

系所組別： 工業設計學系甲組

考試科目： 統計方法

考試日期：0222，節次：3

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. What is the difference and the relationship between an alpha level (level of significance) and a p-value in the hypothesis testing? (5%)
2. What is the benefit of doing a one-tailed test versus a two-tailed test? (5%)
3. Provide an appropriate response to the following statement:
 - (1) A one-way ANOVA is being performed. The null hypothesis will be rejected if SSE is large relatively to SSTR. *True or false:* _____. (5%)
 - (2) When performing a z procedure, it is best to look at the data first and then determine if you should do a one-sided or two-sided test. *True or false:* _____. (5%)
4. Answer true or false to each of the statements in parts (a) and (b), and explain your reasoning.
 - (a) Two data sets that have identical frequency distributions have identical relative-frequency distributions. *True or false:* _____. (5%)
 - (b) Two data sets that have identical relative-frequency distributions have identical frequency distributions. *True or false:* _____. (5%)
 - (c) Use your answers to parts (a) and (b) to explain why relative-frequency distributions are better than frequency distributions for comparing two data sets. (5%)
5. The amount of time it takes to go through all security checks at the Taiwan Tao-Yuan airport is a random variable with mean $\mu = 30$ minutes and standard deviation $\sigma = 12.4$ minutes. A simple random sample of 16 passengers is to be observed going through the security.
 - (1) What is the mean of the sampling distribution of the sample mean, \bar{x} ? (5%)
 - (2) What is the variance of the sampling distribution of the sample mean, \bar{x} ? (5%)
 - (3) For the passengers, what is the approximate probability that the mean amount of time to get through security will be less than 25 minutes? (5%)
6. The percentage of variation in product-form that is accounted for by the linear relationship between product-form and function is approximately 64%. The value of the correlation coefficient between the product-form and the function is _____. (5%)
7. In Tainan, 72% of the people own a smart phone, 38% own a tablet PC, and 29% own both a smart phone and a tablet PC.
 - (1) What proportion of people in Tainan city own either a smart phone or a tablet PC? (5%)
 - (2) What is the probability that a randomly selected person from Tainan owns a tablet PC, given that the person owns a smart phone? (5%)
 - (3) Are the events "owns a tablet PC" and "owns a smart phone" independent? Explain your response. (5%)

(背面仍有題目,請繼續作答)

系所組別： 工業設計學系甲組

考試科目： 統計方法

考試日期：0222，節次：3

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

8. The following table shows the number of bus stops (X) in relation to the number of convenience stores (Y) on the main street of Blacksburg, VA.

# of Bus Stops (X)	# of Convenience Stores (Y)
1	1
1	2
2	2
4	5

- (1) Calculate the correlation coefficient for the 2 variables. (5%)
- (2) Determine the regression equation for these data. (5%)
- (3) Determine the average amount of predictive error of the equation. (5%)

9. Below are the anxiety scores (on a scale from 1 to 7, low to high) for five fifth-grade children before and after using a child calming toy (designed by a talented Industrial Design student at NCKU) over a weekend.

Before	After
6	3
5	2
4	4
5	4
7	4

- (1) Perform a statistical test (at the 0.05 level of significance) that children's anxiety scores are different before and after using the toy. (10%)
- (2) Calculate the 95% confidence interval and **describe** how it results in the same conclusion as the statistical test. (5%)

系所組別：工業設計學系甲組

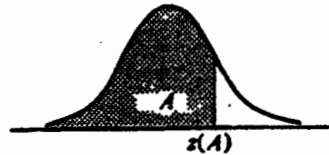
考試科目：統計方法

考試日期：0222，節次：3

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

TABLE B.1 Cumulative Probabilities of the Standard Normal Distribution.

Entry is area A under the standard normal curve from $-\infty$ to $z(A)$



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.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	.7704	.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	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.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	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.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	.9875	.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	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

(背面仍有題目,請繼續作答)

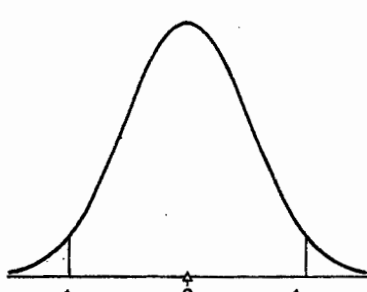
系所組別： 工業設計學系甲組

考試科目： 統計方法

考試日期： 0222， 節次： 3

※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

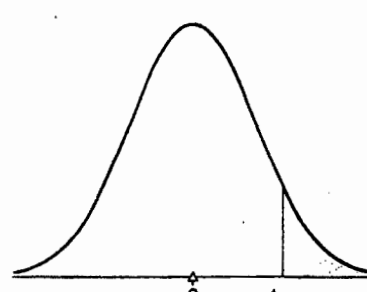
Table B^a
CRITICAL VALUES OF *t*



Two-tailed or Nondirectional Test
LEVEL OF SIGNIFICANCE
(*p*-value in color)

$p > .05$ $p < .05$ $p < .01$ $p < .001$

<i>df</i>	.05*	.01**	.001
1	12.706	63.657	636.62
2	4.303	9.925	31.598
3	3.182	5.841	12.924
4	2.776	4.604	8.610
5	2.571	4.032	6.869
6	2.447	3.707	5.959
7	2.365	3.499	5.408
8	2.306	3.355	5.041
9	2.262	3.250	4.781
10	2.228	3.169	4.587
11	2.201	3.106	4.437
12	2.179	3.055	4.318
13	2.160	3.012	4.221
14	2.145	2.977	4.140
15	2.131	2.947	4.073
16	2.120	2.921	4.015
17	2.110	2.898	3.965
18	2.101	2.878	3.922
19	2.093	2.861	3.883
20	2.086	2.845	3.850
21	2.080	2.831	3.819
22	2.074	2.819	3.792
23	2.069	2.807	3.767
24	2.064	2.797	3.745
25	2.060	2.787	3.725
26	2.056	2.779	3.707
27	2.052	2.771	3.690
28	2.048	2.763	3.674
29	2.045	2.756	3.659
30	2.042	2.750	3.646
40	2.021	2.704	3.551
60	2.000	2.660	3.460
120	1.980	2.617	3.373
∞	1.960	2.576	3.291



One-tailed or Directional Test
LEVEL OF SIGNIFICANCE
(*p*-value in color)

$p > .05$ $p < .05$ $p < .01$ $p < .001$

<i>df</i>	.05	.01	.001
1	6.314	31.821	318.31
2	2.920	6.965	22.326
3	2.353	4.541	10.213
4	2.132	3.747	7.173
5	2.015	3.365	5.893
6	1.943	3.143	5.208
7	1.895	2.998	4.785
8	1.860	2.896	4.501
9	1.833	2.821	4.297
10	1.812	2.764	4.144
11	1.796	2.718	4.025
12	1.782	2.681	3.930
13	1.771	2.650	3.852
14	1.761	2.624	3.787
15	1.753	2.602	3.733
16	1.746	2.583	3.686
17	1.740	2.567	3.646
18	1.734	2.552	3.610
19	1.729	2.539	3.579
20	1.725	2.528	3.552
21	1.721	2.518	3.527
22	1.717	2.508	3.505
23	1.714	2.500	3.485
24	1.711	2.492	3.467
25	1.708	2.485	3.450
26	1.706	2.479	3.435
27	1.703	2.473	3.421
28	1.701	2.467	3.408
29	1.699	2.462	3.396
30	1.697	2.457	3.385
40	1.684	2.423	3.307
60	1.671	2.390	3.232
120	1.658	2.358	3.160
∞	1.645	2.326	3.090

^aDiscussed in Section 13.2.
*95% level of confidence.
**99% level of confidence.