

所別：產業經濟研究所碩士班 甲組 科目：統計學

考生注意：請依序橫向作答，未作答題請書寫題號，違者以扣分處理。

1. (10%) Given that the discrete random variable X has mass function,

$$\Pr(X = x) = \begin{cases} x/6 & \text{where } x = 1, 2, 3 \\ 0 & \text{elsewhere,} \end{cases}$$

describe its cumulative distribution, $F(x)$.

2. (10%) Given that 40% of entering college students do not complete their degree programs, what is the probability that out of 6 randomly selected students, more than half will get their degree?

3. (10%) Given that the random variable x has density

$$f(x) = \frac{1}{\sqrt{18\pi}} e^{-(x^2 - 10x + 25)/18}, \quad -\infty < x < \infty$$

(a) (3%) Is this distribution normal?

(b) (4%) What is the μ and σ ?

(c) (3%) What is its maximum value?

4. (10%) How large a sample must be taken in order that you are 99 percent certain that \bar{X}_n is within 0.5σ of μ ? (Note: the Weak Law of Large Numbers is

$$\Pr(|\bar{X}_n - \mu| < \varepsilon) \geq 1 - \frac{\sigma^2}{n\varepsilon^2}$$

5. (10%) Neighboring farmers, Mr. A and Mr. B, were planting different varieties of corn. Each planted 100 acres under similar conditions. Mr. A's yield was 84 bushels per acre with a standard deviation of 5 bushels. Mr. B had a yield of 80 bushels per acre with a standard deviation of 6 bushels. Assume all sampling normal.

(a) (5%) What is the maximum likelihood estimate of the difference in mean?

(b) (5%) Make a 90% confidence interval estimate for the mean difference in yield between the two farms.

6. (10%) In a public opinion poll, 320 out of 400 persons interviewed supported the administration's policy on tax plan.

(a) (3%) Establish a 95% confidence interval estimate of the proportion of persons supporting the government's stand on tax plan.

(b) (3%) What can be concluded with 0.99 confidence about the maximum error

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注：背面有試題

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in our estimate if the proportion of those supporting the administration policy is estimated as 80%?

- (c) (4%) With what degree of confidence can we assert that the proportion of persons supporting the administration policy is somewhere between 77% and 83%?

7. (10%) Suppose a new cancer medicine, called Treatment Q134, is developed and tested on a random sample of 170 patients. Of these patients, 150 are cured and 20 die. An almost identical group of 170 patients are tested with the older treatment Q133 and of these patients 130 are cured and 40 die. Test the significance of these results. (Note: $\Pr(\chi^2 > 3.84) = 0.05$)

8. (10%) Let X and Y be independent, exponentially distributed random variables with densities:

$$f(X) = \beta e^{-\beta X} \quad X > 0$$

$$g(Y) = \beta e^{-\beta Y} \quad Y > 0$$

Find the density function of $Z = X+Y$

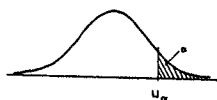
9. (10%) Consider the exponential distribution $f(X) = \lambda e^{-\lambda X}$ for $X > 0$.

- (a) (5%) Find the moment generating function.
 (b) (5%) Find the mean and variance from the (a).

10. (10%) Consider the random variable X which has a binomial distribution with $n=5$ and the probability of success on a single trial, θ . Let $f(X; \theta)$ denote the probability distribution function of X and let $H_0: \theta = 1/2$ and $H_1: \theta = 3/4$. Let the level of significance $\alpha = 1/32$. Determine the best critical region for the test of the null hypothesis H_0 against the alternative hypothesis H_1 .

Percentage Points of the Normal Distribution

The table gives the 100α percentage points, u_α , of a standardised Normal distribution where $\alpha = \frac{1}{\sqrt{2\pi}} \int_{u_\alpha}^{\infty} e^{-x^2/2} dx$. Thus u_α is the value of a standardised Normal variate which has probability α of being exceeded.



α	u_α	α	u_α	α	u_α	α	u_α	α	u_α
.50	0.0000	.050	1.6449	.030	1.8808	.020	2.0537	.010	2.3263
.45	0.1257	.048	1.6646	.029	1.8957	.019	2.0749	.009	2.3656
.40	0.2533	.046	1.6849	.028	1.9110	.018	2.0969	.008	2.4089
.35	0.3853	.044	1.7060	.027	1.9268	.017	2.1201	.007	2.4573
.30	0.5244	.042	1.7279	.026	1.9431	.016	2.1444	.006	2.5121
.25	0.6745	.040	1.7507	.025	1.9600	.015	2.1701	.005	2.5758
.20	0.8416	.038	1.7744	.024	1.9774	.014	2.1973	.004	2.6521
.15	1.0364	.036	1.7991	.023	1.9954	.013	2.2262	.003	2.7478
.10	1.2816	.034	1.8250	.022	2.0141	.012	2.2571	.002	2.8782
.05	1.6449	.032	1.8522	.021	2.0335	.011	2.2904	.001	3.0902
								.000005	4.4172