科目	統計學	適用系所	統計學系統計與精算碩士班應用統計暨計量財務組、精算組	時間	90分鐘

Note: $e^{-3} = 0.0498$; $e^{-5} = 0.0067$; $e^{-6} = 0.0025$　(The standard Normal probability table is provided on Page 3.)

1.　(10%) On the average, 6 cars arrive at the drive-up window of a restaurant every hour. Define the random variable X to be the number of cars arriving in any hour.

　　a.　Compute the probability that exactly 3 cars will arrive in the next hour. (5分)

　　b.　Compute the probability that no more than 3 cars will arrive in the next 30 minutes. (5分)

2.　(10%) The time between arrivals of customers at the drive-up window of a restaurant follows an exponential probability distribution with a mean of 3 minutes.

　　a.　What is the probability that the arrival time between customers will be 2 minutes or more? (5分)

　　b.　What is the probability that the arrival time between customers will be between 1 and 2 minutes? (5分)

3.　(20%) A department store has determined that 25% of all their sales are credit sales. A random sample of 100 sales is selected.

　　a.　What is the sampling distribution of $\bar{p}$? and explain why? (5分)

　　b.　What is the standard error of sampling distribution of $\bar{p}$? (5分)

　　c.　What is the probability that the sample proportion will be greater than 0.50? (5分)

　　d.　What is the probability that the sample proportion will be between 0.40 to 0.50? (5分)

4.　(15%) A university planner is interested in determining the percentage of spring semester students who will attend summer school. She takes a pilot sample of 100 spring semester students discovering that 50 will return to summer school.

　　a.　Construct a 95% confidence interval estimate for the percentage of spring semester students who will return to summer school. (5分)

　　b.　Using the results of the pilot study with a 0.95 probability, how large of a sample would have to be taken to provide a margin of error of 3% or less? (5分)

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5. (10%) A large automobile insurance company selected samples of single and married male policy- holders and recorded the number who made an insurance claim over the preceding three-year period.

Single Policyholders	Married Policyholders
n1 = 400	n2 = 900
Number making claims = 76	Number making claims = 90

a. Use α = 0.05. Test to determine whether the claim rates differ between single and married male policyholders.(critical value 1.96) (5分)

b. Provide a 95% confidence interval for the difference between the proportions for the two populations. (5分)

6. (10%)Phoenix Marketing International identified Bridgeport, Connecticut, LosAlamos, New Mexico, Naples, Florida and Washington D.C. as the four U.S. cities with the highest percentage of millionaires (*USA Today,* December 7, 2011). Data consistent with that study show the following number of millionaires for samples of individuals from each of the four cities.

Millionaire	city			
	Bridgeport	Los Alamos	Naples	Washington DC
Yes	44	35	36	34
No	456	265	364	366

a. What is the estimate of the percentage of millionaires in each of these cities? (4分)

b. Using a 0.05 level of significance, test for the equality of the population proportion of millionaires for these four cities. What is your conclusion? (critical value 7.815) (6分)

7. (10%)An automobile dealer conducted a test to determine if the time in minutes needed to complete a minor engine tune-up depends on whether a computerized engine analyzer or an electronic analyzer is used. Because tune-up time varies among compact, intermediate, and full-sized cars, the three types of cars were used as blocks in the experiment. The data obtained follow.

		Analyzer	
		Computerized	Electronic
Car	Compact	50	42
	Intermediate	55	44
	Full-sized	63	46

Use α = 0.05 to test for any significant differences. (critical value 18.51)

科目	統計學	適用 系所	統計學系統計與精算碩士班應 用統計暨計量財務組、精算組	時間	90分鐘

※請務必在答案卷作答區內作答。　　共　3　頁第　3　頁

8. (20%)The following data are the monthly salaries y and the grade point averages x for students who obtained a bachelor's degree in business administration

GPA	2.6	3.4	3.6	3.2	3.5	2.9
Monthly Salary	3600	3900	4300	3800	4200	3900

a. The estimated regression equation for these data is $\hat{y} = 2090.5 + 581.1x$ and MSE $=21,284$. Develop a point estimate of the starting salary for a student with a GPA of 3.0.(5分)

b. Develop a 95% confidence interval for the mean starting salary for all students with a 3.0 GPA. (use t value 2.776) (5分)

c. Develop a 95% prediction interval for Ryan Dailey, a student with a GPA of 3.0. (use t value 2.776) (5分)

d. Discuss the differences in your answers to parts (b) and (c). (5分)

The following table is the cumulative probabilities for the standard normal distribution.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641