

元智大學 103 學年度研究所 碩士班 招生試題卷

系(所)別： 資訊管理學系碩士班

組別： 資管組 A

科目： 統計學

用紙第 / 頁共 2 頁

●不可使用電子計算機

無計算或說明過程 不予計分

1. A desk contains three drawers. Drawer 1 contains two gold coins. Drawer 2 contains one gold coin and two silver coins. Drawer 3 contains 2 silver coins. You randomly choose a drawer and then randomly choose a coin. If a silver coin is chosen, what is the probability that you choose drawer 2? (8%)
2. Suppose we draw a single card from a deck of 52 cards. Let event A be that a red card is drawn, and event B be that a diamond is drawn. Are events A and B independent? (8%)
3. Let X be a random variable representing the number of dots when you throw a die once. Compute the $E(X)$ and $Var(X)$. (8%)
4. Before burning out, a light bulb gives X hours of light, where X is $N(500, 400)$. If we have four bulbs, what is the probability that they will give a total of at least 1960 hours of light? (8%)
5. Suppose that we want to estimate what proportion of all drivers exceeds the 65-mph speed limit on a road between Reno and Las Vegas.
 - (a) How large a sample will we need to be able to assert with probability 0.95 that the error of our estimate, the sample proportion, will be no more than 0.02? (4%)
 - (b) Resolve part (a), given that the proportion of all drivers who exceeds the 65-mph speed limit on the given road is at least 0.70. (4%)
6. A police patrol car drives a prescribed route in a neighborhood, and the dispatcher wants to know whether, if uninterrupted, the average time required by the patrol car to drive its route exceeds 28 minutes. With a random sample of 36 uninterrupted rounds, the police car averaged 29.5 minutes with a sample standard deviation of 6 minutes.
 - (a) Write down the hypotheses to be tested. (4%)
 - (b) What is the corresponding p -value? (4%)
 - (c) Do we reject the null hypotheses at the level of significance $\alpha = 0.05$? (4%)
 - (d) If the true population mean is 30 minutes, what is the probability of Type II error? (8%)
7. If x_1 and x_2 are the number of successes obtained in n_1 trials of one kind and n_2 of another, the trials are all independent, and the corresponding probabilities of success are, respectively, p_1 and p_2 . For large n_1 and n_2 , please state how you test at the α level of significance whether the null hypothesis $p_1 = p_2$ is rejected. (10%)
8. A quality-control engineer takes a daily sample of n tires coming off an assembly line, and collects for the number of tires with imperfections observed on K days as below.

Number with imperfections	Number of samples
0	k_1
1	k_2
2 or more	k_3

State how you test at the α level of significance whether the engineer is sampling from a binomial population. (10%)

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9. Let $X_i, i = A, \dots, D$, be independent random variables representing that the number of words per minute that a secretary typed on several occasions on four different computer keyboards. The corresponding observation data for each random variable are given in the following table.

Keyboard A: $x_{A,1}, x_{A,2}, \dots, x_{A,n}$

Keyboard B: $x_{B,1}, x_{B,2}, \dots, x_{B,n}$

Keyboard C: $x_{C,1}, x_{C,2}, \dots, x_{C,n}$

Keyboard D: $x_{D,1}, x_{D,2}, \dots, x_{D,n}$

- (a) Please describe how to test at the α level of significance whether $\mu_A = \mu_B = \mu_C = \mu_D$ is rejected. (12%)
- (b) What assumptions are necessary for the method that you used in part (a)? (4%)
- (c) If the assumptions in part (b) are not satisfied, what method do you suggest for doing the test? (4%)

Standard Normal Table

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857