

系所組別： 工業設計學系甲組

考試科目： 統計方法

考試日期：0225，節次：3

1. What is a  $p$  value in hypothesis testing? (5pts)
2. What is Level of Significance ( $\alpha$ )? (5pts)
3. Explain why a census is often not the best way to obtain information about a population. (5pts)
4.
  - (a) What is Type I error? (5pts)
  - (b) What is Type II error? (5pts)
5. Identify and explain the significance of the three basic principles of experimental design. (10pts)

6. Determine the following values for the data.

1 3 4 1 0 2 5 8 0 2 3 4 7 11

- (1) Mean (3pts)
- (2) Mode (3pts)
- (3) Median (3pts)
- (4) Interquartile Range (3pts)
- (5) Range (3pts)

7. The following table shows the number of chapters in a book (X) in relation to the number of typos found in the book (Y).

# of chapters (X)	# of typos (Y)
5	4
5	3
2	2
2	2
3	2
1	1
2	2

- (1) Calculate the correlation coefficient for the 2 variables (5pts).
- (2) Determine the least squares regression equation for these data (5pts).
- (3) Determine the average amount of predictive error,  $S_{y|x}$  (5pts).
- (4) Predict the number of typos if the author decides to write 7 chapters for the book (5pts).

(背面仍有題目,請繼續作答)

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8. The ID department wants to make *Room 5260* a lounge bar so that Faculty and students could relax themselves after work/class. The department decides to recruit female undergraduate students to work part time from school. If you get the assignment for designing an adjustable bar counter to accommodate 95% female students, what would the range of height adjustment need to be? Use the female students' elbow height (Mean=102 cm, Standard deviation=3.5 cm) for the calculation. (10pts)

9. Independent random samples of 5 northern households and 5 southern households in Taiwan provided the following data on their last year's vehicle miles of travel (VMT), in thousands of miles.

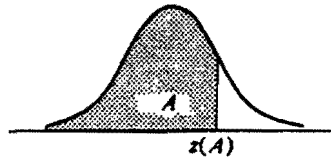
Northern households	Southern households
12	7
5	3
11	4
11	6
9	3

At the 0.05 level of significance, is there a difference in last year's mean VMT for northern and southern households?

- (1) State the statistical hypotheses. (5pts)
- (2) Show your calculations. (5pts)
- (3) State your decision and interpretation of your analysis. (5pts)
- (4) If appropriate, construct a 95% confidence interval for the true population means difference. (5pts)

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

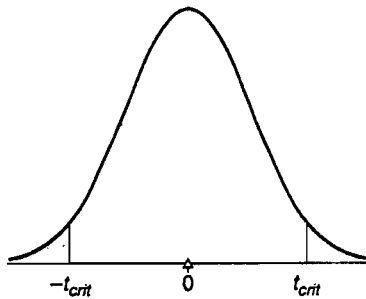
Entry is area  $A$  under the standard normal curve from  $-\infty$  to  $z(A)$



$z$	.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

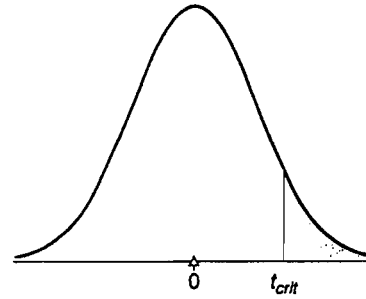
(背面仍有題目,請繼續作答)

**Table B<sup>a</sup>**  
**CRITICAL VALUES OF *t***



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

*p* > .05   *p* < .05   *p* < .01   *p* < .001



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

*p* > .05   *p* < .05   *p* < .01   *p* < .001

<i>df</i>	Two-tailed or Nondirectional Test			One-tailed or Directional Test		
	.05*	.01**	.001	.05	.01	.001
1	12.706	63.657	636.62	6.314	31.821	318.31
2	4.303	9.925	31.598	2.920	6.965	22.326
3	3.182	5.841	12.924	2.353	4.541	10.213
4	2.776	4.604	8.610	2.132	3.747	7.173
5	2.571	4.032	6.869	2.015	3.365	5.893
6	2.447	3.707	5.959	1.943	3.143	5.208
7	2.365	3.499	5.408	1.895	2.998	4.785
8	2.306	3.355	5.041	1.860	2.896	4.501
9	2.262	3.250	4.781	1.833	2.821	4.297
10	2.228	3.169	4.587	1.812	2.764	4.144
11	2.201	3.106	4.437	1.796	2.718	4.025
12	2.179	3.055	4.318	1.782	2.681	3.930
13	2.160	3.012	4.221	1.771	2.650	3.852
14	2.145	2.977	4.140	1.761	2.624	3.787
15	2.131	2.947	4.073	1.753	2.602	3.733
16	2.120	2.921	4.015	1.746	2.583	3.686
17	2.110	2.898	3.965	1.740	2.567	3.646
18	2.101	2.878	3.922	1.734	2.552	3.610
19	2.093	2.861	3.883	1.729	2.539	3.579
20	2.086	2.845	3.850	1.725	2.528	3.552
21	2.080	2.831	3.819	1.721	2.518	3.527
22	2.074	2.819	3.792	1.717	2.508	3.505
23	2.069	2.807	3.767	1.714	2.500	3.485
24	2.064	2.797	3.745	1.711	2.492	3.467
25	2.060	2.787	3.725	1.708	2.485	3.450
26	2.056	2.779	3.707	1.706	2.479	3.435
27	2.052	2.771	3.690	1.703	2.473	3.421
28	2.048	2.763	3.674	1.701	2.467	3.408
29	2.045	2.756	3.659	1.699	2.462	3.396
30	2.042	2.750	3.646	1.697	2.457	3.385
40	2.021	2.704	3.551	1.684	2.423	3.307
60	2.000	2.660	3.460	1.671	2.390	3.232
120	1.980	2.617	3.373	1.658	2.358	3.160
∞	1.960	2.576	3.291	1.645	2.326	3.090

<sup>a</sup>Discussed in Section 13.2.

\*95% level of confidence.

\*\*99% level of confidence.

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Table C1  
CRITICAL VALUES OF F



FINDING p-VALUE  
if observed F is  
... smaller than light number,  $p > .05$   
... between light and dark numbers,  $p < .05$   
... larger than dark number,  $p < .01$

.05 level of significance (light numbers)  
.01 level of significance (dark numbers)

DEGREES OF FREEDOM IN NUMERATOR

DEGREES OF FREEDOM IN DENOMINATOR

Table with columns for degrees of freedom in numerator (1-13) and denominator (1-∞). Values represent critical F-values for alpha = 0.05 and alpha = 0.01.

(背面仍有題目,請繼續作答)

Table C (Continued)  
CRITICAL VALUES OF F

FINDING  $p$ -VALUE  
If observed  $F$  is  
... smaller than light number,  $p > .05$   
... between light and dark numbers,  $p < .05$   
... larger than dark number,  $p < .01$

DEGREES OF FREEDOM IN NUMERATOR

DEGREES OF FREEDOM IN DENOMINATOR

Table with columns for Degrees of Freedom in Numerator (2-26) and Degrees of Freedom in Denominator (14-26). The table contains critical values for F-distribution at various significance levels.