

國立台灣科技大學九十八學年度碩士班招生試題

系所組別：企業管理系碩士班甲組、乙組、丙組
 科目：統計學

(總分為 100 分)

1. Questions 1a) through 1d) are based on the following article.

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 A new national poll suggests that a majority of Americans think it will take the country two years or longer to recover from the current recession. Only 13 percent of those questioned in a recent survey think the economy will recover within a year. Twenty-seven percent think it will take up to two years and 59 percent feel it will take two years or longer to recover from the current recession, which has already lasted 13 months.

"Barack Obama said in his inaugural address that the country's problems will not be solved in a short span of time, and Americans are getting the message," said a polling director.

A senior political analyst thinks the public's initial judgment on how President Obama is handling the economy will come in 2010 during the midterm elections. "The final grades from the public will come in four years, when we expect Barack Obama to run for re-election. That's when a solid majority expect to see results on the economy," the analyst said.

The economy remains the top issue by far, with 74 percent of those questioned saying it's the most important issue facing the country today. The war in Iraq is a distant second at 8 percent.

Of those who think economy is the most serious problem faced by the country, half say they worry most about keeping their jobs. The federal budget deficit ranks second with only 15 percent. Home mortgages and other economic issues account for the remaining 35 percent.

The proposed \$825 billion stimulus plan to pump up the economy is on the agenda when Obama meets with his economic team. The poll numbers released Sunday indicate that nearly six in 10 Americans support an increase in government spending to rev up the economy, and suggest even higher levels of support for a plan that also involves tax cuts.

Fifty-eight percent of those questioned said they favored increased government spending to stimulate the economy. Four in 10 of those polled opposed increased spending of taxpayer dollars. If tax cuts for individuals and businesses are added to the package, support for the stimulus plan jumps 13 points, to 71 percent, and opposition drops 12 points, to 28 percent.

Barack Obama's plan to reach out to Republican members of Congress with a tax cut component to his stimulus package seems to be working with the GOP rank and file. Most Republicans nationwide oppose a stimulus plan that only has increased spending in it. But support for a stimulus plan with tax cuts climbs to 70 percent among Republicans.

The package to stimulate the ailing economy is a top priority for Obama. Democrats in the House of Representatives last week unveiled their version of the economic recovery package, which would cost \$825 billion. Their plan would include \$275 billion in tax breaks and \$550 billion in spending. Americans think that tax cuts would do more to help the economy than government spending, although they may not be right about that. Only one in five say that they would spend the money from a proposed \$500 tax cut, while most say they would save that money or use it to pay off bills. Only a third of those questioned say the government should run a deficit when the country's in recession, with 65 percent saying Washington should balance the budget even when the nation's in a recession and is at war.



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"Americans always worry about the deficit. It doesn't always mean they're willing to do much about it. In the months following the 9/11 attacks, it was one of the few times we've ever seen voters willing to say they're willing to have the country run a deficit. It looks like that crisis was bigger than this crisis," the analyst added.

The poll was conducted January 12 to 15, with 1,245 adult Americans questioned by telephone.

.....

- 1a) How many more percentage points of Americans think their government should balance the budget than those who think the government should run a deficit, even when the nation is in a recession and is at war? (3 points)
- 1b) How many more percentage points of Americans think they worry most about the federal budget deficit rather than the war in Iraq? (4 points)
- 1c) Calculate the margin, in percentage, of those who favored increased government spending versus those who opposed it before tax cuts (for individuals and businesses) are added to the stimulus plan. Then calculate the same margin after tax cuts (for individuals and businesses) are added to the stimulus plan. (6 points)
- 1d) Give a point estimate and a 95% confidence interval estimate of the percentage of Americans who think it will take two years or longer to recover from the current recession. (8 points)
2. Stroke is a major cause of death and disability in the United States and is a growing public health concern. The latest projections estimate that more than 1 million strokes will occur annually by the year 2010. Moreover, stroke has a disproportionate impact on different races. Many studies have provided strong evidence for lipids as a risk factor for coronary artery disease (CAD). These studies demonstrate a direct relationship between total cholesterol, low-density lipoprotein cholesterol (LDL-C), and CAD and an inverse relationship between high-density lipoprotein cholesterol (HDL-C) and CAD. These relationships have not been as clearly established for ischemic stroke with some studies even questioning whether cholesterol is a risk factor for stroke.
- A population-based study was conducted. Community subjects were identified by random-digit dialing using dual frame sampling to identify both published and unpublished telephone numbers. When a household was contacted, the research objectives were explained and a resident aged 39 years or older was interviewed briefly to record age, sex, race or ethnicity, and stroke incidences. These telephone interviews were performed by trained bilingual interviewers. Totally 533 people were interviewed. The race breakdown was 283 Hispanic, 150 Black, and 100 White. A total of 160 people experienced strokes before, of which 45% was Hispanic, 37% Black, and the remaining White. Can the statement "stroke has a disproportionate impact on different races" be supported by the data?
- 2a) Explain what kind of statistical problem (for instance, a confidence interval problem) is it? (5 points)
- 2b) Write down any formula(e) you use. (5 points)
- 2c) Give your opinion on whether you support the statement. Show detailed calculations (please carry 2 decimal places in your calculations). (19 points)



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- 3 台科公司在 5 個月內生產了 25 批的智慧型機器人，總經理得到下列的數據：

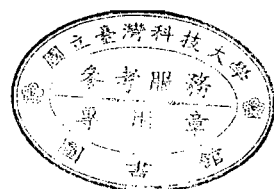
批次	批數(X_i)	工時(Y_i)
1	80	399
2	30	121
3	50	221
4	90	376
5	70	361
6	60	224
7	120	546
8	80	352
9	100	353
10	50	157
11	40	160
12	70	252
13	90	389
14	20	113
15	110	435
16	130	420
17	50	212
18	50	268
19	90	377
20	110	421
21	50	273
22	90	468
23	40	244
24	80	342
25	70	323

- 請製作迴歸線。(10 points)
- 請計算出 R^2 (5 points)。
- 該總經理認為 R^2 數值大於 0.7，可以做出下列的推論：
 - 本數值計算出的迴歸線具有良好的配適度。
 - 由迴歸線可以做出有用的預測。
 請評述以上兩點的正確性，並請說明理由。(10 points)

- 4 台科研究機構為了驗證七個行銷方案對於消費者購買意願的影響，利用研究設計蒐集了 375 份的樣本，並得出下列的 ANOVA 表：

	平方和	自由度	均方和	F 值	顯著性
行銷方案	22.141	?	?	?	0.04
誤差	?	?	1.656		
總和	?	?			

- 請協助完成該 ANOVA 表(四捨五入到小數點下第三位)。(21 points)
- 請檢定：不同的行銷方案對於消費者購買意願是否有影響 ($\alpha=0.05$)。(4 points)



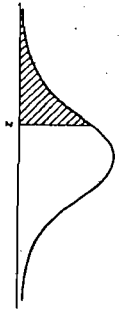
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TABLE 1 Values of the Standard Normal Distribution Function

$$\Phi(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}u^2\right) du = P(Z \leq z)$$

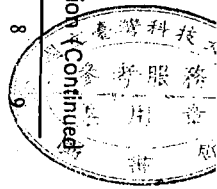


z	0	1	2	3	4	5	6	7	8	9
-3.	.0013	.0010	.0007	.0005	.0003	.0002	.0002	.0001	.0001	.0000
-2.9	.0019	.0018	.0017	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.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	.0126	.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	.0238	.0233
-1.8	.0359	.0352	.0344	.0336	.0329	.0322	.0314	.0307	.0300	.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	.0570	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0722	.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
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2297	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

TABLE 1 Values of the Standard Normal Distribution Function Continued

z	0	1	2	3	4	5	6	7	8	9
0.	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
1.	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
2.	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
3.	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
4.	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
5.	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
6.	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
7.	.7580	.7611	.7642	.7673	.7703	.7734	.7764	.7794	.7823	.7852
8.	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
9.	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9278	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9430	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9648	.9656	.9664	.9671	.9678	.9686	.9693	.9700	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9762	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9874	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9978	.9979	.9979	.9980	.9981	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.	.9987	.9990	.9993	.9995	.9997	.9998	.9998	.9999	.9999	1.0000

Note 1: If a normal variable X is not "standard," its values must be "standardized":
 $Z = (X - \mu)/\sigma$, i.e., $P(X \leq x) = \Phi((x - \mu)/\sigma)$.
 Note 2: For "two-tail" probabilities, see Table 1b.
 Note 3: For $z \geq 4$, $\Phi(z) = 1$ to four decimal places; for $z \leq -4$, $\Phi(z) = 0$ to four decimal places.
 Note 4: Entries opposite 3 and -3 are for 3.0, 3.1, 3.2, etc., and -3.0, -3.1, etc., respectively.



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Table 2. Percentage Points of the Chi-squared Distribution*

$1-\alpha$	0.005	0.010	0.025	0.050	0.100	0.250	0.500	0.750	0.900	0.950	0.975	0.990	0.995
1	0.04393	0.04157	0.04982	0.04393	0.0158	0.102	0.455	1.32	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	0.575	1.39	2.77	4.61	5.99	7.38	9.21	10.6
3	0.0717	0.115	0.216	0.352	0.584	1.21	2.37	4.11	6.25	7.81	9.35	11.3	12.8
4	0.207	0.297	0.484	0.711	1.06	1.92	3.36	5.39	7.78	9.49	11.1	13.3	14.9
5	0.412	0.554	0.831	1.15	1.61	2.67	4.35	6.63	9.24	11.1	12.8	15.1	16.7
6	0.676	0.872	1.24	1.64	2.20	3.45	5.35	7.84	10.6	12.6	14.4	16.8	18.5
7	0.989	1.24	1.69	2.17	2.83	4.25	6.35	9.04	12.0	14.1	16.0	18.5	20.3
8	1.34	1.65	2.18	2.73	3.49	5.07	7.34	10.2	13.4	15.5	17.5	20.1	22.0
9	1.73	2.09	2.70	3.33	4.17	5.90	8.34	11.4	14.7	16.9	19.0	21.7	23.6
10	2.16	2.56	3.25	3.94	4.87	6.74	9.34	12.5	16.0	18.3	20.5	23.2	25.2
11	2.60	3.05	3.82	4.57	5.58	7.58	10.3	13.7	17.3	19.7	21.9	24.7	26.8
12	3.07	3.57	4.40	5.23	6.30	8.44	11.3	14.8	18.5	21.0	23.3	26.2	28.3
13	3.57	4.11	5.01	5.89	7.04	9.30	12.3	16.0	19.8	22.4	24.7	27.7	29.8
14	4.07	4.66	5.63	6.57	7.79	10.2	13.3	17.1	21.1	23.7	26.1	29.1	31.3
15	4.60	5.23	6.28	7.26	8.55	11.0	14.3	18.2	22.3	25.0	27.5	30.6	32.8
16	5.14	5.81	6.91	7.96	9.31	11.9	15.3	19.4	23.5	26.3	28.8	32.0	34.3
17	5.70	6.41	7.56	8.67	10.1	12.8	16.3	20.5	24.8	27.6	30.2	33.4	35.7
18	6.27	7.01	8.23	9.39	10.9	13.7	17.3	21.6	26.0	28.9	31.5	34.8	37.2
19	6.84	7.63	8.91	10.1	11.7	14.6	18.3	22.7	27.2	30.1	32.9	36.2	38.6
20	7.43	8.26	9.59	10.9	12.4	15.5	19.3	23.8	28.4	31.4	34.2	37.6	40.0
21	8.03	8.90	10.3	11.6	13.2	16.3	20.3	24.9	29.6	32.7	35.5	38.9	41.4
22	8.64	9.54	11.0	12.3	14.0	17.2	21.3	26.0	30.8	33.9	36.8	40.3	42.8
23	9.26	10.2	11.7	13.1	14.8	18.1	22.3	27.1	32.0	35.2	38.1	41.6	44.2
24	9.89	10.9	12.4	13.8	15.7	19.0	23.3	28.2	33.2	36.4	39.4	43.0	45.6
25	10.5	11.5	13.1	14.6	16.5	19.9	24.3	29.3	34.4	37.7	40.6	44.3	46.9
26	11.2	12.2	13.8	15.4	17.3	20.8	25.3	30.4	35.6	38.9	41.9	45.6	48.3
27	11.8	12.9	14.5	16.1	18.1	21.7	26.3	31.5	36.7	40.0	43.0	46.9	49.6
28	12.5	13.6	15.3	16.9	18.9	22.7	27.3	32.6	37.9	41.3	44.5	48.3	51.0
29	13.1	14.3	16.0	17.7	19.8	23.6	28.3	33.7	39.1	42.6	45.7	49.6	52.3
30	13.8	15.0	16.8	18.5	20.6	24.5	29.3	34.8	40.3	43.8	47.0	50.9	53.7

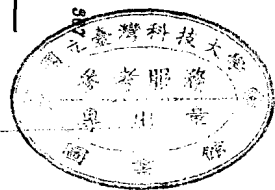
* Abridged from Catherine M. Thompson: Tables of percentage points of the incomplete beta function and of the chi-square distribution, *Biometrika*, vol. 32 (1941), pp. 187-191, and published here with the kind permission of the editor of *Biometrika*.

Appendix

Table 3. Upper Percentage Points of the t Distribution*

$1-\alpha$	0.75	0.90	0.95	0.975	0.99	0.995
1	1.000	3.078	6.314	12.706	31.821	63.657
2	0.816	1.886	2.920	4.303	6.965	9.925
3	0.765	1.638	2.353	3.182	4.541	5.841
4	0.741	1.533	2.132	2.776	3.747	4.604
5	0.727	1.476	2.015	2.571	3.365	4.032
6	0.718	1.440	1.943	2.447	3.143	3.707
7	0.711	1.415	1.895	2.365	2.998	3.499
8	0.706	1.397	1.860	2.306	2.896	3.355
9	0.703	1.383	1.833	2.262	2.821	3.280
10	0.700	1.372	1.812	2.228	2.764	3.169
11	0.697	1.363	1.796	2.201	2.718	3.106
12	0.695	1.356	1.782	2.179	2.681	3.055
13	0.694	1.350	1.771	2.160	2.650	3.012
14	0.692	1.345	1.761	2.145	2.624	2.977
15	0.691	1.341	1.753	2.131	2.602	2.947
16	0.690	1.337	1.746	2.120	2.583	2.921
17	0.689	1.333	1.740	2.110	2.567	2.898
18	0.688	1.330	1.734	2.101	2.552	2.878
19	0.688	1.328	1.729	2.093	2.539	2.861
20	0.687	1.325	1.725	2.086	2.528	2.845
21	0.686	1.323	1.721	2.080	2.518	2.831
22	0.686	1.321	1.717	2.074	2.508	2.819
23	0.685	1.319	1.714	2.069	2.500	2.807
24	0.685	1.318	1.711	2.064	2.492	2.797
25	0.684	1.316	1.708	2.060	2.485	2.787
26	0.684	1.315	1.706	2.056	2.479	2.779
27	0.684	1.314	1.703	2.052	2.473	2.771
28	0.683	1.313	1.701	2.048	2.467	2.763
29	0.683	1.311	1.699	2.045	2.462	2.756
30	0.683	1.310	1.697	2.042	2.457	2.750
40	0.681	1.303	1.684	2.021	2.423	2.704
60	0.679	1.286	1.671	2.000	2.390	2.660
120	0.677	1.289	1.658	1.980	2.358	2.617
∞	0.674	1.282	1.645	1.960	2.326	2.576
						3.291

* Taken from Table III of R. A. Fisher and F. Yates: "Statistical Tables for Biological, Agricultural, and Medical Research," published by Oliver & Boyd Ltd., Edinburgh, by permission of the authors and publishers.



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國立台灣科技大學九十八學年度碩士班招生試題

系所組別：企業管理系碩士班甲組、乙組、丙組

科目：統計學

(總分為 100 分)

Table 4. Upper Percentage Points of the F Distribution*

Table with columns for 1-α, n1, n2, and F values for various degrees of freedom (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 30, 60, 120, ∞).

* Abridged from Maxine Merrington and Catherine M. Thompson: Tables of percentage points of the inverted beta distribution. Biometrika, vol. 33 (1943), pp. 73-88, and published here with the kind permission of the editor of Biometrika.

568 Appendix

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