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NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS 2000

Statistics for Economics (EC224)

2nd Arts

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Time allowed: Three hours.

Instructions: Answer all questions in Section 1 (each worth 2 marks). Answer 2 questions in Section 2 (each worth 30 marks). Answer 8 questions in Section 3 (each worth 12 marks). Total marks are 180.

Section 1

For all of the following statements, indicate if they are true or false.

1- (1) The sample mean is an unbiased estimator of the population mean.

1- (2) The standard normal distribution always has the same variance.

1- (3) The number of customers a shop has per hour is an example of a Poisson process.

1- **(4)** The major advantage of random sampling is that $\bar{x}$ is always equal to μ.

1- **(5)** The width of a confidence interval decreases as sample size decreases.

1- **(6)** A type 1 error cannot be made if the null hypothesis is rejected.

1- **(7)** The assumption of a normal population is critical in the use of a t distribution.

1- **(8)** In analysis of variance the critical region lies in the left tail.

1- **(9)** The coefficient of determination can assume any value between -1 and 1.

1- **(10)** The lotto draw is an example of a hyper-geometric process.

1- **(11)** The variance is always non-negative.

1- (12) The jth percentile in a given distribution is the score above which j percent of the scores are found.

Section 2: Answer both of the following questions.

2- **(1)** A national firm with hundreds of stores investigated the relationship between expenditure for supplies (Y) and sales (X) for 25 stores in 1996. X and Y are both in thousands of pounds.

After conducting a simple linear regression, the following results were found:

$\hat{y} = 2 + .015x$

$\hat{\sigma}_e = 0.5$

$\bar{x} = 300$

$\sum x^2 - n\bar{x}^2 = 10000$

a. Interpret the two coefficients.
b. Do the data give evidence that there is a linear relationship between x and y.
c. The corporate staff had earlier predicted that for a sales increase of £100, an 80p increase in supply expenditures should be expected. Do the data support this?
d. A particular store with 1996 sales of £300000 had supplies expense of £9000. Should the store manager be commended, reprimanded, or ignored in this regard.

2- **(2)** The manager of a company is trying to decide which of three new processes to use to test the quality of their finished product. All three processes are equally reliable, so the deciding factor for the manager will be the time it takes to complete the processes. She asks 12 people from the company to try out the new processes, randomly assigning 4 people to each of them.

The employees work separately from one another, so they do not have the opportunity of learning from one another. The time it took each person to carry out their process is given in the following table:

PROCESS A	PROCESS B	PROCESS C
62	51	55
57	66	40
38	63	58
75	51	83

a) State H_o and H_1.
b) Develop the ANOVA table.
c) Test the null hypothesis at the 5% level of significance and interpret the results.

contd/

Section 3: Answer 8 of the following 10 questions.

3- (1) Under what circumstances will the correlation coefficient be 1?

3- (2) A box of 20 miniature circuit chips has 4 defective chips in it. If 5 chips are selected from the box, find the probability that 2 are defective.

3- (3) During peak periods, customers enter a shop at the rate of 90 per hour. What is the probability that 15 customers enter the shop in a six-minute interval during peak period.

3- (4) An airline computes capacity and range for its planes using a normal distribution for adult passengers with a mean of 65 kilos and a standard deviation of 8 kilos. a) What proportion of the adult passengers weigh more than 75 kilos? b) Between what weights do the middle 90% of the adult passengers fall?

3- (5) A US bank estimates that it loses 30% of customers, who switch banks due to dis-satisfaction with their present banks. If one particular local branch currently has 200 customer accounts, what is the probability that no more than 50 of these will switch.

3- (6) A random sample of 81 items is drawn from a population with parameters $\mu = 125$ and $\sigma = 36$. Find the probability that the sample mean is between 123 and 128.

3- (7) A battery is advertised as having a life of 500 hours. Consumer tests show an average life of 474 hours, from a sample of 40. The sample standard deviation is 20 and the level of significance chosen for decision making is .05. Should the manufacturer's claim be accepted?

3- (8) Given the following results:

$n_1 = 3; n_2 = 3; n_3 = 3; n_4 = 3$

$\bar{x}_1 = 46.33; \bar{x}_2 = 49.67; \bar{x}_3 = 45; \bar{x}_4 = 51$

$SST = 110.7; SSTR = 70.7$

a) Test $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$ at the .05 level of significance. b) Construct a 95% confidence interval for $\mu_1 - \mu_2$.

3- (9) Compute the coefficient of determination for the following data:
Y 12, 11, 9, 8, 5; X 1, 2, 4, 6, 7.

3- (10) a) What do you understand by the term 'confidence intervals'. b) Discuss differences between one-tailed and two-tailed tests.

Formulae Sheet

$$\bar{X} = \frac{\sum X_i}{n}$$

$$S^2 = \frac{\sum X_i^2 - n\bar{X}^2}{n-1}$$

$$cv = \left(\frac{S}{\bar{X}}\right) 100\%$$

$$Z = \frac{X-\mu}{\sigma}$$

$$P(A') = 1 - P(A)$$

$$P(A) = P(A \text{ and } B) + P(A \text{ and } B')$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$$

$$P(A \text{ and } B) = P(B)P(A|B) = P(A)P(B|A)$$

$$P(X=x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$$

$$\mu = np$$

$$\sigma^2 = np(1-p)$$

$$P(X=x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

$$\mu = \lambda$$

$$\sigma^2 = \lambda$$

$$\mu_{\bar{X}} = \mu$$

$$\sigma_{\bar{X}}^2 = \left(\frac{\sigma^2}{n}\right)\left(\frac{N-n}{N-1}\right)$$

$$\sigma_{\bar{X}}^2 = \frac{\sigma^2}{n}$$

$$Z = \frac{\bar{X} - \mu_{\bar{X}}}{\sigma_{\bar{X}}} = \frac{\bar{X}-\mu}{\sigma/\sqrt{n}}$$

$$Z = \frac{X - np}{\sqrt{np(1-p)}}$$

$$t_{(n-1)} = \frac{\bar{X}-\mu}{S/\sqrt{n}}$$

$$S_p = \sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}}$$

$$Z = \frac{p_s - p}{\sqrt{\frac{p(1-p)}{n}}}$$

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{S_p^2}{n_1} + \frac{S_p^2}{n_2}}}$$

$$Z = \frac{(p_{s_1} - p_{s_2}) - (p_1 - p_2)}{\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$F_{(n_1-1, n_2-1)} = \frac{S_1^2}{S_2^2}$$

$$F_{L(n_1-1),(n_2-1)} = \frac{1}{F_{U(n_2-1),(n_1-1)}}$$

$$SST = \sum_{j=1}^{c}\sum_{i=1}^{n_j}\left(X_{ij} - \bar{\bar{X}}\right)^2$$

$$SSA = \sum_{j=1}^{c} n_j \left(\bar{X}_i - \bar{\bar{X}}\right)^2$$

$$SSW = \sum_{j=1}^{c}\sum_{i=1}^{n_j}(X_{ij} - \bar{X}_j)^2$$

$$MSA = \frac{SSA}{c-1}$$

$$MSW = \frac{SSW}{n-c}$$

$$F_{(c-1, \sum n - c)} = \frac{MSA}{MSW}$$

$$b_1 = \frac{\sum X_i Y_i - n\bar{X}\bar{Y}}{\sum X_i^2 - n\bar{X}^2}$$

$$b_0 = \bar{Y} - b_1 \bar{X}$$

$$S_{b_1} = \frac{S_{YX}}{\sqrt{\sum X_i^2 - n\bar{X}^2}}$$

$$S_{YX} = \sqrt{\frac{\sum Y_i^2 - b_0 \sum Y_i - b_1 \sum X_i Y_i}{n-2}}$$

$$SST = \sum Y_i^2 - n\bar{Y}^2$$

$$SSE = \sum Y_i^2 - b_0 \sum Y_i - b_1 \sum X_i Y_i$$

$$SSR = SST - SSE$$

$$r^2 = \frac{SSR}{SST}$$

$$r_{\text{adj}}^2 = 1 - \left[(1-r^2)\frac{n-1}{n-2}\right]$$

$$t_{n-2} = \frac{b_1 - \beta_1}{S_{b_1}}$$

$$r = \frac{\sum X_i Y_i - n\bar{X}\bar{Y}}{\sqrt{\sum X_i^2 - n\bar{X}^2}\sqrt{\sum Y_i^2 - n\bar{Y}^2}}$$

$$h_i = \frac{1}{n} + \frac{(X_i - \bar{X})^2}{\sum (X_i - \bar{X})^2}$$

$$SR_i = \frac{e_i}{S_{YX}\sqrt{1-h_i}}$$

$$\hat{Y}_i \pm t_{n-2} S_{YX} \sqrt{h_i}$$

$$\hat{Y}_i \pm t_{n-2} S_{YX} \sqrt{1+h_i}$$

$$t = \frac{r - \rho}{\sqrt{\frac{1-r^2}{n-2}}}$$

$$\bar{X} - Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right) \le \mu \le \bar{X} + Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

$$\bar{X} - t_{\alpha/2, n-1}\left(\frac{S}{\sqrt{n}}\right) \le \mu \le \bar{X} + t_{\alpha/2, n-1}\left(\frac{S}{\sqrt{n}}\right)$$

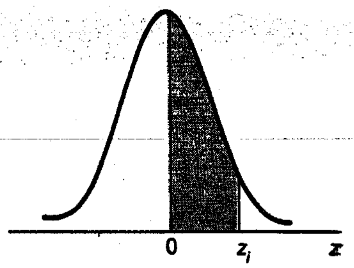
$$p_s - Z_{\alpha/2}\sqrt{\frac{p_s(1-p_s)}{n}} \le p \le p_s + Z_{\alpha/2}\sqrt{\frac{p_s(1-p_s)}{n}}$$

$$n = \frac{Z^2\sigma^2}{e^2}$$

$$n = \frac{Z^2 p(1-p)}{e^2}$$

TABLE A.6: AREAS OF THE STANDARD NORMAL DISTRIBUTION

TABLE A.7 (

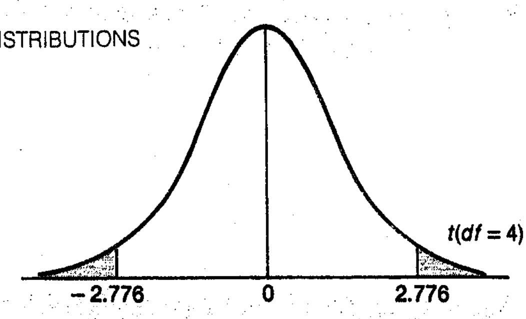


Each value in the table is the proportion of total **area** between the mean and $z = (x - \mu)/\sigma$ standard deviations away from the mean. Values of z are given to two decimal places as a row heading *plus* a column heading. For example, the value $z = 1.25$ is located as the row heading 1.2 *plus* the column heading .05. The value at the intersection of this row and column indicates that the proportion of total area between the mean and 1.25 standard deviations away from the mean (for either $z = +1.25$ or $z = -1.25$) is 0.39435. The value is circled in blue.

z or $\frac{x-\mu}{\sigma}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.00000	0.00399	0.00798	0.01197	0.01595	0.01994	0.02392	0.02790	0.03188	0.03586
0.1	0.03983	0.04380	0.04776	0.05172	0.05567	0.05962	0.06356	0.06749	0.07142	0.07535
0.2	0.07926	0.08317	0.08706	0.09095	0.09483	0.09871	0.10257	0.10642	0.11026	0.11409
0.3	0.11791	0.12172	0.12552	0.12930	0.13307	0.13683	0.14058	0.14431	0.14803	0.15173
0.4	0.15542	0.15910	0.16276	0.16640	0.17003	0.17364	0.17724	0.18082	0.18439	0.18793
0.5	0.19146	0.19497	0.19847	0.20194	0.20540	0.20884	0.21226	0.21566	0.21904	0.22240
0.6	0.22575	0.22907	0.23237	0.23565	0.23891	0.24215	0.24537	0.24857	0.25175	0.25490
0.7	0.25804	0.26115	0.26424	0.26730	0.27035	0.27337	0.27637	0.27935	0.28230	0.28524
0.8	0.28814	0.29103	0.29389	0.29673	0.29955	0.30234	0.30511	0.30785	0.31057	0.31327
0.9	0.31594	0.31859	0.32121	0.32381	0.32639	0.32894	0.33147	0.33398	0.33646	0.33891
1.0	0.34134	0.34375	0.34614	0.34850	0.35083	0.35314	0.35543	0.35769	0.35993	0.36214
1.1	0.36433	0.36650	0.36864	0.37076	0.37286	0.37493	0.37698	0.37900	0.38100	0.38298
1.2	0.38493	0.38686	0.38877	0.39065	0.39251	0.39435	0.39617	0.39796	0.39973	0.40147
1.3	0.40320	0.40490	0.40658	0.40824	0.40988	0.41149	0.41309	0.41466	0.41621	0.41774
1.4	0.41924	0.42073	0.42220	0.42364	0.42507	0.42647	0.42786	0.42922	0.43056	0.43189
1.5	0.43319	0.43448	0.43574	0.43699	0.43822	0.43943	0.44062	0.44179	0.44295	0.44408
1.6	0.44520	0.44630	0.44738	0.44845	0.44950	0.45053	0.45154	0.45254	0.45352	0.45449
1.7	0.45543	0.45637	0.45728	0.45818	0.45907	0.45994	0.46080	0.46164	0.46246	0.46327
1.8	0.46407	0.46485	0.46562	0.46638	0.46712	0.46784	0.46856	0.46926	0.46995	0.47062
1.9	0.47128	0.47193	0.47257	0.47320	0.47381	0.47441	0.47500	0.47558	0.47615	0.47670
2.0	0.47725	0.47778	0.47831	0.47882	0.47932	0.47982	0.48030	0.48077	0.48124	0.48169
2.1	0.48214	0.48257	0.48300	0.48341	0.48382	0.48422	0.48461	0.48500	0.48537	0.48574
2.2	0.48610	0.48645	0.48679	0.48713	0.48745	0.48778	0.48809	0.48840	0.48870	0.48899
2.3	0.48928	0.48956	0.48983	0.49010	0.49036	0.49061	0.49086	0.49111	0.49134	0.49158
2.4	0.49180	0.49202	0.49224	0.49245	0.49266	0.49286	0.49305	0.49324	0.49343	0.49361
2.5	0.49379	0.49396	0.49413	0.49430	0.49446	0.49461	0.49477	0.49492	0.49506	0.49520
2.6	0.49534	0.49547	0.49560	0.49573	0.49585	0.49598	0.49609	0.49621	0.49632	0.49643
2.7	0.49653	0.49664	0.49674	0.49683	0.49693	0.49702	0.49711	0.49720	0.49728	0.49736
2.8	0.49744	0.49752	0.49760	0.49767	0.49774	0.49781	0.49788	0.49795	0.49801	0.49807
2.9	0.49813	0.49819	0.49825	0.49831	0.49386	0.49841	0.49846	0.49851	0.49856	0.49861
3.0	0.49865	0.49869	0.49874	0.49878	0.49882	0.49886	0.49889	0.49893	0.49897	0.49900
3.1	0.49903	0.49906	0.49910	0.49913	0.49916	0.49918	0.49921	0.49924	0.49926	0.49929
3.2	0.49931	0.49934	0.49936	0.49938	0.49940	0.49942	0.49944	0.49946	0.49948	0.49950
3.3	0.49952	0.49953	0.49955	0.49957	0.49958	0.49960	0.49961	0.49962	0.49964	0.49965
3.4	0.49966	0.49968	0.49969	0.49970	0.49971	0.49972	0.49973	0.49974	0.49975	0.49976
3.5	0.49977									
3.6	0.49984									
3.7	0.49989									
3.8	0.49993									
3.9	0.49995									
4.0	0.49997									

Source: John R. Stockton and Charles T. Clark, *Introduction to Business and Economic Statistics*, 5th ed. (Cincinnati, Ohio: South-Western Publishing, 1975), Appendix H, p. 569. Reproduced with permission.

TABLE A.7: CRITICAL VALUES FOR STUDENT t DISTRIBUTIONS



The table provides values of the statistic $t = (\bar{x} - \mu)/\hat{\sigma}_{\bar{x}}$ for degrees of freedom df = 1(1)30, 40, 60, 120, ∞ and selected one- and two-tailed probabilities α. To illustrate, let df = 4. A one-tailed probability is

$$P(t > 2.776) = P(t < -2.776) = 0.025.$$

A two-tailed probability is $P(|t| > 2.776) = 0.05$.

	α									
	0.25	*0.20*	*0.15*	*0.10*	*0.05*	*0.025*	*0.01*	*0.005*	*0.0005*	*One-Tailed*
df	*0.50*	*0.40*	*0.30*	*0.20*	*0.10*	*0.05*	*0.02*	*0.01*	*0.001*	*Two-Tailed*
1	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657	636.619	
2	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	31.598	
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	12.941	
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	8.610	
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	6.859	
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.959	
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	5.405	
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	5.041	
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.781	
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.587	
11	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.437	
12	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	4.318	
13	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	4.221	
14	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	4.140	
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	4.073	
16	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	4.015	
17	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.965	
18	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.922	
19	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.883	
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.850	
21	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.819	
22	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.792	
23	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.767	
24	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.745	
25	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.725	
26	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.707	
27	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.690	
28	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.674	
29	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.659	
30	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.646	
40	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.551	
60	0.679	0.848	1.046	1.296	1.671	2.000	2.390	2.660	3.460	
120	0.677	0.845	1.041	1.289	1.658	1.980	2.358	2.617	3.373	
∞	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.291	

Source: Abridged from Table III of R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd., London (previously published by Oliver & Boyd, Edinburgh), and by permission of the authors and publishers.

TABLE A.9: CRITICAL VALUES OF *F* DISTRIBUTIONS

α is the right-tail probability. Example: $P(F_{5,7} > 3.97) = 0.05$

Denominator *df*	α	Numerator *df* 1	2	3	4	5	6	7	8	9
1	0.100	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86
	0.050	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
	0.025	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.7	963.3
	0.010	4052	4999.5	5403	5625	5764	5859	5928	5982	6022
2	0.100	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
	0.050	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
	0.025	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39
	0.010	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
3	0.100	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
	0.050	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
	0.025	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47
	0.010	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
4	0.100	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
	0.050	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
	0.025	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90
	0.010	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
5	0.100	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
	0.050	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
	0.025	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68
	0.010	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
6	0.100	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
	0.050	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
	0.025	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52
	0.010	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
7	0.100	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
	0.050	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
	0.025	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82
	0.010	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
8	0.100	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
	0.050	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
	0.025	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36
	0.010	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
9	0.100	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44
	0.050	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
	0.025	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	4.03
	0.010	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
10	0.100	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35
	0.050	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
	0.025	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78
	0.010	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
11	0.100	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27
	0.050	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
	0.025	6.72	5.26	4.63	4.28	4.04	3.88	3.76	3.66	3.59
	0.010	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63
12	0.100	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21
	0.050	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
	0.025	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44
	0.010	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39