Master of Arts Examination, 2023

(1st Year, 2nd Semester)

DEPARTMENT OF SOCIOLOGY

[Social Statistics]

Time : Two Hours Full Marks : 30

Answer *either* in English *or* in Bengali.

All questions carry equal marks.

Answer any ***two*** questions.

1. a) Explain which of the following is a statistic and which is a parameter by giving reasons. 5

   i) The mean age of American from 2010 decennial census

   ii) The unemployment rate for the population of U.S. adults, estimated by the government from a large sample

   iii) The percentage of Texans opposed to the health care reform bill from a poll of 1,000 residents

   iv) The mean salaries of employees at your school (e.g., administrators, faculty, maintenance)

   v) The percentage of students at your school who receive financial aid

   b) All the numbers below are of those convicted of public corruption. Find out the following:

   i) What is the range of convictions in 1990? In 2009? Which is greater? 2

   ii) What is the mean number of convictions in 1990 and 2009? 2

   iii) Calculate the standard deviation for 1990 and 2009. 4

   iv) Which year appears to have more variability in number of convictions as measured by the standard deviation? Are the results consistent with what you found using the range? 2

Number of Public Corruption Convictions by Year

1990		2009	
Govt. Level	No. of Convictions	Govt. Level	No. of Convictions
Federal	583	Federal	426
State	79	State	102
Local	225	Local	257

Source: U.S. Census Bureau, *Statistical Abstract of the United States:* 2012, Table 338.

[Turn over

2. a) Distinguish between paramaters and statistics. 4

b) What are tests of significance? 2

c) What are one-tailed and two-tailed test? 4

d) The senior class has been given a comprehensive examination to assess educational experience. The mean on the test was 74 and the standard deviation was 10. What percentage of the students had scores :

a) between 75 and 85

b) below 75?

c) below 80?

d) below 85? 5

3. a) What is point estimate and interval estimate? 2

b) State the Central Limit Theorem. 3

c) What is null hypothesis and alternative hypothesis? 4

d) It is known that, nationally, doctors working for health maintenance organizations (HMOs) average 13.5 years of experience in their specialties, with a standard deviation of 7.6 years. The executive director of an HMO in a Western state is interested in determining whether doctors have less experience than the national average. A random sample of 150 doctors from HMOs shows a mean of only 10.9 years of experience.

i) State the research and the null hypotheses to test whether doctors in this HMO have less experience than the national average. 2

ii) Using an alpha level of .01, calculate this test. 4

4. a) What are the types of error? 4

b) How can errors be avoided? 3

c) What are the properties of a bivariate relationship? 3

d) A student of Sociology wishes to examine whether or not there is a relationship between the unemployment rate of the country and suicide rate among youth over eleven-month period. Analyze the problem statistically and interpret the results sociologically. 5

Month	Unemployment Rate	Suicide Rate
1	8	52
2	9	59
3	7	55
4	11	60
5	12	62
6	9	49
7	6	50
8	7	49
9	8	51
10	5	46
11	4	44

Appendix A

Area Under the Normal Curve

Column (a) lists Z scores from 0.00 to 4.00. Only positive scores are displayed, but, since the normal curve is symmetrical, the areas for negative scores will be exactly the same as areas for positive scores. Column (b) lists the proportion of the total area between the Z score and the mean. Figure A.1 displays areas of this type. Column (c) lists the proportion of the area beyond the Z score, and Figure A.2 displays this type of area.

FIGURE A.1 Area Between Mean and Z

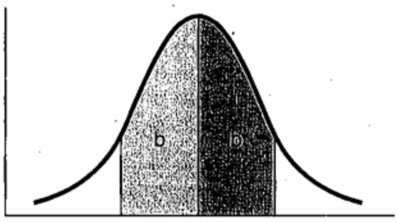
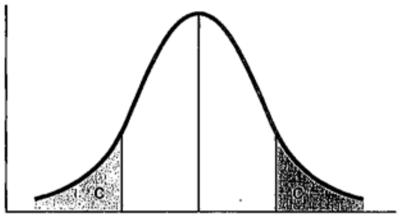


FIGURE A.2 Area Beyond Z



(a) Z	(b) Area Between Mean and Z	(c) Area Beyond Z
0.00	0.0000	0.5000
0.01	0.0040	0.4960
0.02	0.0080	0.4920
0.03	0.0120	0.4880
0.04	0.0160	0.4840
0.05	0.0199	0.4801
0.06	0.0239	0.4761
0.07	0.0279	0.4721
0.08	0.0319	0.4681
0.09	0.0359	0.4641
0.10	0.0398	0.4602
0.11	0.0438	0.4562
0.12	0.0478	0.4522
0.13	0.0517	0.4483
0.14	0.0557	0.4443
0.15	0.0596	0.4404
0.16	0.0636	0.4364
0.17	0.0675	0.4325
0.18	0.0714	0.4286
0.19	0.0753	0.4247
0.20	0.0793	0.4207
0.21	0.0832	0.4168
0.22	0.0871	0.4129
0.23	0.0910	0.4090
0.24	0.0948	0.4052
0.25	0.0987	0.4013
0.26	0.1026	0.3974
0.27	0.1064	0.3936
0.28	0.1103	0.3897
0.29	0.1141	0.3859
0.30	0.1179	0.3821
0.31	0.1217	0.3783
0.32	0.1255	0.3745
0.33	0.1293	0.3707
0.34	0.1331	0.3669
0.35	0.1368	0.3632
0.36	0.1406	0.3594
0.37	0.1443	0.3557
0.38	0.1480	0.3520
0.39	0.1517	0.3483
0.40	0.1554	0.3446

(a) Z	(b) Area Between Mean and Z	(c) Area Beyond Z
0.41	0.1591	0.3409
0.42	0.1628	0.3372
0.43	0.1664	0.3336
0.44	0.1700	0.3300
0.45	0.1736	0.3264
0.46	0.1772	0.3228
0.47	0.1808	0.3192
0.48	0.1844	0.3156
0.49	0.1879	0.3121
0.50	0.1915	0.3085
0.51	0.1950	0.3050
0.52	0.1985	0.3015
0.53	0.2019	0.2981
0.54	0.2054	0.2946
0.55	0.2088	0.2912
0.56	0.2123	0.2877
0.57	0.2157	0.2843
0.58	0.2190	0.2810
0.59	0.2224	0.2776
0.60	0.2257	0.2743
0.61	0.2291	0.2709
0.62	0.2324	0.2676
0.63	0.2357	0.2643
0.64	0.2389	0.2611
0.65	0.2422	0.2578
0.66	0.2454	0.2546
0.67	0.2486	0.2514
0.68	0.2517	0.2483
0.69	0.2549	0.2451
0.70	0.2580	0.2420
0.71	0.2611	0.2389
0.72	0.2642	0.2358
0.73	0.2673	0.2327
0.74	0.2703	0.2297
0.75	0.2734	0.2266
0.76	0.2764	0.2236
0.77	0.2794	0.2206
0.78	0.2823	0.2177
0.79	0.2852	0.2148
0.80	0.2881	0.2119
0.81	0.2910	0.2090
0.82	0.2939	0.2061
0.83	0.2967	0.2033
0.84	0.2995	0.2005
0.85	0.3023	0.1977
0.86	0.3051	0.1949
0.87	0.3078	0.1922
0.88	0.3106	0.1894
0.89	0.3133	0.1867
0.90	0.3159	0.1841
0.91	0.3186	0.1814
0.92	0.3212	0.1788
0.93	0.3238	0.1762
0.94	0.3264	0.1736
0.95	0.3289	0.1711
0.96	0.3315	0.1685
0.97	0.3340	0.1660
0.98	0.3365	0.1635
0.99	0.3389	0.1611
1.00	0.3413	0.1587
1.01	0.3438	0.1562
1.02	0.3461	0.1539
1.03	0.3485	0.1515
1.04	0.3508	0.1492
1.05	0.3531	0.1469
1.06	0.3554	0.1446
1.07	0.3577	0.1423
1.08	0.3599	0.1401
1.09	0.3621	0.1379
1.10	0.3643	0.1357
1.11	0.3665	0.1335
1.12	0.3686	0.1314
1.13	0.3708	0.1292
1.14	0.3729	0.1271
1.15	0.3749	0.1251
1.16	0.3770	0.1230
1.17	0.3790	0.1210
1.18	0.3810	0.1190
1.19	0.3830	0.1170
1.20	0.3849	0.1151
1.21	0.3869	0.1131
1.22	0.3888	0.1112
1.23	0.3907	0.1093
1.24	0.3925	0.1075
1.25	0.3944	0.1056
1.26	0.3962	0.1038
1.27	0.3980	0.1020
1.28	0.3997	0.1003
1.29	0.4015	0.0985
1.30	0.4032	0.0968
1.31	0.4049	0.0951
1.32	0.4066	0.0934
1.33	0.4082	0.0918
1.34	0.4099	0.0901
1.35	0.4115	0.0885
1.36	0.4131	0.0869
1.37	0.4147	0.0853
1.38	0.4162	0.0838
1.39	0.4177	0.0823
1.40	0.4192	0.0808
1.41	0.4207	0.0793
1.42	0.4222	0.0778
1.43	0.4236	0.0764
1.44	0.4251	0.0749
1.45	0.4265	0.0735
1.46	0.4279	0.0721
1.47	0.4292	0.0708
1.48	0.4306	0.0694
1.49	0.4319	0.0681
1.50	0.4332	0.0668

(a) Z	(b) Area Between Mean and Z	(c) Area Beyond Z	(a) Z	(b) Area Between Mean and Z	(c) Area Beyond Z
1.51	0.4345	0.0655	2.06	0.4803	0.0197
1.52	0.4357	0.0643	2.07	0.4808	0.0192
1.53	0.4370	0.0630	2.08	0.4812	0.0188
1.54	0.4382	0.0618	2.09	0.4817	0.0183
1.55	0.4394	0.0606	2.10	0.4821	0.0179
1.56	0.4406	0.0594	2.11	0.4826	0.0174
1.57	0.4418	0.0582	2.12	0.4830	0.0170
1.58	0.4429	0.0571	2.13	0.4834	0.0166
1.59	0.4441	0.0559	2.14	0.4838	0.0162
1.60	0.4452	0.0548	2.15	0.4842	0.0158
1.61	0.4463	0.0537	2.16	0.4846	0.0154
1.62	0.4474	0.0526	2.17	0.4850	0.0150
1.63	0.4484	0.0516	2.18	0.4854	0.0146
1.64	0.4495	0.0505	2.19	0.4857	0.0143
1.65	0.4505	0.0495	2.20	0.4861	0.0139
1.66	0.4515	0.0485	2.21	0.4864	0.0136
1.67	0.4525	0.0475	2.22	0.4868	0.0132
1.68	0.4535	0.0465	2.23	0.4871	0.0129
1.69	0.4545	0.0455	2.24	0.4875	0.0125
1.70	0.4554	0.0446	2.25	0.4878	0.0122
1.71	0.4564	0.0436	2.26	0.4881	0.0119
1.72	0.4573	0.0427	2.27	0.4884	0.0116
1.73	0.4582	0.0418	2.28	0.4887	0.0113
1.74	0.4591	0.0409	2.29	0.4890	0.0110
1.75	0.4599	0.0401	2.30	0.4893	0.0107
1.76	0.4608	0.0392	2.31	0.4896	0.0104
1.77	0.4616	0.0384	2.32	0.4898	0.0102
1.78	0.4625	0.0375	2.33	0.4901	0.0099
1.79	0.4633	0.0367	2.34	0.4904	0.0096
1.80	0.4641	0.0359	2.35	0.4906	0.0094
1.81	0.4649	0.0351	2.36	0.4909	0.0091
1.82	0.4656	0.0344	2.37	0.4911	0.0089
1.83	0.4664	0.0336	2.38	0.4913	0.0087
1.84	0.4671	0.0329	2.39	0.4916	0.0084
1.85	0.4678	0.0322	2.40	0.4918	0.0082
1.86	0.4686	0.0314	2.41	0.4920	0.0080
1.87	0.4693	0.0307	2.42	0.4922	0.0078
1.88	0.4699	0.0301	2.43	0.4925	0.0075
1.89	0.4706	0.0294	2.44	0.4927	0.0073
1.90	0.4713	0.0287	2.45	0.4929	0.0071
1.91	0.4719	0.0281	2.46	0.4931	0.0069
1.92	0.4726	0.0274	2.47	0.4932	0.0068
1.93	0.4732	0.0268	2.48	0.4934	0.0066
1.94	0.4738	0.0262	2.49	0.4936	0.0064
1.95	0.4744	0.0256	2.50	0.4938	0.0062
1.96	0.4750	0.0250	2.51	0.4940	0.0060
1.97	0.4756	0.0244	2.52	0.4941	0.0059
1.98	0.4761	0.0239	2.53	0.4943	0.0057
1.99	0.4767	0.0233	2.54	0.4945	0.0055
2.00	0.4772	0.0228	2.55	0.4946	0.0054
2.01	0.4778	0.0222	2.56	0.4948	0.0052
2.02	0.4783	0.0217	2.57	0.4949	0.0051
2.03	0.4788	0.0212	2.58	0.4951	0.0049
2.04	0.4793	0.0207	2.59	0.4952	0.0048
2.05	0.4798	0.0202	2.60	0.4953	0.0047

(a) Z	(b) Area Between Mean and Z	(c) Area Beyond Z	(a) Z	(b) Area Between Mean and Z	(c) Area Beyond Z
1.51	0.4345	0.0655	2.06	0.4803	0.0197
1.52	0.4357	0.0643	2.07	0.4808	0.0192
1.53	0.4370	0.0630	2.08	0.4812	0.0188
1.54	0.4382	0.0618	2.09	0.4817	0.0183
1.55	0.4394	0.0606	2.10	0.4821	0.0179
1.56	0.4406	0.0594	2.11	0.4826	0.0174
1.57	0.4418	0.0582	2.12	0.4830	0.0170
1.58	0.4429	0.0571	2.13	0.4834	0.0166
1.59	0.4441	0.0559	2.14	0.4838	0.0162
1.60	0.4452	0.0548	2.15	0.4842	0.0158
1.61	0.4463	0.0537	2.16	0.4846	0.0154
1.62	0.4474	0.0526	2.17	0.4850	0.0150
1.63	0.4484	0.0516	2.18	0.4854	0.0146
1.64	0.4495	0.0505	2.19	0.4857	0.0143
1.65	0.4505	0.0495	2.20	0.4861	0.0139
1.66	0.4515	0.0485	2.21	0.4864	0.0136
1.67	0.4525	0.0475	2.22	0.4868	0.0132
1.68	0.4535	0.0465	2.23	0.4871	0.0129
1.69	0.4545	0.0455	2.24	0.4875	0.0125
1.70	0.4554	0.0446	2.25	0.4878	0.0122
1.71	0.4564	0.0436	2.26	0.4881	0.0119
1.72	0.4573	0.0427	2.27	0.4884	0.0116
1.73	0.4582	0.0418	2.28	0.4887	0.0113
1.74	0.4591	0.0409	2.29	0.4890	0.0110
1.75	0.4599	0.0401	2.30	0.4893	0.0107
1.76	0.4608	0.0392	2.31	0.4896	0.0104
1.77	0.4616	0.0384	2.32	0.4898	0.0102
1.78	0.4625	0.0375	2.33	0.4901	0.0099
1.79	0.4633	0.0367	2.34	0.4904	0.0096
1.80	0.4641	0.0359	2.35	0.4906	0.0094
1.81	0.4649	0.0351	2.36	0.4909	0.0091
1.82	0.4656	0.0344	2.37	0.4911	0.0089
1.83	0.4664	0.0336	2.38	0.4913	0.0087
1.84	0.4671	0.0329	2.39	0.4916	0.0084
1.85	0.4678	0.0322	2.40	0.4918	0.0082
1.86	0.4686	0.0314	2.41	0.4920	0.0080
1.87	0.4693	0.0307	2.42	0.4922	0.0078
1.88	0.4699	0.0301	2.43	0.4925	0.0075
1.89	0.4706	0.0294	2.44	0.4927	0.0073
1.90	0.4713	0.0287	2.45	0.4929	0.0071
1.91	0.4719	0.0281	2.46	0.4931	0.0069
1.92	0.4726	0.0274	2.47	0.4932	0.0068
1.93	0.4732	0.0268	2.48	0.4934	0.0066
1.94	0.4738	0.0262	2.49	0.4936	0.0064
1.95	0.4744	0.0256	2.50	0.4938	0.0062
1.96	0.4750	0.0250	2.51	0.4940	0.0060
1.97	0.4756	0.0244	2.52	0.4941	0.0059
1.98	0.4761	0.0239	2.53	0.4943	0.0057
1.99	0.4767	0.0233	2.54	0.4945	0.0055
2.00	0.4772	0.0228	2.55	0.4946	0.0054
2.01	0.4778	0.0222	2.56	0.4948	0.0052
2.02	0.4783	0.0217	2.57	0.4949	0.0051
2.03	0.4788	0.0212	2.58	0.4951	0.0049
2.04	0.4793	0.0207	2.59	0.4952	0.0048
2.05	0.4798	0.0202	2.60	0.4953	0.0047

(a) Z	(b) Area Between Mean and Z	(c) Area Beyond Z
2.61	0.4955	0.0045
2.62	0.4956	0.0044
2.63	0.4957	0.0043
2.64	0.4959	0.0041
2.65	0.4960	0.0040
2.66	0.4961	0.0039
2.67	0.4962	0.0038
2.68	0.4963	0.0037
2.69	0.4964	0.0036
2.70	0.4965	0.0035
2.71	0.4966	0.0034
2.72	0.4967	0.0033
2.73	0.4968	0.0032
2.74	0.4969	0.0031
2.75	0.4970	0.0030
2.76	0.4971	0.0029
2.77	0.4972	0.0028
2.78	0.4973	0.0027
2.79	0.4974	0.0026
2.80	0.4974	0.0026
2.81	0.4975	0.0025
2.82	0.4976	0.0024
2.83	0.4977	0.0023
2.84	0.4977	0.0023
2.85	0.4978	0.0022
2.86	0.4979	0.0021
2.87	0.4979	0.0021
2.88	0.4980	0.0020
2.89	0.4981	0.0019
2.90	0.4981	0.0019
2.91	0.4982	0.0018
2.92	0.4982	0.0018
2.93	0.4983	0.0017
2.94	0.4984	0.0016
2.95	0.4984	0.0016
2.96	0.4985	0.0015
2.97	0.4985	0.0015
2.98	0.4986	0.0014
2.99	0.4986	0.0014
3.00	0.4986	0.0014
3.01	0.4987	0.0013
3.02	0.4987	0.0013
3.03	0.4988	0.0012
3.04	0.4988	0.0012
3.05	0.4989	0.0011
3.06	0.4989	0.0011
3.07	0.4989	0.0011
3.08	0.4990	0.0010
3.09	0.4990	0.0010
3.10	0.4990	0.0010
3.11	0.4991	0.0009
3.12	0.4991	0.0009
3.13	0.4991	0.0009
3.14	0.4992	0.0008
3.15	0.4992	0.0008
3.16	0.4992	0.0008
3.17	0.4992	0.0008
3.18	0.4993	0.0007
3.19	0.4993	0.0007
3.20	0.4993	0.0007
3.21	0.4993	0.0007
3.22	0.4994	0.0006
3.23	0.4994	0.0006
3.24	0.4994	0.0006
3.25	0.4994	0.0006
3.26	0.4994	0.0006
3.27	0.4995	0.0005
3.28	0.4995	0.0005
3.29	0.4995	0.0005
3.30	0.4995	0.0005
3.31	0.4995	0.0005
3.32	0.4995	0.0005
3.33	0.4996	0.0004
3.34	0.4996	0.0004
3.35	0.4996	0.0004
3.36	0.4996	0.0004
3.37	0.4996	0.0004
3.38	0.4996	0.0004
3.39	0.4997	0.0003
3.40	0.4997	0.0003
3.41	0.4997	0.0003
3.42	0.4997	0.0003
3.43	0.4997	0.0003
3.44	0.4997	0.0003
3.45	0.4997	0.0003
3.46	0.4997	0.0003
3.47	0.4997	0.0003
3.48	0.4997	0.0003
3.49	0.4998	0.0002
3.50	0.4998	0.0002
3.60	0.4998	0.0002
3.70	0.4999	0.0001
3.80	0.4999	0.0001
3.90	0.4999	<0.0001
4.00	0.4999	<0.0001

Appendix B

Distribution of *t*

Use this table to find the critical region (step 3 of the five-step model) for tests of significance with sample means when sample size (N) is small. First, choose an alpha level and a one- or two-tailed test. Then find degrees of freedom to find the t score that marks the beginning of the critical region.

Degrees of Freedom (df)	Level of Significance for One-Tailed Test					
	.10	.05	.025	.01	.005	.0005
	Level of Significance for Two-Tailed Test					
	.20	.10	.05	.02	.01	.001
1	3.078	6.314	12.706	31.821	63.657	636.619
2	1.886	2.920	4.303	6.965	9.925	31.598
3	1.638	2.353	3.182	4.541	5.841	12.941
4	1.533	2.132	2.776	3.747	4.604	8.610
5	1.476	2.015	2.571	3.365	4.032	6.859
6	1.440	1.943	2.447	3.143	3.707	5.959
7	1.415	1.895	2.365	2.998	3.499	5.405
8	1.397	1.860	2.306	2.896	3.355	5.041
9	1.383	1.833	2.262	2.821	3.250	4.781
10	1.372	1.812	2.228	2.764	3.169	4.587
11	1.363	1.796	2.201	2.718	3.106	4.437
12	1.356	1.782	2.179	2.681	3.055	4.318
13	1.350	1.771	2.160	2.650	3.012	4.221
14	1.345	1.761	2.145	2.624	2.977	4.140
15	1.341	1.753	2.131	2.602	2.947	4.073
16	1.337	1.746	2.120	2.583	2.921	4.015
17	1.333	1.740	2.110	2.567	2.898	3.965
18	1.330	1.734	2.101	2.552	2.878	3.922
19	1.328	1.729	2.093	2.539	2.861	3.883
20	1.325	1.725	2.086	2.528	2.845	3.850
21	1.323	1.721	2.080	2.518	2.831	3.819
22	1.321	1.717	2.074	2.508	2.819	3.792
23	1.319	1.714	2.069	2.500	2.807	3.767
24	1.318	1.711	2.064	2.492	2.797	3.745
25	1.316	1.708	2.060	2.485	2.787	3.725
26	1.315	1.706	2.056	2.479	2.779	3.707
27	1.314	1.703	2.052	2.473	2.771	3.690
28	1.313	1.701	2.048	2.467	2.763	3.674
29	1.311	1.699	2.045	2.462	2.756	3.659
30	1.310	1.697	2.042	2.457	2.750	3.646
40	1.303	1.684	2.021	2.423	2.704	3.551
60	1.296	1.671	2.000	2.390	2.660	3.460
120	1.289	1.658	1.980	2.358	2.617	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.291

Source: Table III of Fisher and Yates: *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd., London (1974), 6th edition (previously published by Oliver & Boyd Ltd., Edinburgh).

Appendix D

Distribution of *F*

Use this table to find the critical region (step 3 of the five-step model) for analysis of variance tests. Choose an alpha level of either 0.05 or 0.01 and then find the degrees of freedom to find the *F* ratio that marks the beginning of the critical region.

$p = .05$

n_1 / n_2	1	2	3	4	5	6	8	12	24	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	238.9	243.9	249.0	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.41	19.45	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.84	8.74	8.64	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.91	5.77	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.68	4.53	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.15	4.00	3.84	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.73	3.57	3.41	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.44	3.28	3.12	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.23	3.07	2.90	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.07	2.91	2.74	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	2.95	2.79	2.61	2.40
12	4.75	3.88	3.49	3.26	3.11	3.00	2.85	2.69	2.50	2.30
13	4.67	3.80	3.41	3.18	3.02	2.92	2.77	2.60	2.42	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.53	2.35	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.64	2.48	2.29	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.42	2.24	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.55	2.38	2.19	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.34	2.15	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.48	2.31	2.11	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.45	2.28	2.08	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.42	2.25	2.05	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.40	2.23	2.03	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.38	2.20	2.00	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.36	2.18	1.98	1.73
25	4.24	3.38	2.99	2.76	2.60	2.49	2.34	2.16	1.96	1.71
26	4.22	3.37	2.98	2.74	2.59	2.47	2.32	2.15	1.95	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.30	2.13	1.93	1.67
28	4.20	3.34	2.95	2.71	2.56	2.44	2.29	2.12	1.91	1.65
29	4.18	3.33	2.93	2.70	2.54	2.43	2.28	2.10	1.90	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.27	2.09	1.89	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.18	2.00	1.79	1.51
60	4.00	3.15	2.76	2.52	2.37	2.25	2.10	1.92	1.70	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.02	1.83	1.61	1.25
∞	3.84	2.99	2.60	2.37	2.21	2.09	1.94	1.75	1.52	1.00

Values of n_1 and n_2 represent the degrees of freedom associated with the between and within estimates of variance, respectively.

Source: Table V of Fisher and Yates: *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd., London (1974), 6th edition (previously published by Oliver and Boyd Ltd., Edinburgh). Reprinted by permission of Addison Wesley Longman Ltd.

$p = .01$

n_1 / n_2	1	2	3	4	5	6	8	12	24	∞
1	4052	4999	5403	5625	5764	5859	5981	6106	6234	666
2	98.49	99.01	99.17	99.25	99.30	99.33	99.36	99.42	99.46	99.50
3	34.12	30.81	29.46	28.71	28.24	27.91	27.49	27.05	26.60	26.12
4	21.20	18.00	16.69	15.98	15.52	15.21	14.80	14.37	13.93	13.46
5	16.26	13.27	12.06	11.39	10.97	10.67	10.27	9.89	9.47	9.02
6	13.74	10.92	9.78	9.15	8.75	8.47	8.10	7.72	7.31	6.88
7	12.25	9.55	8.45	7.85	7.46	7.19	6.84	6.47	6.07	5.65
8	11.26	8.65	7.59	7.01	6.63	6.37	6.03	5.67	5.28	4.86
9	10.56	8.02	6.99	6.42	6.06	5.80	5.47	5.11	4.73	4.31
10	10.04	7.56	6.55	5.99	5.64	5.39	5.06	4.71	4.33	3.91
11	9.65	7.20	6.22	5.67	5.32	5.07	4.74	4.40	4.02	3.60
12	9.33	6.93	5.95	5.41	5.06	4.82	4.50	4.16	3.78	3.36
13	9.07	6.70	5.74	5.20	4.86	4.62	4.30	3.96	3.59	3.16
14	8.86	6.51	5.56	5.03	4.69	4.46	4.14	3.80	3.43	3.00
15	8.68	6.36	5.42	4.89	4.56	4.32	4.00	3.67	3.29	2.87
16	8.53	6.23	5.29	4.77	4.44	4.20	3.89	3.55	3.18	2.75
17	8.40	6.11	5.18	4.67	4.34	4.10	3.79	3.45	3.08	2.65
18	8.28	6.01	5.09	4.58	4.25	4.01	3.71	3.37	3.00	2.57
19	8.18	5.93	5.01	4.50	4.17	3.94	3.63	3.30	2.92	2.49
20	8.10	5.85	4.94	4.43	4.10	3.87	3.56	3.23	2.86	2.42
21	8.02	5.78	4.87	4.37	4.04	3.81	3.51	3.17	2.80	2.36
22	7.94	5.72	4.82	4.31	3.99	3.76	3.45	3.12	2.75	2.31
23	7.88	5.66	4.76	4.26	3.94	3.71	3.41	3.07	2.70	2.26
24	7.82	5.61	4.72	4.22	3.90	3.67	3.36	3.03	2.66	2.21
25	7.77	5.57	4.68	4.18	3.86	3.63	3.32	2.99	2.62	2.17
26	7.72	5.53	4.64	4.14	3.82	3.59	3.29	2.96	2.58	2.13
27	7.68	5.49	4.60	4.11	3.78	3.56	3.26	2.93	2.55	2.10
28	7.64	5.45	4.57	4.07	3.75	3.53	3.23	2.90	2.52	2.06
29	7.60	5.42	4.54	4.04	3.73	3.50	3.20	2.87	2.49	2.03
30	7.56	5.39	4.51	4.02	3.70	3.47	3.17	2.84	2.47	2.01
40	7.31	5.18	4.31	3.83	3.51	3.29	2.99	2.66	2.29	1.80
60	7.08	4.98	4.13	3.65	3.34	3.12	2.82	2.50	2.12	1.60
120	6.85	4.79	3.95	3.48	3.17	2.96	2.66	2.34	1.95	1.38
∞	6.64	4.60	3.78	3.32	3.02	2.80	2.51	2.18	1.79	1.00

Values of n_1 and n_2 represent the degrees of freedom associated with the between and withinestimates of variance, respectively.