

元智大學 102 學年度研究所 碩士班 招生試題卷

系(所)別： 管理學院經營管理碩士班 組別： 國際企業碩士學位 科目： 統計學 用紙第 | 頁共 > 頁

●可使用現行『國家考試電子計算器規格標準』規定第一類之計算機

Providing calculation processes will help you to earn some points when the final answers are not correct.
Critical value information is at the end of the exam.

Q1 (10 points, 5 points each) Bad gums may mean a bad heart. Researchers discovered that 85% of people who have suffered a heart attack had periodontal disease, an inflammation of the gums. Only 29% of healthy people have this disease. Please answer the following questions according to the above situation.
 (1) Suppose that in a certain community heart attacks are quite rare, occurring with only 10% probability. If someone has periodontal disease, what is the probability that he or she will have a heart attack?
 (2) If 40% of the people in a community will have a heart attack, what is the probability that a person without periodontal disease will have a heart attack?

Q2 (12 points, 4 points each) A certain type of tomato seed germinates 90% of the time. A backyard farmer planted 15 seeds. $P(x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$
 (1) Find the probability that 13 or fewer germinate.
 (2) Find the probability that 13 or more germinate.
 (3) Find the probability that exactly 5 seeds do not germinate.

Q3 (10 points) It is known that the amount of time needed to change the oil on a car is normally distributed. The amount of time to complete a random sample of 10 oil changes was recorded and listed here. Compute and interpret the 99% confidence interval estimate of the mean of the population.
 12 11 15 15 18 12 25 20 18 24

Q4 (10 points) A medical statistician wants to estimate the average weight loss of people who are on a new diet plan. In a preliminary study, he guesses that the standard deviation of the population of weight losses is about 10 pounds. How large a sample should he take to estimate the mean weight loss to within ± 2 pounds, with 94% confidence?

Q5 (9 points, 3 points each) The amount of time devoted to studying statistics each week by students who achieve a grade of A in the course is a normally distributed random variable with a mean of 7.5 hours and a standard deviation of 2.1 hours.
 (1) What proportion of A students study for more than 10 hours per week?
 (2) Find the probability that an A student spends between 7 and 9 hours studying.
 (3) What is the amount of time below which only 5% of all A students spend studying?

Q6 (10 points) We are interested in comparing the average department store prices of two leading wallet brands. Our sample was taken by randomly selecting eight department stores and recording the prices of the basic style wallets at each store. The data are shown in the following table:

Department Store	1	2	3	4	5	6	7	8
Brand Good	\$175	197	188	187	165	175	186	187
Brand Nice	\$230	245	244	229	225	225	242	240

The average and standard deviation of the differences in each store is calculated at \$53 and \$5.66 respectively. Use $\alpha = 0.01$ to test whether, on average, Brand Nice costs \$50 more than Brand Good does.

Q7 (10 points) The College of Management computing center wants to determine the proportion of business students who have laptop computers. If the proportion exceeds 30%, then the lab will scale back a proposed enlargement of its facilities. Suppose 200 business students were randomly sampled and 75 have laptops. Use p-value to conduct a hypothesis test to decide whether the computing center will not enlarge its facilities at $\alpha = 0.02$.

Q8 (Short Answer, 2 points) If sample size decreases, β will (increase, decrease, no change) when other factors are constant.

Q9 (Short Answer, 2 points) If Type I Error decreases, power will (increase, decrease, no change) when other factors are constant.

Q10 (15 points) According to recent research, the number of the full seasons a professional basketball player had has an impact on his average errors per 48 minutes. To test this study, Robin randomly selects 10 NBA players and established the following table.

Basketball Players	1	2	3	4	5	6	7	8	9	10
Errors/48-min, y	8	7	4	5	5	4	4	3	3	2
# of Full Season, x	1	2	3	3	4	5	7	8	8	9

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1. (10 points) Establish the simple regression model.
2. (5 points) Calculate and explain the coefficient of determination.

Q11 (10 points) A market research firm is interested in the possible success of new flavors of ice cream. A study was conducted with three different flavors—peach, almond, and coconut. Five participants were given a sample of each ice cream, in random order, and asked to rate the flavors on a 100-point scale. The results are given in the table below.

Flavors	Participants				
	1	2	3	4	5
Peach	75	80	73	77	82
Almond	83	98	78	80	90
Coconut	73	89	74	74	83

Sources	SS	df	MS	F
Treatment			103.2	
Block	441.6			(ii)
Error	(i)		10.2	
Total				

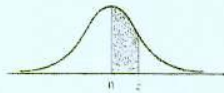
$$LSD_{\alpha} = t_{\alpha/2, df} \sqrt{MSE \left(\frac{1}{n_i} + \frac{1}{n_j} \right)}$$

1. (2 points) What are the values in cell (i) and (ii)?
2. (8 points) Which flavor is the favorite flavor in this study? Use LSD method with $\alpha = 0.05$.

Partial t distribution:

$t_{0.05,7}=1.895$	$t_{0.05,8}=1.860$	$t_{0.05,9}=1.833$	$t_{0.05,10}=1.812$
$t_{0.025,7}=2.365$	$t_{0.025,8}=2.306$	$t_{0.025,9}=2.262$	$t_{0.025,10}=2.228$
$t_{0.01,7}=2.998$	$t_{0.01,8}=2.896$	$t_{0.01,9}=2.821$	$t_{0.01,10}=2.764$
$t_{0.005,7}=3.499$	$t_{0.005,8}=3.355$	$t_{0.005,9}=3.250$	$t_{0.005,10}=3.169$

Normal Curve Areas



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817