

國立中央大學九十一年度碩士班研究生入學試題卷

所別: 土木工程學系 己組 科目: 統計學 共 2 頁 第 1 頁

1. 以國內目前所發行之樂透彩為例，簽注時由1至42個號碼中任選6個號碼為一注，最少須猜中三個號碼才得獎。今某君以包牌的方式下注，由1至42個號碼中挑選其中8個號碼，再由此8個號碼中選取所有可能之6個號碼組合下注。假設開獎之後得知所選8個號碼之中開出4個號碼（即猜中4個號碼，但不含特別號），已知每一注樂透彩之投注成本為50元，試由下表彩金給獎方式計算該君之獲利為多少？（15分）

獎別	對中號碼數	各獎項獎金總額(新台幣元)	中獎人數	每人可得獎金(新台幣元)
頭獎	六個數字全中	120,560,979	11	10,960,089
貳獎	對中任五個號碼+特別號	38,071,880	55	692,216
參獎	對中任五個號碼	47,588,690	1,285	37,034
肆獎	對中任四個號碼	111,038,135	33,235	3,341
普獎	對中任三個號碼	86,636,400	433,182	200

2. In a hand of 13 cards chosen from an ordinary deck, find the probability that it is composed of exactly 3 clubs, 4 diamonds, 4 hearts, and 2 spades. (10分)
3. 據聞某一城市有60%之家庭飲用A品牌牛乳。今隨機抽取10戶人家調查，若其中小於等於3戶購買A品牌牛乳，則將否定上述傳聞而認為飲用A品牌牛乳之家庭比例低於60%。(a) 假使傳聞為真，則此項調查檢定犯下型I錯誤 (type I error) 之機率為何？(5分)(b) 若對立假設之比例為30%，則犯型II錯誤 (type II error) 之機率為何？(5分)
4. 當電腦故障時，有75%的機率是因為負荷過重所造成，15%的機率是因為軟體出問題所造成，85%的機率是因為負荷過重或軟體出問題所造成。試問 (a) 電腦故障是因負荷過重且軟體出問題所造成的機率為多少？(5分)(b) 電腦故障是因軟體出問題但非負荷過重所造成的機率為多少？(5分)
5. A submarine fires 3 torpedoes at a ship, with the following chances of hitting:
 For the first torpedo, $1/3$.
 For the other torpedo,
 $1/2$ if the previous torpedo is a hit.
 $1/4$ if the previous torpedo is a miss.
 Let X be the total number of hits. (a) Find the mean and variance of X . (5分) (b) What is the probability of at least 2 hits, given that the first shot was a hit? (10分)
6. A certain type of brick is being considered for use in a particular construction project. The brick will be used unless sample evidence strongly suggests that the true average compressive strength is below 3200 psi. A random sample of 36 bricks is selected, and each is subjected to a compressive strength test. The resulting sample average compressive strength and sample standard deviation of compressive strength are 3109 psi and 156 psi, respectively. Carry out a test to reach a decision using level of significance 0.05, given $z_{0.025}=1.96$ and $z_{0.05}=1.645$. (10分)

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7. Three different roads feed into a particular freeway entrance. Suppose that during a fixed time period, the number of cars coming from each road onto freeway is a random variable, with expected value and standard deviation as given in the table.

	Road 1	Road 2	Road 3
Expected value	800	1000	600
Standard deviation	16	25	18

What is the expected total number of cars entering the freeway at this point during the period? Assume that the three random variables are independent, compute the standard deviation of the total. (10分)

8. From the following sample of student grades,

Student	First Test X	Second Test Y
A	80	90
B	60	70
C	40	40
D	30	40
E	40	60

(a) Calculate the simple linear regression of Y on X; (5分)

(b) At the 5% significance level, can you reject the null hypothesis $\beta=0$?

($t_{0.05, \nu=5} = 2.015$, $t_{0.05, \nu=4} = 2.132$, $t_{0.05, \nu=3} = 2.353$, $t_{0.025, \nu=5} = 2.571$, $t_{0.025, \nu=4} = 2.776$, $t_{0.025, \nu=3} = 3.182$) (5分)

9. Taiwan Area is, on the average, hit by 6 typhoons a year. Find the probability that in a given year this area will be hit by anywhere from 6 to 8 typhoons. (10分)

參考用