

國立中正大學
108 學年度碩士班招生考試
試 題

[第 1 節]

系所組別	心理學系臨床心理學
科目名稱	心理與教育統計學

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

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一、簡答填充題：(答題時請標示題號及空格編號。共 50 分)

In answering questions 1 – 3, refer to the following information.

A psychology professor gave a quiz with 12 questions to a class of 14 students. The scores were:
12, 3, 10, 9, 1, 8, 7, 10, 10, 6, 3, 9, 9, 11

1. The median equals a. The mean is b. (4 分)
2. Based on the mean and median of the data set above, what can you say about the shape of the distribution of those data? a After converting the scores above to z scores, what the shape of the distribution will be? b The mean of the set of z scores will equal c. The standard deviation of the set of z scores will equal d. (12 分)
3. Suppose that in previous classes the median had always been 7.5 and you are interested in whether the median value has changed, what statistical test would you use? Explain your answer. (5 分)

In answering questions 4 – 5, refer to the following information.

The owner of a local bookstore wanted to find out how many books are purchased each year by the average people in Chiayi. The data for a random sample are as follows:

7, 1, 5, 3, 10, 0, 6, 9, 12, 5

4. What statistical method would you recommend? a Describe the assumptions underlying the use of the statistical method you recommend: b (10 分)
5. What would happen if the sample size increases? (4 分)

In answering questions 6 – 8, refer to the following information.

A training program to enhance typing speed was carried out in 8 trainees. All the trainees typed the same material before the start and after the end of the program. The scores (in words per minute) were as follows:

Trainee	1	2	3	4	5	6	7	8
Before	60	58	50	63	67	49	55	64
After	68	62	59	69	72	52	60	64

6. To determine if the training program improves typing speed, what parametric test would you use? Explain your answer. (5 分)
7. The degrees of freedom for the appropriate test statistic are . (3 分)
8. The obtained value of the appropriate test statistic is . Please show your calculations. (7 分)

二、計算題: (共 50 分)

Note that you are asked to answer till three decimal places.

1. According to the following data, perform hypothesis tests applied to means of two groups. Please include hypothesis, test statistics, degree of freedom, critical value/ p-value/confidence interval, and conclusion when A and B are two independent samples. ($\alpha=.05$) (10 分)

A	8 4 6 3 1 4 4 6 4 2 2 1 1 4 3 3 2 6 3 4	$\Sigma X=71$ $\Sigma X^2=319$
B	2 1 1 3 2 7 2 1 3 1 0 2 4 2 3 3 0 1 2 2	$\Sigma X=42$ $\Sigma X^2=134$

A-B 6 3 5 0 -1 -3 2 5 1 1 2 -1 -3 2 0 0 2 5 1 2 $\Sigma X=29$
 $\Sigma X^2=163$

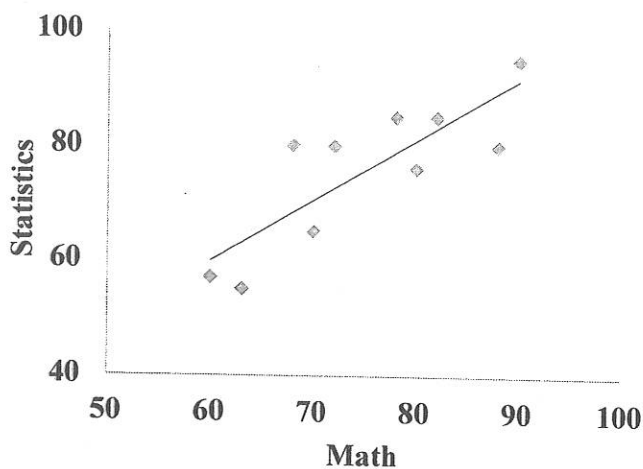
2. To study the effect of early experience on conditioning, an experimenter raised three groups of rats in the presence of (1) no special stimulus, (2) a tone stimulus, and (3) a vibratory stimulus. The rates were later classically conditioned using either a tone or a vibratory stimulus as the conditioned stimulus. This is a 2×3 factorial design. Analyze the data and interpret the results. Please include (a) ANOVA table and conclude if factors are significant, and (b) obtain an interaction plot for cell means in your answer. ($\alpha=.05$) (15 分; 5 分)

Conditioned Stimulus \ Experience	Control	Tone	Vibration
Tone	11 16 21 $\Sigma X=48$ $\Sigma X^2=818$	25 28 34 $\Sigma X=87$ $\Sigma X^2=2565$	6 13 20 $\Sigma X=39$ $\Sigma X^2=605$
Vibration	19 24 29 $\Sigma X=72$ $\Sigma X^2=1778$	21 26 31 $\Sigma X=78$ $\Sigma X^2=2078$	44 41 52 $\Sigma X=137$ $\Sigma X^2=6321$

3. The following data represent the math exam and statistics score for the freshmen in the department of psychology. The scatterplot of the data is also provided. The teacher would like to use the math exam to predict statistics score. Please find the correlation coefficient and regression line for (a) the original data, and (b) the transformed data that math and statistics are standardized. You might need to use $r = \frac{\text{COV}_{XY}}{s_X s_Y}$ and $b = \frac{\text{COV}_{XY}}{s_X^2}$ during calculation. (10 分; 10 分)

Math	60	63	68	70	72	78	80	82	88	90	$\Sigma x = 751$ $\Sigma x^2 = 57329$
Statistics	57	55	80	65	80	85	76	85	80	95	$\Sigma y = 758$ $\Sigma y^2 = 58950$

Math×

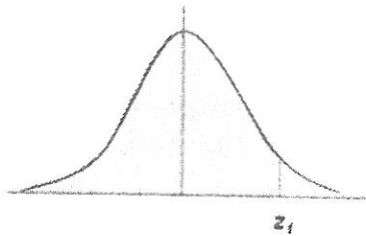
Statistics 3420 3465 5440 4550 5760 6630 6080 6970 7040 8550 $\Sigma xy = 57905$ 

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$$p(z \leq z_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_1} e^{-\frac{1}{2}z^2} dz$$

[illegible]

Table entry for p
and C is the point
 t^* with probability
 p lying above it
and probability C
lying between
 $-t^*$ and t^* .

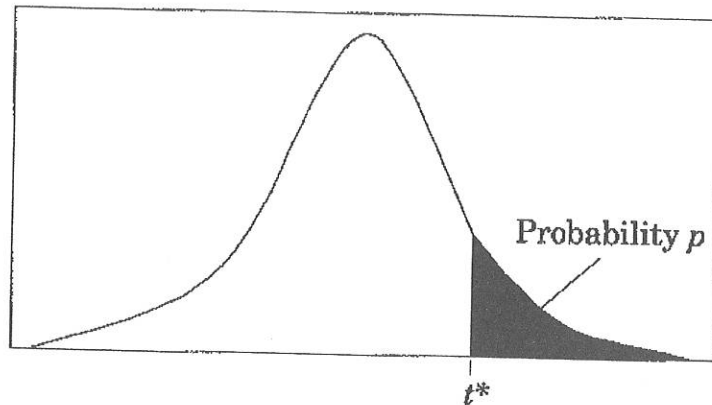


Table B t distribution critical values

df	Tail probability p											
	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	127.3	318.3	636.6
2	.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.09	22.33	31.60
3	.765	.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.21	12.92
4	.741	.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	.727	.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	.718	.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	.711	.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	.706	.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	.703	.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	.700	.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	.697	.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	.695	.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	.694	.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	.692	.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	.691	.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	.690	.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	.689	.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	.688	.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	.688	.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	.687	.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	.686	.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	.686	.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	.685	.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	.685	.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	.684	.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	.684	.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	.684	.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	.683	.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	.683	.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	.683	.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	.681	.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	.679	.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	.679	.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
80	.678	.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	.677	.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	.675	.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
∞	.674	.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291
	50%	60%	70%	80%	90%	95%	96%	98%	99%	99.5%	99.8%	99.9%

Confidence level C

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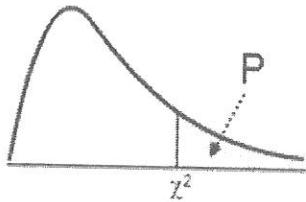
F Values for $\alpha = 0.05$

d_2	1	2	3	4	d_1 5	6	7	8	9	10	12	15	20
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5				
2	18.51	19.00	19.16	19.25	19.3	19.33	19.35	19.37	19.38	241.9	243.9	245.9	248.0
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	19.4	19.41	19.43	19.45
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	8.79	8.74	8.70	8.66
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	5.96	5.91	5.86	5.80
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.74	4.68	4.62	4.56
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	4.06	4.00	3.94	3.87
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.64	3.57	3.51	3.44
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.35	3.28	3.22	3.15
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	3.14	3.07	3.01	2.94
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.98	2.91	2.85	2.77
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.85	2.79	2.72	2.65
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.75	2.69	2.62	2.54
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.67	2.60	2.53	2.46
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.60	2.53	2.46	2.39
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.54	2.48	2.40	2.33
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.49	2.42	2.35	2.28
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.45	2.38	2.31	2.23
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.41	2.34	2.27	2.19
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.38	2.31	2.23	2.16
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.35	2.28	2.20	2.12
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.32	2.25	2.18	2.10
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.30	2.23	2.15	2.07
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.27	2.20	2.13	2.05
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.25	2.18	2.11	2.03
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.24	2.16	2.09	2.01
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.22	2.15	2.07	1.99
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.20	2.13	2.06	1.97
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.19	2.12	2.04	1.96
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.18	2.10	2.03	1.94
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.16	2.09	2.01	1.93
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	2.08	2.00	1.92	1.84
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.99	1.92	1.84	1.75
inf	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.91	1.83	1.75	1.66
										1.83	1.75	1.67	1.57

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DF	P										
	0.995	0.975	0.20	0.10	0.05	0.025	0.02	0.01	0.005	0.002	0.001
1	0.0000393	0.000982	1.642	2.706	3.841	5.024	5.412	6.635	7.879	9.550	10.828
2	0.0100	0.0506	3.219	4.605	5.991	7.378	7.824	9.210	10.597	12.429	13.816
3	0.0717	0.216	4.642	6.251	7.815	9.348	9.837	11.345	12.838	14.796	16.266
4	0.207	0.484	5.989	7.779	9.488	11.143	11.668	13.277	14.860	16.924	18.467
5	0.412	0.831	7.289	9.236	11.070	12.833	13.388	15.086	16.750	18.907	20.515
6	0.676	1.237	8.558	10.645	12.592	14.449	15.033	16.812	18.548	20.791	22.458
7	0.989	1.690	9.803	12.017	14.067	16.013	16.622	18.475	20.278	22.601	24.322
8	1.344	2.180	11.030	13.362	15.507	17.535	18.168	20.090	21.955	24.352	26.124
9	1.735	2.700	12.242	14.684	16.919	19.023	19.679	21.666	23.589	26.056	27.877
10	2.156	3.247	13.442	15.987	18.307	20.483	21.161	23.209	25.188	27.722	29.588
11	2.603	3.816	14.631	17.275	19.675	21.920	22.618	24.725	26.757	29.354	31.264
12	3.074	4.404	15.812	18.549	21.026	23.337	24.054	26.217	28.300	30.957	32.909
13	3.565	5.009	16.985	19.812	22.362	24.736	25.472	27.688	29.819	32.535	34.528
14	4.075	5.629	18.151	21.064	23.685	26.119	26.873	29.141	31.319	34.091	36.123
15	4.601	6.262	19.311	22.307	24.996	27.488	28.259	30.578	32.801	35.628	37.697
16	5.142	6.908	20.465	23.542	26.296	28.845	29.633	32.000	34.267	37.146	39.252
17	5.697	7.564	21.615	24.769	27.587	30.191	30.995	33.409	35.718	38.648	40.790
18	6.265	8.231	22.760	25.989	28.869	31.526	32.346	34.805	37.156	40.136	42.312
19	6.844	8.907	23.900	27.204	30.144	32.852	33.687	36.191	38.582	41.610	43.820
20	7.434	9.591	25.038	28.412	31.410	34.170	35.020	37.566	39.997	43.072	45.315
21	8.034	10.283	26.171	29.615	32.671	35.479	36.343	38.932	41.401	44.522	46.797
22	8.643	10.982	27.301	30.813	33.924	36.781	37.659	40.289	42.796	45.962	48.268
23	9.260	11.689	28.429	32.007	35.172	38.076	38.968	41.638	44.181	47.391	49.728
24	9.886	12.401	29.553	33.196	36.415	39.364	40.270	42.980	45.559	48.812	51.179
25	10.520	13.120	30.675	34.382	37.652	40.646	41.566	44.314	46.928	50.223	52.620
26	11.160	13.844	31.795	35.563	38.885	41.923	42.856	45.642	48.290	51.627	54.052
27	11.808	14.573	32.912	36.741	40.113	43.195	44.140	46.963	49.645	53.023	55.476
28	12.461	15.308	34.027	37.916	41.337	44.461	45.419	48.278	50.993	54.411	56.892
29	13.121	16.047	35.139	39.087	42.557	45.722	46.693	49.588	52.336	55.792	58.301
30	13.787	16.791	36.250	40.256	43.773	46.979	47.962	50.892	53.672	57.167	59.703