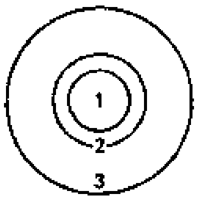
國立中央大學八十五學年度碩士班研究生入學試題卷

1.The probability that a regularly scheduled flight departs on time is 0.85 ; the probability that it arrives on time is 0.80; and the probability that it departs and arrives on time is 0.75. Find the probability that a plane arrives on time given that it did not depart on time.(10%)

2.A new radar device is being considered for a certain defense missile system. The system is checked by experimenting with actual aircraft in which a *kill* or a *no kill* is simulated. If in 300 trials, 252 kills occur, accept or reject, at the 0.05 level of significance, the claim that the probability of a kill with the new system does not exceed the 0.8 probability of the existing device.(10%)(Hint: $P[Z \le 1.645] = 0.95$, $P[Z \le 1.96] = 0.975$)

3.Suppose a circular target is divided into three zones bounded by concentric circles of radius 1/3, 1/2, and 1, as illustrated in the following diagram.



If three shots are fired at random at the target, what is the probability that exactly one shot lands in each zone?(15%)

4.The government awarded grants to the agricultural departments of 9 universities to test the yield capabilities of two new varieties of rice. Each variety was planted on plots of equal area at each university and the yields, in kilograms per plot, recorded as following:

Variety	University								
	1	2	3	4	5	6	7	8	9
1	38	23	35	41	44	29	37	31	38
2	45	25	31	38	50	33	36	40	43

Find a 95% confidence interval for the mean difference between the yields of the two varieties, assuming the differences of yields to be approximately normally distributed. (10%)(Hint: $P\left[T_{d.f.=8} \le 1.860\right] = 0.95$, $P\left[T_{d.f.=8} \le 2.306\right] = 0.975$)

5.In the 432 years from 1500 to 1931, war broke out somewhere in the world a total of 299 times. The following table gives the distribution of the number of years in which x wars broke out.

Number of Wars, x, Beginning in a Given Year	Observed Frequency
0	223
1	142
2	48
3	15
≧4	4

At the 0.05 level of significance, test the hypothesis that the recorded data may be fitted by the Poisson distribution.(15%)(Hint: $\chi^2_{0.05} = 7.815$)

6. The proportion of families seeing TV news program in a certain city is believed to be p=0.6. If a random sample of 10 families shows that 3 or less see TV news program, we shall reject the hypothesis that p=0.6 in favor of the alternative p<0.6. (a) Find the probability of committing a type I error if the true proportion is p=0.6. (5%) (b) Find the probability of committing a type II error for the alternatives p=0.3. (5%)

7. Use the following summary information for the dependent variable Y and the independent variable X

$$n = 10 \qquad \sum_{i=1}^{10} x_i = 16.75 \qquad \sum_{i=1}^{10} y_i = 170$$

$$\sum_{i=1}^{10} x_i^2 = 28.64 \qquad \sum_{i=1}^{10} y_i^2 = 2898 \qquad \sum_{i=1}^{10} x_i y_i = 285.625$$

(a) Estimate the linear regression equation of Y on X; (5%) (b) Test the hypothesis $\beta_1=0$ at the 0.01 level; (5%) (c) Test the hypothesis $\beta_0=25$ at the 0.05 level. (5%)

(Hint: $\mu_{Y|x} = \beta_0 + \beta_1 x$, and

$$P\left[T_{d.f.=8} \le 2.896\right] = 0.99,\ P\left[T_{d.f.=8} \le 3.355\right] = 0.995,$$

$$P\left[T_{d.f.=8} \le 1.860\right] = 0.95,\ P\left[T_{d.f.=8} \le 2.306\right] = 0.975)$$

8. A study considered the ability to predict cracking of latex paints on exposed wood surfaces based on accelerated cracking tests. Representative data on accelerated crack rating X and exposure crack rating Y are given below.

Accelerated crack rating X	Exposure crack rating Y
2.0	1.9
2.0	2.3
3.0	2.7
3.0	3.9
4.0	3.0
4.0	4.2
5.0	3.1
5.0	4.8
6.0	4.8
6.0	6.7
7.0	5.1
7.0	6.4

Test for lack of linear fit at the 0.05 level of significance. (15%)

(Hint: $SSE = S_{yy} - \dfrac{S_{xy}^{\ 2}}{S_{xx}}$, $SSE_{pure\ error} = \sum\sum\left(Y_{ij} - \overline{Y}_i\right)^2$,

$SSE_{lack\ of\ fit} = SSE - SSE_{pure\ error}$, and $F_{4,6,0.95} = 4.53$)