

國立臺北科技大學九十九學年度碩士班招生考試

系所組別：4300 資訊與運籌管理研究所

第二節 統計學 試題

第一頁 共二頁

注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

每題需附簡單計算才予計分，共 4 大題，共 100 分，敘述可以中文或英文作答

Note: Normal Distribution $Z_{.1} = 1.282$, $Z_{.05} = 1.645$, $Z_{.025} = 1.96$, $Z_{.01} = 2.326$, $Z_{.005} = 2.576$, $Z_{.0005} = 3.291$, $P(Z > 0.5) = 0.3085$, $P(Z > 1) = 0.1587$, $P(Z > 1.3) = 0.0968$, $P(Z > 1.4) = 0.0808$, $P(Z > 1.5) = 0.0668$, $P(Z > 2) = 0.0228$, $t_{63, 0.025} = 1.9983$, $t_{64, 0.025} = 1.9977$, $t_{65, 0.025} = 1.9971$, $t_{63, 0.05} = 1.6694$, $t_{64, 0.05} = 1.6690$, $t_{65, 0.05} = 1.6686$

1. (18%) A politician who is running for the office of mayor of a city with 50,000 registered voters commissions a survey. In the survey, 45% of the 400 registered voters interviewed say they plan to vote for her.
 - (a) How big is the sample size? (3%)
 - (b) Is the value 45% a parameter or a statistic? (3%)
 - (c) What is the 95% confidence interval estimate of her population support rate? (6%)
 - (d) What is the most estimation error of 45% under 95% confidence level? (3%)
 - (e) What is the sample size of this survey if we want the estimation error less than 3% under 95% confidence level? (3%)
2. (12%) An Internet pharmacy advertises that it will deliver the over-the-counter products that customers purchase within 3 to 6 days. The manager of the company wanted to be more precise in its advertising. Accordingly, she recorded the number of days it took to deliver to customers. From the data the following probability distribution was developed.

Number of days	0	1	2	3	4	5	6	7	8
Probability	0	0	.01	.04	p	.42	.21	.02	.02

- (a) What is the value of p? (3%)
 - (b) What is the probability that a delivery will be made within the advertised period of 3 to 6 days? (3%)
 - (c) How many days in average will customers receive their purchases? (3%)
 - (d) What is the standard deviation of this distribution? (3%)
3. (30%) A professor of statistics hands back his graded midterms in class by calling out the name of each student and personally handing the exam over to its owner. At the end of the process he notes that there are several exams left over, the result of students missing that class. He forms the theory that the absence is caused by a poor performance by those students on the test. If the theory is correct, the leftover papers will have lower marks than

those papers handed back. He recorded the marks (out of 100) for the leftover papers and the marks of the returned papers.

	Leftover	Returned
Sample mean	61.7143	70.5660
Sample variance	48.9890	203.9811
Sample size	14	53

- (a) What is the pooled variance if we assumed the two populations have equal variance? (10%)
 - (b) What is the degree of freedom of the test statistic? (5%)
 - (c) Do the data support the professor's theory under the 5% significant level and why (you need to write the proper hypothesis, test statistic, critical value and conclusion)? (15%)
4. (40%) An apple juice manufacturer has developed a new product—a liquid concentrate that, when mixed with water, produces 1 liter of apple juice. The product has several attractive features. First, it is more convenient than canned apple juice. Second, because the apple juice that is sold in cans is actually made from concentrate, the quality of the new product is at least as high as that of canned apple juice. Third, the cost of the new product is slightly lower than that of canned apple juice. She creates advertising that emphasizes convenience, quality, or price. There are two media that are available: television and newspapers. As a consequence, the experiment was repeated in the following way, six different small cities were selected. In city 1, the marketing emphasized convenience, but all the advertising was conducted on television. In city 2, marketing also emphasized convenience, but all the advertising was conducted in the daily newspaper, quality was emphasized in cities 3 and 4. City 3 learned about the product from television commercials, and city 4 saw newspaper advertising. Price was the marketing emphasis in cities 5 and 6. City 5 saw television commercials, and city 6 saw newspaper advertisements, in each city, the weekly sales for each of 10 weeks were recorded.

ANOVA for Sale differences between six cities

Summary				
Groups	Count	Sum	Average	Variance
City-1	10	5555	556	8641
City-2	10	5759	576	8546
City-3	10	6430	643	3885
City-4	10	6871	687	12559
City-5	10	6000	600	9528
City-6	10	6244	624	12524

ANOVA

Source of Variance	SS	df	MS	F	P-value
Between Groups	----(a)----	5	----(d)----	2.45	0.0452
Within Groups	----(b)----	---(c)---	----(e)----		
Total	614757				

- (a) to (e) each 5%
- (f) What conclusions can be drawn from these results based on 5% significant level? (5%)
- (g) We may suspect the differences of marketing strategies and the two media. What kind guessing are you possible to get from the figure shown below? And why? (10%)

注意：背面尚有試題

