所別：土木工程學系碩士班 己組 科目：統計學

1. (5%) What are the four key properties associated with the normal distribution?

2. (10%) Assuming a Poisson probability distribution, the number of claims for missing baggage in a small city for a well-known airplane averages nine per day. What is the probability that, on a given day, there will be
   a. (5%) fewer than three claims?
   b. (5%) greater than three claims?

3. (10%) A municipal bond service has three rating categories (A, B, and C). Suppose that in the past year, of the municipal bonds issued throughout the United States, 70% were rated A, 20% were rated B, and 10% were rated C. Of the municipal bonds rated A, 50% were issued by cities, 40% by suburbs, and 10% by rural areas. Of the municipal bonds rated B, 60% were issued by cities, 20% by suburbs, and 20% by rural areas. Of the municipal bonds rated C, 90% were issued by cites, 5% by suburbs, and 5% by rural areas.
   a. (5%) What proportion of municipal bonds is issued by cities?
   b. (5%) If a new municipal bond is to be issued by a city, what is the probability that it will receive an A rating?

4. (30%) A marketing analyst for a major shoe manufacturer is considering the development of a new brand of running shoes. The marketing analyst wants to determine which variables can be used in predicting durability (or the effect of long-term impact). Two independent variables are to be considered, X_1 (*Foreimp*), a measurement of the forefoot shock-absorbing capability, and X_2 (*Midsole*), a measurement of the change in impact properties over time, along with the dependent variable Y (*Ltimp*), which is a measure of the long-term ability to absorb shock after a repeated impact test. A random sample of 15 types of currently manufactured running shoes was selected for testing. The following (partial) output is obtained:

ANOVA	*df*	*SS*	*MS*	*F*	Significance *F*
Regression	2	12.61020	6.30510	97.69	0.0001
Residual	12	0.77453	0.06454		
Total	14	13.38473			

Variable	Coefficient	*Standard Error*	*t STAT*	*P_Value*
Intercept	-0.02686	0.06905	-0.39	0.7034
Foreimp	0.79116	0.06295	12.57	0.0000
Midsole	0.60484	0.07174	8.43	0.0000

   a. (5%) Assuming that each independent variable is linearly related to long-term impact, state the multiple regression equation.
   b. (5%) Interpret the meaning of the slopes in this problem.
   c. (10%) Compute the coefficient of multiple determination $\gamma^2_{Y.12}$ and interpret its meaning.
   d. (10%) Compute the adjusted γ^2.

5. (20%) A fast-food chain wants to determine whether there are any differences between three media (i.e. magazine, TV, radio) in terms of consumer recall of an ad. The results of an advertising study are as follows.

	Media			
Recall ability	Magazine	TV	Radio	Total
# of persons remembering ad	25	10	7	42
# of persons not remembering ad	73	93	108	274
Total	98	103	115	316

$\chi^2_{0.05,2}$=5.991; $\chi^2_{0.025,2}$=7.378; $\chi^2_{0.05,3}$=7.815; $\chi^2_{0.025,3}$=9.348

   a. (10%) At the 0.05 level of significance, determine whether there is evidence of a significant media effect with respect to the proportion of individuals who can recall the ad.
   b. (10%) What would be your answer to (a) if 17 of the 115 individuals who heard the radio ad could recall it?

注意：背面有試題

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6. (25%) Given a randomized block experiment having one factor containing four treatment levels and eight blocks, from the ANOVA summary table below, fill in all the *shaded* missing results (1% each cell, subtotal 10%).

Source	*df*	Sum of squares	Mean square	*F*
Among treatments	$c-1=?$	$SSA = ?$	$MSA = 80$	$F = ?$
Among blocks	$r-1=?$	$SSBL = 540$	$MSBL = ?$	
Errors	$(r-1)(c-1)=?$	$SSE = ?$	$MSE = ?$	
Total	$rc-1=?$	$SST = 1104$		

$F(0.05,3,7)=4.35$; $F(0.05,7,3)=8.89$; $F(0.05,3,21)=3.07$; $F(0.05,7,21)=2.49$

a. (5%) At the 0.05 level of significance, what is the upper tail critical value from the F distribution when testing for block effects?

b. (5%) State the decision rule for testing the null hypothesis of no block effects.

c. (5%) What is your statistical decision?

Table of Poisson Probabilities (*Continued*)

	λ									
X	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0
5	0.1579	0.1549	0.1519	0.1487	0.1454	0.1420	0.1385	0.1349	0.1314	0.1277
6	0.1605	0.1601	0.1595	0.1586	0.1575	0.1562	0.1546	0.1529	0.1511	0.1490
7	0.1399	0.1418	0.1435	0.1450	0.1462	0.1472	0.1480	0.1486	0.1489	0.1490
8	0.1066	0.1099	0.1130	0.1160	0.1188	0.1215	0.1240	0.1263	0.1284	0.1304
9	0.0723	0.0757	0.0791	0.0825	0.0858	0.0891	0.0923	0.0954	0.0985	0.1014
10	0.0441	0.0469	0.0498	0.0528	0.0558	0.0588	0.0618	0.0649	0.0679	0.0710
11	0.0245	0.0265	0.0285	0.0307	0.0330	0.0353	0.0377	0.0401	0.0426	0.0452
12	0.0124	0.0137	0.0150	0.0164	0.0179	0.0194	0.0210	0.0227	0.0245	0.0264
13	0.0058	0.0065	0.0073	0.0081	0.0089	0.0098	0.0108	0.0119	0.0130	0.0142
14	0.0025	0.0029	0.0033	0.0037	0.0041	0.0046	0.0052	0.0058	0.0064	0.0071
15	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020	0.0023	0.0026	0.0029	0.0033
16	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0010	0.0011	0.0013	0.0014
17	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0006
18	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001

	λ									
X	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0
0	0.0008	0.0007	0.0007	0.0006	0.0006	0.0005	0.0005	0.0004	0.0004	0.0003
1	0.0059	0.0054	0.0049	0.0045	0.0041	0.0038	0.0035	0.0032	0.0029	0.0027
2	0.0208	0.0194	0.0180	0.0167	0.0156	0.0145	0.0134	0.0125	0.0116	0.0107
3	0.0492	0.0464	0.0438	0.0413	0.0389	0.0366	0.0345	0.0324	0.0305	0.0286
4	0.0874	0.0836	0.0799	0.0764	0.0729	0.0696	0.0663	0.0632	0.0602	0.0573
5	0.1241	0.1204	0.1167	0.1130	0.1094	0.1057	0.1021	0.0986	0.0951	0.0916
6	0.1468	0.1445	0.1420	0.1394	0.1367	0.1339	0.1311	0.1282	0.1252	0.1221
7	0.1489	0.1486	0.1481	0.1474	0.1465	0.1454	0.1442	0.1428	0.1413	0.1396
8	0.1321	0.1337	0.1351	0.1363	0.1373	0.1382	0.1388	0.1392	0.1395	0.1396
9	0.1042	0.1070	0.1096	0.1121	0.1144	0.1167	0.1187	0.1207	0.1224	0.1241
10	0.0740	0.0770	0.0800	0.0829	0.0858	0.0887	0.0914	0.0941	0.0967	0.0993
11	0.0478	0.0504	0.0531	0.0558	0.0585	0.0613	0.0640	0.0667	0.0695	0.0722
12	0.0283	0.0303	0.0323	0.0344	0.0366	0.0388	0.0411	0.0434	0.0457	0.0481
13	0.0154	0.0168	0.0181	0.0196	0.0211	0.0227	0.0243	0.0260	0.0278	0.0296
14	0.0078	0.0086	0.0095	0.0104	0.0113	0.0123	0.0134	0.0145	0.0157	0.0169
15	0.0037	0.0041	0.0046	0.0051	0.0057	0.0062	0.0069	0.0075	0.0083	0.0090
16	0.0016	0.0019	0.0021	0.0024	0.0026	0.0030	0.0033	0.0037	0.0041	0.0045
17	0.0007	0.0008	0.0009	0.0010	0.0012	0.0013	0.0015	0.0017	0.0019	0.0021
18	0.0003	0.0003	0.0004	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0009
19	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004
20	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

	λ									
X	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0
0	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001
1	0.0025	0.0023	0.0021	0.0019	0.0017	0.0016	0.0014	0.0013	0.0012	0.0011
2	0.0100	0.0092	0.0086	0.0079	0.0074	0.0068	0.0063	0.0058	0.0054	0.0050
3	0.0269	0.0252	0.0237	0.0222	0.0208	0.0195	0.0183	0.0171	0.0160	0.0150
4	0.0544	0.0517	0.0491	0.0466	0.0443	0.0420	0.0398	0.0377	0.0357	0.0337
5	0.0882	0.0849	0.0816	0.0784	0.0752	0.0722	0.0692	0.0663	0.0635	0.0607
6	0.1191	0.1160	0.1128	0.1097	0.1066	0.1034	0.1003	0.0972	0.0941	0.0911
7	0.1378	0.1358	0.1338	0.1317	0.1294	0.1271	0.1247	0.1222	0.1197	0.1171
8	0.1395	0.1392	0.1388	0.1382	0.1375	0.1366	0.1356	0.1344	0.1332	0.1318
9	0.1256	0.1269	0.1280	0.1290	0.1299	0.1306	0.1311	0.1315	0.1317	0.1318