

- ✓ 一、請說明下列名詞
- (a.) type I error (4%)
 - (b.) central limit theorem (4%)
 - (c.) heteroscedasticity (4%)
 - (d.) spurious association (4%)
 - (e.) Simpson's paradox (4%)

- ✓ 二、研究者想利用系統隨機抽樣 (systematic random sampling) 的方式找出具有代表性的樣本，以便估計社區居民 (總人口數為 36,000 人) 對施政滿意的比例。研究者預期在 95% 的信賴水準下，要讓估計誤差範圍維持在 $\pm 4\%$ 。請問：
- (a.) 研究者所需要的樣本數大約是多少？(10%)
 - (b.) 抽樣的方式大略為何？(5%)

- ✓ 三、研究者想知道不同地區居民在運動時間上是否存在差異，從三個地區中各別隨機抽出 5 位居民，並統計他們每月平均運動時數的分配如下：

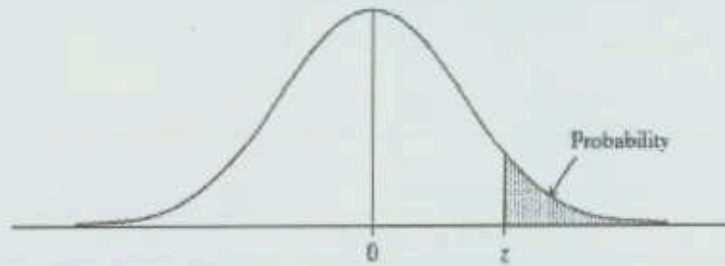
北區	中區	南區
15	14	13
16	13	12
14	15	11
17	16	14
15	14	11

請根據上述資料：

- (a.) 請列出適當的統計假設 (5%)
- (b.) 在 $\alpha = 0.05$ 的水準下，請進行檢定統計假設及說明其意義。(10%)

[附表]

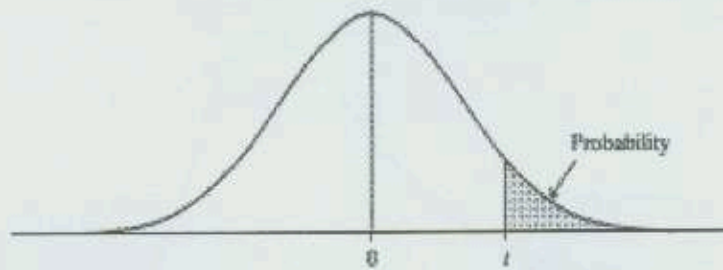
TABLE A: Normal curve tail probabilities. Standard normal probability in right-hand tail (for negative values of z , probabilities are found by symmetry).



z	Second Decimal Place of z									
	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0722	.0708	.0694	.0681
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.8	.0359	.0352	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
2.9	.0019	.0018	.0017	.0017	.0016	.0016	.0015	.0015	.0014	.0014
3.0	.00135									
3.5	.000233									
4.0	.0000317									
4.5	.00000340									
5.0	.000000287									

Source: R. E. Walpole, *Introduction to Statistics* (New York: Macmillan, 1968).

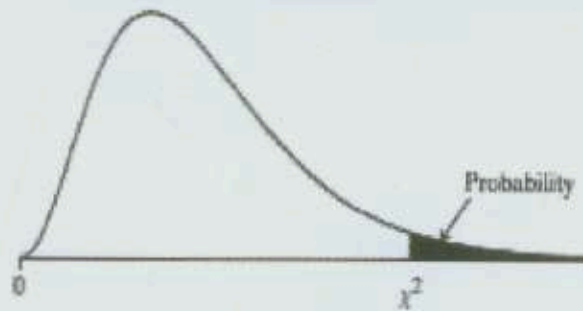
TABLE B: *t* Distribution Critical Values



df	Confidence Level					
	80%	90%	95%	98%	99%	99.8%
	Right-Tail Probability					
	<i>t</i> _{.100}	<i>t</i> _{.050}	<i>t</i> _{.025}	<i>t</i> _{.010}	<i>t</i> _{.005}	<i>t</i> _{.001}
1	3.078	6.314	12.706	31.821	63.656	318.289
2	1.886	2.920	4.303	6.965	9.925	22.328
3	1.638	2.353	3.182	4.541	5.841	10.214
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.894
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646
18	1.330	1.734	2.101	2.552	2.878	3.611
19	1.328	1.729	2.093	2.539	2.861	3.579
20	1.325	1.725	2.086	2.528	2.845	3.552
21	1.323	1.721	2.080	2.518	2.831	3.527
22	1.321	1.717	2.074	2.508	2.819	3.505
23	1.319	1.714	2.069	2.500	2.807	3.485
24	1.318	1.711	2.064	2.492	2.797	3.467
25	1.316	1.708	2.060	2.485	2.787	3.450
26	1.315	1.706	2.056	2.479	2.779	3.435
27	1.314	1.703	2.052	2.473	2.771	3.421
28	1.313	1.701	2.048	2.467	2.763	3.408
29	1.311	1.699	2.045	2.462	2.756	3.396
30	1.310	1.697	2.042	2.457	2.750	3.385
40	1.303	1.684	2.021	2.423	2.704	3.307
50	1.299	1.676	2.009	2.403	2.678	3.261
60	1.296	1.671	2.000	2.390	2.660	3.232
80	1.292	1.664	1.990	2.374	2.639	3.195
100	1.290	1.660	1.984	2.364	2.626	3.174
∞	1.282	1.645	1.960	2.326	2.576	3.091

Source: "Table of Percentage Points of the *t*-Distribution." Computed by Maxine Merrington, *Biometrika*, 32 (1941): 300. Reproduced by permission of the *Biometrika* trustees.

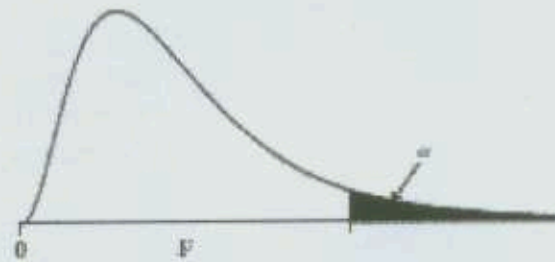
TABLE C: Chi-Squared Distribution Values for Various Right-Tail Probabilities



df	Right-Tail Probability						
	0.250	0.100	0.050	0.025	0.010	0.005	0.001
1	1.32	2.71	3.84	5.02	6.63	7.88	10.83
2	2.77	4.61	5.99	7.38	9.21	10.60	13.82
3	4.11	6.25	7.81	9.35	11.34	12.84	16.27
4	5.39	7.78	9.49	11.14	13.28	14.86	18.47
5	6.63	9.24	11.07	12.83	15.09	16.75	20.52
6	7.84	10.64	12.59	14.45	16.81	18.55	22.46
7	9.04	12.02	14.07	16.01	18.48	20.28	24.32
8	10.22	13.36	15.51	17.53	20.09	21.96	26.12
9	11.39	14.68	16.92	19.02	21.67	23.59	27.88
10	12.55	15.99	18.31	20.48	23.21	25.19	29.59
11	13.70	17.28	19.68	21.92	24.72	26.76	31.26
12	14.85	18.55	21.03	23.34	26.22	28.30	32.91
13	15.98	19.81	22.36	24.74	27.69	29.82	34.53
14	17.12	21.06	23.68	26.12	29.14	31.32	36.12
15	18.25	22.31	25.00	27.49	30.58	32.80	37.70
16	19.37	23.54	26.30	28.85	32.00	34.27	39.25
17	20.49	24.77	27.59	30.19	33.41	35.72	40.79
18	21.60	25.99	28.87	31.53	34.81	37.16	42.31
19	22.72	27.20	30.14	32.85	36.19	38.58	43.82
20	23.83	28.41	31.41	34.17	37.57	40.00	45.32
25	29.34	34.38	37.65	40.65	44.31	46.93	52.62
30	34.80	40.26	43.77	46.98	50.89	53.67	59.70
40	45.62	51.80	55.76	59.34	63.69	66.77	73.40
50	56.33	63.17	67.50	71.42	76.15	79.49	86.66
60	66.98	74.40	79.08	83.30	88.38	91.95	99.61
70	77.58	85.53	90.53	95.02	100.4	104.2	112.3
80	88.13	96.58	101.8	106.6	112.3	116.3	124.8
90	98.65	107.6	113.1	118.1	124.1	128.3	137.2
100	109.1	118.5	124.3	129.6	135.8	140.2	149.5

Source: Calculated using *StatTable*, software from Cytel Software, Cambridge, MA.

TABLE D: F Distribution



		$\alpha = .05$									
		df_1									
df_2		1	2	3	4	5	6	8	12	24	∞
1		161.4	199.5	215.7	224.6	230.2	234.0	238.9	243.9	249.0	254.3
2		18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.41	19.45	19.50
3		10.13	9.55	9.28	9.12	9.01	8.94	8.84	8.74	8.64	8.53
4		7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.91	5.77	5.63
5		6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.68	4.53	4.36
6		5.99	5.14	4.76	4.53	4.39	4.28	4.15	4.00	3.84	3.67
7		5.59	4.74	4.35	4.12	3.97	3.87	3.73	3.57	3.41	3.23
8		5.32	4.46	4.07	3.84	3.69	3.58	3.44	3.28	3.12	2.93
9		5.12	4.26	3.86	3.63	3.48	3.37	3.23	3.07	2.90	2.71
10		4.96	4.10	3.71	3.48	3.33	3.22	3.07	2.91	2.74	2.54
11		4.84	3.98	3.59	3.36	3.20	3.09	2.95	2.79	2.61	2.40
12		4.75	3.88	3.49	3.26	3.11	3.00	2.85	2.69	2.50	2.30
13		4.67	3.80	3.41	3.18	3.02	2.92	2.77	2.60	2.42	2.21
14		4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.53	2.35	2.13
15		4.54	3.68	3.29	3.06	2.90	2.79	2.64	2.48	2.29	2.07
16		4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.42	2.24	2.01
17		4.45	3.59	3.20	2.96	2.81	2.70	2.55	2.38	2.19	1.96
18		4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.34	2.15	1.92
19		4.38	3.52	3.13	2.90	2.74	2.63	2.48	2.31	2.11	1.88
20		4.35	3.49	3.10	2.87	2.71	2.60	2.45	2.28	2.08	1.84
21		4.32	3.47	3.07	2.84	2.68	2.57	2.42	2.25	2.05	1.81
22		4.30	3.44	3.05	2.82	2.66	2.55	2.40	2.23	2.03	1.78
23		4.28	3.42	3.03	2.80	2.64	2.53	2.38	2.20	2.00	1.76
24		4.26	3.40	3.01	2.78	2.62	2.51	2.36	2.18	1.98	1.73
25		4.24	3.38	2.99	2.76	2.60	2.49	2.34	2.16	1.96	1.71
26		4.22	3.37	2.98	2.74	2.59	2.47	2.32	2.15	1.95	1.69
27		4.21	3.35	2.96	2.73	2.57	2.46	2.30	2.13	1.93	1.67
28		4.20	3.34	2.95	2.71	2.56	2.44	2.29	2.12	1.91	1.65
29		4.18	3.33	2.93	2.70	2.54	2.43	2.28	2.10	1.90	1.64
30		4.17	3.32	2.92	2.69	2.53	2.42	2.27	2.09	1.89	1.62
40		4.08	3.23	2.84	2.61	2.45	2.34	2.18	2.00	1.79	1.51
60		4.00	3.15	2.76	2.52	2.37	2.25	2.10	1.92	1.70	1.39
120		3.92	3.07	2.68	2.45	2.29	2.17	2.02	1.83	1.61	1.25
∞		3.84	2.99	2.60	2.37	2.21	2.09	1.94	1.75	1.52	1.00

Source: From Table V of R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd., London, 1974. (Previously published by Oliver & Boyd, Edinburgh.) Reprinted by permission of the authors and publishers.