



所別：生物統計研究所碩士班

科目：統計學 【可攜帶電子計算機應試】

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1. For the Physicians Health Study, consider the null hypothesis that the population proportion of heart attacks p_1 for placebo is the same as the population proportion p_2 for aspirin. The sample proportions were $\hat{p}_1 = 189/11034 = 0.017$ and $\hat{p}_2 = 104/11037 = 0.0094$. (at the 0.05 level of significance)

(a) (8%) For testing $H_0: p_1 = p_2$ against $H_1: p_1 \neq p_2$, show that the pooled estimate of the common value p under H_0 is 0.0133 and the standard error is 0.0016.

(b) (9%) Find and interpret the p-value in context.

2. For a 2x3 table on gender and happiness shown again below, SAS software tells us that test statistics is 0.08. (at the 0.05 level of significance)

Gender	Happiness		
	Not	Pretty	Very
Females	227	939	527
Males	163	737	393

(a) (5%) State the null and alternative hypothesis, in context, to which these results apply.

(b) (5%) According p-value, what do you conclude?

3. A report summarizing scores for students on a verbal(言語) aptitude test x and a mathematics(數學) aptitude test y states that mean $\bar{x} = 480$, $\bar{y} = 500$, standard deviation $s_x = 80$, $s_y = 120$, correlation coefficient $r = 0.6$.

(a) (10%) Find the slope of the regression line, based on its connection with the correlation.

(b) (10%) Find and interpret the predication equation for predicting verbal test result using math test result and plot the regression line.

4. Do people who go to bars and pubs a lot tend to have more friends? A recent survey asked, "How often do you go to a bar?" The table shows results of ANOVA for comparing the mean number of good friends at three levels (very often, occasional, never) of this variable.

(a) (10%) What are the assumptions of ANOVA?

(b) (10%) Fill in all the blanks in the ANOVA table.

Source	Degrees of freedom (DF)	Sum of squares (SS)	Mean squares (MS)	F	p-value
Group	(I) _____	(III) _____	(IV) _____	(VI) _____	(VII) _____
Error	419	77172	(V) _____		
Total	(II) _____	78288			

(c) (5%) State the null hypothesis and the alternative hypothesis for this case.

(d) (5%) Based p-value, explain how to interpret the conclusion. Do you need to do the multiple comparisons?

5. Current estimates are that about 25% of all deaths are due to cancer, and of the deaths that are due to cancer, 30% are attributed to tobacco, 40% to diet, and 30% to other causes; and of the deaths that are not due to cancer, 10% are attributed to tobacco, 30% to diet, and 60% to other causes.

(a) (3%) Find the probability that a death is due to cancer and tobacco.

(b) (5%) Find the probability that a death is due to tobacco.

6. In recent years, the score on Biostatistics have had a mean of 82 and standard deviation of 5.

(a) (7%) If the distribution is normal, of those who scored above 70, about what proportion scored above 90.

(b) (8%) A group of 50 students forms a study group to prepare for the exam. If they are a random sample of the students taking the exam, what proportion of mean score is between 80 and 90?

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附錄
附錄 1 標準常態分布右尾機率 (α) 對照表

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010

註： $P(Z \geq z) = \alpha$ ， z 由第一欄及第一列獲得，例如： $P(Z \geq 1.96) = 0.025$ ， $\alpha = 0.025$

附錄 2 卡方分布右尾機率 (α) 對照表

df	α					
	0.975	0.95	0.9	0.1	0.05	0.025
1	0.0010	0.0039	0.0158	2.7055	3.8415	5.0239
2	0.0506	0.1026	0.2107	4.6052	5.9915	7.3778
3	0.2158	0.3518	0.5844	6.2514	7.8147	9.3484
4	0.4844	0.7107	1.0636	7.7794	9.4877	11.1433
5	0.8312	1.1455	1.6103	9.2364	11.0705	12.8325

註：第 $(1-\alpha) \times 100$ 個百分位，即 χ_{α}^2

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附錄3 F分布右尾機率(α)對照表

分母自 由度 (df2)	α	分子自由度 (df1)		
		1	2	3
423	0.010	6.695	4.656	3.828
	0.025	5.060	3.721	3.147
	0.050	3.864	3.017	2.626
	0.100	2.717	2.315	2.097
422	0.010	6.695	4.656	3.828
	0.025	5.060	3.721	3.147
	0.050	3.864	3.017	2.626
	0.100	2.717	2.315	2.097
421	0.010	6.695	4.656	3.828
	0.025	5.060	3.721	3.147
	0.050	3.864	3.017	2.626
	0.100	2.717	2.315	2.097
420	0.010	6.696	4.656	3.829
	0.025	5.060	3.721	3.147
	0.050	3.864	3.017	2.626
	0.100	2.718	2.315	2.097

分母自 由度 (df2)	α	分子自由度 (df1)			
		423	422	421	420
1	0.010	6358.343	6358.325	6358.307	6358.289
	0.025	1017.054	1017.051	1017.048	1017.046
	0.050	254.013	254.012	254.011	254.011
	0.100	63.252	63.252	63.252	63.252
2	0.010	99.497	99.497	99.497	99.497
	0.025	39.496	39.496	39.496	39.496
	0.050	19.493	19.493	19.493	19.493
	0.100	9.489	9.489	9.489	9.489
3	0.010	26.152	26.153	26.153	26.153
	0.025	13.915	13.915	13.915	13.915
	0.050	8.533	8.533	8.533	8.533
	0.100	5.136	5.136	5.136	5.136

註：第 $(1-\alpha)\times 100$ 個百分位，即 F_{α}

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