or greater. We are further willing to assume no more than a 5% chance of failing to undertake the sales campaign when we should have." From the sample information, would you say that the subscription service should undertake a sales campaign in the city?

3. 10%

In an effort to budget the coming year's expenses, the manager of a company motor pool wishes to estimate the total annual maintenance costs for the 170 company cars presently operated by company personnel. Currently, those operating the company cars pay for maintenance themselves and are reimbursed at the year's end. How many company employees with company cars should the manager contact if she wishes to estimate the total annual maintenance costs with a bound of $500 on the error of estimation? Assume that past evidence suggests that the standard deviation of annual maintenance costs is about $100 per car.

參考用

二、填充題：(佔45%，每格3分，答題時請依下列答格號碼，每一個答格佔一行或一列作答，否則不予計分)

1. 利用F分配檢定兩群体的變異數是否相等時，其假設為 ___(1)___。
2. 比較兩個群体平均值是否相等時，採用等大樣本的好處是 ___(2)___。
3. χ^2分配與F分配的關係是 ___(3)___，而與常態分配的關係是 ___(4)___。
4. 完全隨机設計的優點是 ___(5)___，缺點是 ___(6)___。
5. 變異數分析的三個重要前提是 ___(7)___。
6. 相關係數等於1時，則資料與迴歸直線的關係是 ___(8)___。
7. 假設檢定結果若為接受H_0，則表示吾人手上的資料 ___(9)___。
8. 設 L 為線性組合，則 $M_L = \sigma_L^2 +$ ___(10)___。
9. 檢力 (power of test) 的定義是 ___(11)___，有效增加檢力的方法有 ___(12)___。
10. Laspeyres index 的定義是 ___(13)___，其優缺點為 ___(14)___。
11. 指數平滑係數α採用較大的時機是 ___(15)___。