

102 年公務人員高等考試三級考試試題

類 科：衛生行政、食品衛生檢驗、衛生技術、漁業技術、養殖技術

科 目：生物統計學

考試時間：2 小時

座號：_____

※注意：(一)可以使用電子計算器。

(二)不必抄題，作答時請將試題題號及答案依照順序寫在試卷上，於本試題上作答者，不予計分。

一、(一)請解釋標準差及標準誤。(10 分)

(二)當要發表一研究論文，你會選擇報告標準差或標準誤？理由為何？(10 分)

二、某研究對國小學生作眼睛檢查，有效樣本為 1000，2%學生有斜視。斜視的 95%信賴區間 (confidence interval, 簡稱 CI) 應為多少？(20 分)

三、下表為來自某論文有關憂鬱傾向 (Depression Inclination) 與人格特質 (Personality Traits) 變項相關之研究結果，問其中有一嚴重的錯誤是？(10 分)

Correlation Matrix among Depression Inclination and Personality Traits

	DI	PIP	PPI	PSI	PSD
DI	1.00	0.27*	0.38*	0.35*	0.37*
	-	(0, .24)	(.05, .29)	(.04, .27)	(.05, .28)
PIP	0.27*	1.00	0.54*	0.51*	0.46*
	(0, .24)	-	(.14, .37)	(.12, .35)	(.09, .33)
PPI	0.38*	0.54*	1.00	0.58*	0.61*
	(.05, .29)	(.14, .37)	-	(.16, .39)	(.18, .41)
PSI	0.35*	0.51*	0.58*	1.00	0.58*
	(.04, .27)	(.12, .35)	(.16, .39)	-	(.16, .39)
PSD	0.37*	0.46*	0.61*	0.58*	1.00
	(.05, .28)	(.09, .33)	(.18, .41)	(.16, .39)	-

Abbreviations: DI: Depression Inclination; PIP: Interpersonal Problems; PPI: Persecutory Ideas; PSI: Social Introversion; PSD: Self Depreciation; *: significant at the 0.05 level.

Each parenthesis indicates the 95% confidence interval for the corresponding correlation.

四、某公司員工使用四種中文輸入法 (注音、倉頡、大易、速成)。使用四種中文輸入法的員工各隨機抽 10 位，並記錄每分鐘打字數，其平均數±標準差分別為 31±8、40±6、39±7、35±7。

(一)問四種輸入法的輸入速度是否相同，設 α (第一型誤差) = 0.05？(20 分)

(二)針對(一)結果作一簡短討論，例如：需要進行後續統計分析、應考量那些可能影響因素？(5 分)

五、下表為來自某論文之實驗組與對照組在介入前後空腹血糖與糖化血色素之平均值比較的研究結果：

(一)請說出其 p 值採用何種統計檢定方法？(10 分)

(二)並解釋結果及建議後續使用何種統計方法來釐清介入成效？(15 分)

實驗組與對照組在介入前後空腹血糖與糖化血色素之平均值

	介入前	介入後	p值
	Mean ± SD	Mean ± SD	
空腹血糖			
實驗組	226.91 ± 72.13	159.36 ± 47.76	.000**
對照組	200.11 ± 68.38	190.84 ± 72.53	.084
糖化血色素			
實驗組	9.5 ± 2.2	8.1 ± 1.7	.000**
對照組	9.3 ± 2.8	8.6 ± 2.2	.021*

* : $p < .05$, ** : $p < .01$

標準常態分佈表

Z	右尾機率	Z	右尾機率	Z	右尾機率	Z	右尾機率	Z	右尾機率	Z	右尾機率
0.00	0.5000	0.50	0.3085	1.00	0.1587	1.50	0.0668	2.00	0.0228	2.50	0.0062
0.01	0.4980	0.51	0.3050	1.01	0.1562	1.51	0.0655	2.01	0.0222	2.51	0.0060
0.02	0.4920	0.52	0.3015	1.02	0.1539	1.52	0.0643	2.02	0.0217	2.52	0.0059
0.03	0.4880	0.53	0.2981	1.03	0.1515	1.53	0.0630	2.03	0.0212	2.53	0.0057
0.04	0.4840	0.54	0.2946	1.04	0.1492	1.54	0.0618	2.04	0.0207	2.54	0.0055
0.05	0.4801	0.55	0.2912	1.05	0.1469	1.55	0.0606	2.05	0.0202	2.55	0.0054
0.06	0.4761	0.56	0.2877	1.06	0.1446	1.56	0.0594	2.06	0.0197	2.56	0.0052
0.07	0.4721	0.57	0.2843	1.07	0.1423	1.57	0.0582	2.07	0.0192	2.57	0.0051
0.08	0.4681	0.58	0.2810	1.08	0.1401	1.58	0.0571	2.08	0.0188	2.58	0.0049
0.09	0.4641	0.59	0.2776	1.09	0.1379	1.59	0.0559	2.09	0.0183	2.59	0.0048
0.10	0.4602	0.60	0.2743	1.10	0.1357	1.60	0.0548	2.10	0.0179	2.60	0.0047
0.11	0.4562	0.61	0.2709	1.11	0.1335	1.61	0.0537	2.11	0.0174	2.61	0.0045
0.12	0.4522	0.62	0.2676	1.12	0.1314	1.62	0.0526	2.12	0.0170	2.62	0.0044
0.13	0.4483	0.63	0.2643	1.13	0.1292	1.63	0.0516	2.13	0.0166	2.63	0.0043
0.14	0.4443	0.64	0.2611	1.14	0.1271	1.64	0.0505	2.14	0.0162	2.64	0.0041
0.15	0.4404	0.65	0.2578	1.15	0.1251	1.65	0.0495	2.15	0.0158	2.65	0.0040
0.16	0.4364	0.66	0.2546	1.16	0.1230	1.66	0.0485	2.16	0.0154	2.66	0.0039
0.17	0.4325	0.67	0.2514	1.17	0.1210	1.67	0.0475	2.17	0.0150	2.67	0.0038
0.18	0.4286	0.68	0.2483	1.18	0.1190	1.68	0.0465	2.18	0.0146	2.68	0.0037
0.19	0.4247	0.69	0.2451	1.19	0.1170	1.69	0.0455	2.19	0.0143	2.69	0.0036
0.20	0.4207	0.70	0.2420	1.20	0.1151	1.70	0.0446	2.20	0.0139	2.70	0.0035
0.21	0.4168	0.71	0.2389	1.21	0.1131	1.71	0.0436	2.21	0.0136	2.71	0.0034
0.22	0.4129	0.72	0.2358	1.22	0.1112	1.72	0.0427	2.22	0.0132	2.72	0.0033
0.23	0.4090	0.73	0.2327	1.23	0.1093	1.73	0.0418	2.23	0.0129	2.73	0.0032
0.24	0.4052	0.74	0.2296	1.24	0.1075	1.74	0.0409	2.24	0.0125	2.74	0.0031
0.25	0.4013	0.75	0.2266	1.25	0.1056	1.75	0.0401	2.25	0.0122	2.75	0.0030
0.26	0.3974	0.76	0.2236	1.26	0.1038	1.76	0.0392	2.26	0.0119	2.76	0.0029
0.27	0.3936	0.77	0.2206	1.27	0.1020	1.77	0.0384	2.27	0.0116	2.77	0.0028
0.28	0.3897	0.78	0.2177	1.28	0.1003	1.78	0.0375	2.28	0.0113	2.78	0.0027
0.29	0.3859	0.79	0.2148	1.29	0.0985	1.79	0.0367	2.29	0.0110	2.79	0.0026
0.30	0.3821	0.80	0.2119	1.30	0.0968	1.80	0.0359	2.30	0.0107	2.80	0.0026
0.31	0.3783	0.81	0.2090	1.31	0.0951	1.81	0.0351	2.31	0.0104	2.81	0.0025
0.32	0.3745	0.82	0.2061	1.32	0.0934	1.82	0.0344	2.32	0.0102	2.82	0.0024
0.33	0.3707	0.83	0.2033	1.33	0.0918	1.83	0.0336	2.33	0.0099	2.83	0.0023
0.34	0.3669	0.84	0.2005	1.34	0.0901	1.84	0.0329	2.34	0.0096	2.84	0.0023
0.35	0.3632	0.85	0.1977	1.35	0.0885	1.85	0.0322	2.35	0.0094	2.85	0.0022
0.36	0.3594	0.86	0.1949	1.36	0.0869	1.86	0.0314	2.36	0.0091	2.86	0.0021
0.37	0.3557	0.87	0.1922	1.37	0.0853	1.87	0.0307	2.37	0.0089	2.87	0.0021
0.38	0.3520	0.88	0.1894	1.38	0.0838	1.88	0.0301	2.38	0.0087	2.88	0.0020
0.39	0.3483	0.89	0.1867	1.39	0.0823	1.89	0.0294	2.39	0.0084	2.89	0.0019
0.40	0.3446	0.90	0.1841	1.40	0.0808	1.90	0.0287	2.40	0.0082	2.90	0.0019
0.41	0.3409	0.91	0.1814	1.41	0.0793	1.91	0.0281	2.41	0.0080	2.91	0.0018
0.42	0.3372	0.92	0.1788	1.42	0.0778	1.92	0.0274	2.42	0.0078	2.92	0.0018
0.43	0.3336	0.93	0.1762	1.43	0.0764	1.93	0.0268	2.43	0.0075	2.93	0.0017
0.44	0.3300	0.94	0.1736	1.44	0.0749	1.94	0.0262	2.44	0.0073	2.94	0.0016
0.45	0.3264	0.95	0.1711	1.45	0.0735	1.95	0.0256	2.45	0.0071	2.95	0.0016
0.46	0.3228	0.96	0.1685	1.46	0.0721	1.96	0.0250	2.46	0.0069	2.96	0.0015
0.47	0.3192	0.97	0.1660	1.47	0.0708	1.97	0.0244	2.47	0.0068	2.97	0.0015
0.48	0.3156	0.98	0.1635	1.48	0.0694	1.98	0.0239	2.48	0.0066	2.98	0.0014
0.49	0.3121	0.99	0.1611	1.49	0.0681	1.99	0.0233	2.49	0.0064	2.99	0.0014

t 分布

自由度	雙尾 機率						
	0.5	0.4	0.3	0.2	0.1	0.05	0.01
	右尾 機率						
自由度	0.25	0.2	0.15	0.1	0.05	0.025	0.005
1	1.0000	1.3764	1.9626	3.0777	6.3138	12.7062	63.6567
2	0.8165	1.0607	1.3862	1.8856	2.9200	4.3027	9.9248
3	0.7649	0.9785	1.2498	1.6377	2.3534	3.1824	5.8409
4	0.7407	0.9410	1.1896	1.5332	2.1319	2.7764	4.6041
5	0.7267	0.9195	1.1558	1.4759	2.0151	2.5706	4.0321
6	0.7176	0.9057	1.1342	1.4398	1.9432	2.4469	3.7074
7	0.7111	0.8960	1.1192	1.4149	1.8946	2.3646	3.4995
8	0.7064	0.8889	1.1082	1.3968	1.8596	2.3060	3.3554
9	0.7027	0.8834	1.0997	1.3830	1.8331	2.2622	3.2498
10	0.6998	0.8791	1.0931	1.3722	1.8125	2.2281	3.1693
11	0.6975	0.8755	1.0877	1.3634	1.7959	2.2010	3.1058
12	0.6955	0.8726	1.0832	1.3562	1.7823	2.1788	3.0545
13	0.6938	0.8702	1.0795	1.3502	1.7709	2.1604	3.0123
14	0.6924	0.8681	1.0763	1.3450	1.7613	2.1448	2.9768
15	0.6912	0.8662	1.0735	1.3406	1.7531	2.1314	2.9467
16	0.6901	0.8647	1.0711	1.3368	1.7459	2.1199	2.9208
17	0.6892	0.8633	1.0690	1.3334	1.7396	2.1098	2.8982
18	0.6884	0.8621	1.0672	1.3304	1.7341	2.1009	2.8784
19	0.6876	0.8610	1.0655	1.3277	1.7291	2.0930	2.8609
20	0.6870	0.8600	1.0640	1.3253	1.7247	2.0860	2.8453
21	0.6864	0.8591	1.0627	1.3232	1.7207	2.0796	2.8314
22	0.6858	0.8583	1.0615	1.3212	1.7171	2.0739	2.8188
23	0.6853	0.8575	1.0603	1.3195	1.7139	2.0687	2.8073
24	0.6849	0.8569	1.0593	1.3178	1.7109	2.0639	2.7969
25	0.6844	0.8562	1.0584	1.3164	1.7081	2.0595	2.7874
26	0.6840	0.8557	1.0575	1.3150	1.7056	2.0555	2.7787
27	0.6837	0.8551	1.0567	1.3137	1.7033	2.0518	2.7707
28	0.6834	0.8547	1.0560	1.3125	1.7011	2.0484	2.7633
29	0.6830	0.8542	1.0553	1.3114	1.6991	2.0452	2.7564
30	0.6828	0.8538	1.0547	1.3104	1.6973	2.0423	2.7500

F 分布

分子 自由度	分母 自由度	$\alpha=0.1$	$\alpha=0.05$	$\alpha=0.025$	$\alpha=0.01$	$\alpha=0.005$
		$\alpha=0.1$	$\alpha=0.05$	$\alpha=0.025$	$\alpha=0.01$	$\alpha=0.005$
1	10	3.28502	4.9646	6.93673	10.0443	12.8265
1	12	3.17655	4.74723	6.55377	9.3302	11.7542
1	14	3.10221	4.60011	6.29794	8.8616	11.0603
1	16	3.04811	4.494	6.11513	8.531	10.5755
1	18	3.00698	4.41387	5.97805	8.2854	10.2181
1	20	2.97465	4.35124	5.87149	8.096	9.9439
1	22	2.94858	4.30095	5.7863	7.9454	9.7271
1	24	2.92712	4.25968	5.71664	7.8229	9.5513
1	26	2.90913	4.2252	5.65862	7.7213	9.4059
1	28	2.89385	4.19597	5.60956	7.6356	9.2838
1	30	2.88069	4.17088	5.56753	7.5625	9.1797
1	40	2.83535	4.08475	5.42394	7.3141	8.8279
1	60	2.79107	4.00119	5.28561	7.0771	8.4946
1	80	2.76931	3.96035	5.21835	6.9627	8.3346
1	100	2.75638	3.93614	5.17859	6.8953	8.2406
1	120	2.74781	3.92012	5.15233	6.8509	8.1788
1	∞	2.71056	3.85077	5.03905	6.6603	7.9145
2	10	2.92447	4.10282	5.4564	7.5594	9.427
2	12	2.8068	3.88529	5.09587	6.9266	8.5096
2	14	2.72647	3.73889	4.8567	6.5149	7.9216
2	16	2.66817	3.63372	4.68667	6.2262	7.5138
2	18	2.62395	3.55456	4.55967	6.0129	7.2148
2	20	2.58925	3.49283	4.46126	5.8489	6.9865
2	22	2.56131	3.44336	4.38277	5.719	6.8064
2	24	2.53833	3.40283	4.31873	5.6136	6.6609
2	26	2.5191	3.36902	4.26548	5.5263	6.5409
2	28	2.50276	3.34039	4.22053	5.4529	6.4403
2	30	2.48872	3.31583	4.18206	5.3903	6.3547
2	40	2.44037	3.23173	4.05099	5.1785	6.0664
2	60	2.39325	3.15041	3.92527	4.9774	5.795
2	80	2.37015	3.11077	3.86433	4.8807	5.6652
2	100	2.35643	3.0873	3.82837	4.8239	5.5892
2	120	2.34734	3.07178	3.80464	4.7865	5.5393
2	∞	2.3079	3.00472	3.70252	4.6264	5.3265

F 分布(續)

分子 分母						
自由度	自由度	$\alpha=0.1$	$\alpha=0.05$	$\alpha=0.025$	$\alpha=0.01$	$\alpha=0.005$
3	10	2.72767	3.70826	4.82562	6.5523	8.0807
3	12	2.60552	3.49029	4.47418	5.9525	7.2258
3	14	2.52222	3.34389	4.24173	5.5639	6.6804
3	16	2.46181	3.23887	4.07682	5.2922	6.3034
3	18	2.41601	3.15991	3.95386	5.0919	6.0278
3	20	2.38009	3.09839	3.8587	4.9382	5.8177
3	22	2.35117	3.04912	3.78289	4.8166	5.6524
3	24	2.32739	3.00879	3.72108	4.7181	5.519
3	26	2.30749	2.97515	3.66974	4.6366	5.4091
3	28	2.2906	2.94669	3.62641	4.5681	5.317
3	30	2.27607	2.92228	3.58936	4.5097	5.2388
3	40	2.22609	2.83875	3.46326	4.3126	4.9758
3	60	2.17741	2.75808	3.34252	4.1259	4.729
3	80	2.15355	2.71878	3.28408	4.0363	4.6113
3	100	2.13938	2.69553	3.24962	3.9837	4.5424
3	120	2.12999	2.68017	3.22689	3.9491	4.4972
3	∞	2.08928	2.6138	3.12918	3.8012	4.3048
4	10	2.60534	3.47805	4.46834	5.9943	7.3428
4	12	2.4801	3.25917	4.12121	5.412	6.5211
4	14	2.39469	3.11225	3.89191	5.0354	5.9984
4	16	2.33274	3.00692	3.72942	4.7726	5.6378
4	18	2.28577	2.92774	3.60834	4.579	5.3746
4	20	2.24893	2.86608	3.5147	4.4307	5.1743
4	22	2.21927	2.81671	3.44013	4.31343	5.01678
4	24	2.19488	2.77629	3.37936	4.21845	4.88978
4	26	2.17447	2.74259	3.32889	4.13996	4.78524
4	28	2.15714	2.71408	3.28632	4.07403	4.69771
4	30	2.14223	2.68963	3.24993	4.01788	4.62336
4	40	2.09095	2.60597	3.12611	3.82829	4.37378
4	60	2.04099	2.52522	3.00766	3.64905	4.13989
4	80	2.01649	2.48588	2.95036	3.56311	4.02851
4	100	2.00194	2.46261	2.91658	3.51268	3.96338
4	120	1.9923	2.44724	2.89431	3.47953	3.92065
4	∞	1.95049	2.38083	2.79859	3.33795	3.73905

X² 分布

自由度	雙尾機率							
	0.5	0.4	0.3	0.2	0.1	0.05	0.01	0.001
1	0.4549	0.7083	1.0742	1.6424	2.7055	3.8415	6.6349	10.8276
2	1.3863	1.8326	2.4079	3.2189	4.6052	5.9915	9.2103	13.8155
3	2.3660	2.9462	3.6649	4.6416	6.2514	7.8147	11.3449	16.2662
4	3.3567	4.0446	4.8784	5.9886	7.7794	9.4877	13.2767	18.4668
5	4.3515	5.1319	6.0644	7.2893	9.2364	11.0705	15.0863	20.5150
6	5.3481	6.2108	7.2311	8.5581	10.6446	12.5916	16.8119	22.4577
7	6.3458	7.2832	8.3834	9.8032	12.0170	14.0671	18.4753	24.3219
8	7.3441	8.3505	9.5245	11.0301	13.3616	15.5073	20.0902	26.1245
9	8.3428	9.4136	10.6564	12.2421	14.6837	16.9190	21.6660	27.8772
10	9.3418	10.4732	11.7807	13.4420	15.9872	18.3070	23.2093	29.5883
11	10.3410	11.5298	12.8987	14.6314	17.2750	19.6751	24.7250	31.2641
12	11.3403	12.5838	14.0111	15.8120	18.5493	21.0261	26.2170	32.9095
13	12.3398	13.6356	15.1187	16.9848	19.8119	22.3620	27.6882	34.5282
14	13.3393	14.6853	16.2221	18.1508	21.0641	23.6848	29.1412	36.1233
15	14.3389	15.7332	17.3217	19.3107	22.3071	24.9958	30.5779	37.6973
16	15.3385	16.7795	18.4179	20.4651	23.5418	26.2962	31.9999	39.2524
17	16.3382	17.8244	19.5110	21.6146	24.7690	27.5871	33.4087	40.7902
18	17.3379	18.8679	20.6014	22.7595	25.9894	28.8693	34.8053	42.3124
19	18.3377	19.9102	21.6891	23.9004	27.2036	30.1435	36.1909	43.8202
20	19.3374	20.9514	22.7745	25.0375	28.4120	31.4104	37.5662	45.3147
21	20.3372	21.9915	23.8578	26.1711	29.6151	32.6706	38.9322	46.7970
22	21.3370	23.0307	24.9390	27.3015	30.8133	33.9244	40.2894	48.2679
23	22.3369	24.0689	26.0184	28.4288	32.0069	35.1725	41.6384	49.7282
24	23.3367	25.1063	27.0960	29.5533	33.1962	36.4150	42.9798	51.1786
25	24.3366	26.1430	28.1719	30.6752	34.3816	37.6525	44.3141	52.6197
26	25.3365	27.1789	29.2463	31.7946	35.5632	38.8851	45.6417	54.0520
27	26.3363	28.2141	30.3193	32.9117	36.7412	40.1133	46.9629	55.4760
28	27.3362	29.2486	31.3909	34.0266	37.9159	41.3371	48.2782	56.8923
29	28.3361	30.2825	32.4612	35.1394	39.0875	42.5570	49.5879	58.3012
30	29.3360	31.3159	33.5302	36.2502	40.2560	43.7730	50.8922	59.7031