考試科目： 統計學D
科目代碼： 47212
應考系組： 統計系乙組
考試日期：105年03月06日第4節　　　使用計算機：可　　　共 3 頁(第 1 頁)

請於答案卷作答，違者不予計分

請注意這裡附上，下面問題可能需要用到查表的值：

(i) $z_{0.025} = 1.96$, $z_{0.05} = 1.645$, $z_{0.1} = 1.28$, where z_a denotes the value of $Z \sim N(0,1)$ such that the area to the right of this value is equal to a, that is $P(Z > z_a) = a$.

(ii) $t_{0.025}(8) = 2.31$, $t_{0.05}(8) = 1.86$, $t_{0.05}(9) = 1.83$, where $t_a(n)$ denotes the value of $T \sim t(n)$ such that the area to the right of this value is equal to a, that is $P(T > t_a(n)) = a$.

(iii) $\mathcal{X}^2_{0.025}(2) = 7.378$, $\mathcal{X}^2_{0.05}(2) = 5.991$, $\mathcal{X}^2_{0.05}(6) = 12.592$, where $\mathcal{X}^2_a(n)$ denotes the value of $W \sim \mathcal{X}^2(n)$ such that the area to the right of this value is equal to a, that is $P(W > \mathcal{X}^2_a(n)) = a$.

(iv) $F_{0.025}(1,8) = 7.57$, $F_{0.05}(1,8) = 5.32$, $F_{0.025}(8,1) = 965.64$, where $F_a(m,n)$ denotes the value of $F \sim F(m,n)$ such that the area to the right of this value is equal to a, that is $P(F > F_a(m,n)) = a$.

1. A sample of students who graduated with student loan debt is shown here. The data, in thousands of dollars, show typical amounts of debt upon graduation.

2.0　4.0　5.0　10.1　10.2　11.5　12.2　12.4　14.8　18.8

(10%) (a) Find the median and mean.

(5%) (b) What is the percentile for the student loan debt **5.0**?

2. Suppose $P(A) = P(B) = 0.4$ and $P(A \cup B) = 0.6$.

(5%) (a) Are A and B mutually exclusive? Explain.

(5%) (b) Are A and B independent? Explain.

3. A survey showed that 8% of Internet users age 18 and older report keeping a blog. Referring to the 18-29 age group as young adults, the survey showed that for bloggers 54% are young adults and for nonbloggers 24% are young adults.

(7%) (a) What is the probability that an Internet user keeps a blog and is a young adult?

(8%) (b) Suppose that in a follow-up phone survey we contact someone who is 24 years old. What is the probability that this person keeps a blog?

4. Customer arrivals at a bank are random and independent; the probability of an arrival in any one-minute period is the same as the probability of an arrival in any other one-minute period. Answer the following questions, assuming a mean arrival rate of three customers per minute.

(8%) (a) What is the probability of at least two arrivals in a one-minute period?

(7%) (b) What is the mean for the number of arrivals in a ten-minute period?

5. Based on a sample of 240 private companies, about 28% of private companies are owned by women.

(5%) (a) Give the sampling distribution of $\hat{p}$, the sample proportion of companies that are owned by women.

(10%) (b) Compute a 95% confidence interval for the population proportion of companies that are owned by women.

6. (15%) A sample of parts provided the following contingency table data on part quality by production shift.

Shift	Number Good	Number Defective
First	368	32
Second	285	15
Third	176	24

Use $\alpha = 0.05$ and test the hypothesis that part quality is independent of the production shift. What is your conclusion?

7. Following is a portion of the regression output for an application relating maintenance expense (dollars per month) to usage (hours per week) for a particular brand of computer terminal.

ANOVA table

	df	SS
Regression	1	1575.76
Residual	8	349.14
Total	9	1924.90

	Coefficients	Standard Error
Intercept	6.1092	0.9361
Usage	0.8951	0.149

(5%) (a) Give the estimated regression equation.

(10%) (b) Use $\alpha = 0.05$ to test whether monthly maintenance expense is related to usage.