

中原大學 102 學年度 碩士班 入學考試

102/3/2 10:00 ~ 11:30 企業管理學系

誠實是我們珍視的美德，
我們喜愛「拒絕作弊，堅守正直」的你！

科目：統計學

(共 2 頁第 1 頁)

可使用計算機，惟僅限不具可程式及多重記憶者

不可使用計算機

(共十題，每題 10 分)

- The gypsy moth is a serious threat to oak and aspen trees. A state agriculture department places traps throughout the state to detect the moths. When traps are checked periodically, the mean number of moths trapped is only 0.5, but some traps have several moths. The distribution of moth counts is discrete and strongly skewed, with standard deviation 0.7.
 - What are the mean and standard deviation of the average number of moths \bar{x} in 49 traps?
 - Use the central limit theorem and 68-95-99.7 rule to find the probability that average number of moths in 49 traps is greater than 0.4.
- Show that if events A and B are independent, then A and B^C are also independent.
- Toss a fair coin 3 times.
 - Given the distribution of X, the number of heads that you observe.
 - Find probability $P(0 < X < 3)$.
- The following table gives the distribution of X.

X	0	1	2	3	4
P	0.2	0.2	0.2	0.2	0.2

Find the mean and the standard deviation for this random variable.
- The fitted regression equation for a multiple regression is $\hat{y} = -1.4 + 2.6x_1 - 2.3x_2$
 - If $x_1 = 10$ and $x_2 = 10$, what is the predicted value of y?
 - For the answer to part(a) to be valid, is it necessary that the values $x_1 = 10$ and $x_2 = 10$ correspond to a case in the data set? Explain why or why not.
- You are planning a survey of starting salaries for recent computer science majors. In the latest survey by the National Association of Colleges and Employers, the average starting salary was reported to be \$61,467. Assuming the standard deviation is \$12,000, what sample size do you need to have a margin of error equal to \$1000 with 95% confidence?

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7. Suppose A and B are events with $P(A) = 0.6$, $P(B) = 0.3$, and $P(A \text{ and } B) = 0.2$. Find the probability that:
- A or B occurs.
 - Neither A nor B occurs.
8. In a school, 4% of the men and 1% of the women are taller than 6 feet. Furthermore, 60% of the students are women. Suppose a randomly selected student is taller than 6 feet. Find the probability that the student is a woman.
9. Consider the following events for a family with children:
 $A = \{\text{children of both sexes}\}$, $B = \{\text{at most one boy}\}$.
- Show that A and B are independent events if a family has 3 children.
 - Show that A and B are dependent events if a family has only 2 children.
10. You invest 50% of your funds in Treasury bills and 50% in an “index fund” that represents all U.S. common stocks. Your rate of return over time is proportional to that of the T-bills (X) and of the index fund (Y), such that $R = 0.5X + 0.5Y$. Based on annual returns between 1950 and 2010:
- Annual return on T-bills $m_X = 5.0\%$; $s_X = 3\%$
 - Annual return on stocks $m_Y = 12\%$; $s_Y = 20\%$
 - Correlation between X and Y , $r = -0.10$
- Calculate the mean and standard deviation of your portfolio rate of return.