

國立高雄第一科技大學 101 學年度 碩士班 招生考試 試題紙

系 所 別：風險管理與保險系

組 別：精算資訊組

考科代碼：1432

考 科：統計學

注意事項：

- 1、本科目得使用本校提供之電子計算器。
- 2、請於答案卷上規定之範圍作答，違者該題不予計分。

本題目共 7 題，第 1-2 題每題 10 分，第 5 題 20 分，其他每題 15 分，合計 100 分。

$$P(0 < Z < 1.645) = 0.45, P(0 < Z < 1.96) = 0.475, P(0 < Z < 2.326) = 0.490,$$

$$P(0 < Z < 2.70) = 0.4965, P(F_{(2,24)} > 2.54) = 0.1, P(F_{(3,24)} > 2.33) = 0.1, P(F_{(6,24)} > 2.04) = 0.1,$$

$$P(F_{(2,24)} > 3.40) = 0.05, P(F_{(3,24)} > 3.01) = 0.05, P(F_{(6,24)} > 2.51) = 0.05. \text{註腳括弧內為自由度.}$$

1. According to the National Association of Colleges and Employers, the 2010 mean annual salary of business degree graduates in insurance was \$37,000 (Time, May, 2010). In a follow-up study in May 2011, a sample of 64 graduating insurance majors provided a sample mean of \$38,500 and a sample standard deviation of \$5200. Use $\alpha = 0.05$ to test whether the sample data support that May 2011 graduates in insurance have a mean salary greater than the 2010 mean annual salary of \$37,000 and write down the approximate p-value.
2. Environmental health indicators include air quality, water quality, and food quality. Twenty years ago, 47% of U.S. food contained pesticide residues (U.S. News & World Report, December, 1991). In a recent study, 44 of 125 food samples contained pesticide residues. Use $\alpha = 0.01$, compare to the proportion of twenty years ago, test that the proportion has declined and write down the approximate p-value.
3. A Math teacher is interested in the relationship between hours spent studying per week and total points earned in a course. Data collected on 5 students who took the course last semester is as follow.

Student number	1	2	3	4	5
Hours Spent Studying per week x_i	6	11	15	18	20
Total Points Earned y_i	6	8	12	20	30

- a. Develop an estimated regression equation showing how total points earned is related to hours spent studying per week.
- b. Predict the total points earned by Mark Chen. He spent 10 hours studying per week.
4. The calculations for a factorial experiment involving four levels of factor A, three levels of factor B, and three replications resulted in the following data: $SST = 280$, $SSA = 26$, $SSB = 23$, $SSAB = 175$. Set up the ANOVA table and test for any significant main effects and any interaction effect. Use $\alpha = 0.05$. Note that for a complete testing, you have to write down the null hypothesis, alternative hypothesis, test statistic, reject region (or p value) and final conclusion.

ANOVA Table

Source	Sum of Squares	d. f.	Mean Square	F value
Factor A				
Factor B				
Interaction				
Error				
Total				

5. A point is picked uniformly at random from the perimeter of a unit circle.
- (a) Find the probability density function of X , the x -coordinate of the point.
- (b) Find $E[|X|]$
6. An automobile insurance company divides its policyholders into two groups: good drivers and bad drivers. For the good drivers, the amount of an average claim is 12, with a variance of 2. For the bad drivers, the amount of an average claim is 20, with a variance 20. Sixty percent of the policyholders are classified as good drivers. Calculate the variance of the amount of a claim for a policyholder.
7. You are given that the joint distribution of X and Y is described by the probability function
- $$f_{X,Y}(x, y) = P(X = x, Y = y) = \begin{cases} k(3-y) & \text{for } y = 1, 2, 3 \text{ and } x = 0, 1, \dots, y, \\ 0 & \text{otherwise,} \end{cases}$$
- where k is a constant. Calculate variance of X .