

國立臺北科技大學

九十三年學年度工業工程與管理系碩士班入學考試

統計學試題

填准考證號碼

第一頁 共二頁

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注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. (20 points) Yo Yo Company is a small estate company located in Taipei, and specializing primarily in residential listings. They have recently become interested in the possibility of determining the likelihood of one of their listings being sold within a certain number of days. An analysis of company sales of 800 homes for the previous years produced the accompanying data:

Initial Asking Price(unit:\$10,000)	Days Listed Until Sold			Totals
	Under 30	31-90	Over 90	
Under 500	50	40	10	100
501-1000	20	150	80	250
1001-1500	20	280	100	400
Over 1500	10	30	10	50
Totals	100	500	200	800

- a. If A is defined as the event that a home is listed for over 30 days before being sold, estimate the probability of A.
- b. If B is defined as the event that the initial asking price is under 500, estimate the probability of B.
- c. What is the probability of $A \cap B$.

- d. Assuming that a contract has just been signed to list a home that has an initial asking price of less than 500, what is the probability the home will take Yo Yo company more than 30 days to sell?
- e. Are events A and B independent?

2. (30 points) Suppose that the fraction X of male runners and the fraction Y of female runners who complete marathon races can be described by the joint density function

$$f(x,y) = \begin{cases} 8xy & 0 \leq x \leq 1, 0 \leq y \leq x \\ 0 & \text{elsewhere.} \end{cases}$$

Find

- a. μ_x and probability function $g(x)$.
- b. μ_y and probability function $h(y)$.
- c. conditional distribution $f(y|x)$ and determine the probability that fewer than 1/4 of the women entered in a particular marathon actually finished if it is known that exactly 1/2 of the male runners completed the race.
- d. σ_x^2 , σ_y^2 and σ_{xy} .
- e. Are random variables X and Y independent?
3. (30 points) A vote is to be taken among the residents of a town and the surrounding county to determine whether a proposed chemical plant should be constructed. The construction site is within the town limits and for this reason many voters in the county feel that the proposal will pass because of the large proportion of town voters who favor the construction. To determine if there is a significant difference in the proportion of town voters and county voters favoring the proposal, a poll is taken, if 120 of 200 town voters favor the proposal and 240 of 500 county residents favor it.
- a. Would you agree that the proportion of town voters favoring the proposal is higher than the proportion of county voters? Use a 0.025 level of significance. $Z(0.025)=1.96$.
- b. Test the hypothesis that the percentage of town voters favoring the construction of the chemical plant will not exceed the percentage of county voters by more than 3%. Use a 0.025 level of significance. $Z(0.025)=1.96$.
- c. If the true percentage difference between town voters and county voters is 15%. Find the type II error of problem b.
4. (20 points) An analysis of the number of units sold by 10 salespersons in each of 4 sales territories resulted in the following data:

	1	2	3	4
Number of salespersons	10	10	10	10
Average number sold	135	125	137	115
Sample variance	72	64	69	67

- a. Test at the $\alpha = .05$ level if there is any significant difference in the mean number of units sold in the 4 sales territories. Build the ANOVA table.
- b. If $n_1=10$, $n_2=12$, $n_3=10$, and $n_4=15$. Using the same data for sample mean and variance as given, test at the $\alpha = .05$ level if there is any significant difference in the mean number of units sold in the four sales territories. Build the ANOVA table.

$$F_{.05}(2, 30)=3.32, F_{.05}(2, 40)=3.23, F_{.05}(3, 30)=2.92, F_{.05}(3, 40)=2.84, F_{.05}(4, 30)=2.53,$$

$$F_{.05}(5, 40)=2.45, F_{.05}(3, 60)=2.76$$