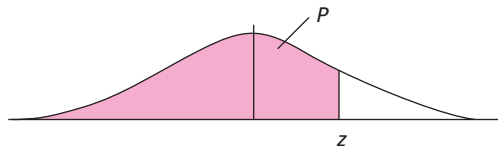


# appendix of statistical tables

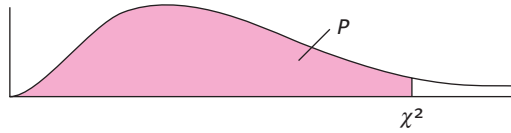
**TABLE 1** Cumulative Standard Unit Normal Distribution



Values of  $P$  corresponding to  $Z$  for the normal curve.  $Z$  is the standard normal variable. The value of  $P$  for  $-Z$  equals one minus the value of  $P$  for  $+Z$ , (e.g., the  $P$  for  $-1.62$  equals  $1 - .9474 = .0526$ ).

$Z$	.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

**TABLE 2** Selected Percentiles of the  $\chi^2$  Distribution



Values of  $\chi^2$  corresponding to  $P$

$\nu$	$\chi^2_{.005}$	$\chi^2_{.01}$	$\chi^2_{.025}$	$\chi^2_{.05}$	$\chi^2_{.10}$	$\chi^2_{.90}$	$\chi^2_{.95}$	$\chi^2_{.975}$	$\chi^2_{.99}$	$\chi^2_{.995}$
1	.000039	.00016	.00098	.0039	.0158	2.71	3.84	5.02	6.63	7.88
2	.0100	.0201	.0506	.1026	.2107	4.61	5.99	7.38	9.21	10.60
3	.0717	.115	.216	.352	.584	6.25	7.81	9.35	11.34	12.84
4	.207	.297	.484	.711	1.064	7.78	9.49	11.14	13.28	14.86
5	.412	.554	.831	1.15	1.61	9.24	11.07	12.83	15.09	16.75
6	.676	.872	1.24	1.64	2.20	10.64	12.59	14.45	16.81	18.55
7	.989	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48	20.28
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.53	20.09	21.96
9	1.73	2.09	2.70	3.33	4.17	14.68	16.92	19.02	21.67	23.59
10	2.16	2.56	3.25	3.94	4.87	15.99	18.31	20.48	23.21	25.19
11	2.60	3.05	3.82	4.57	5.58	17.28	19.68	21.92	24.73	26.76
12	3.07	3.57	4.40	5.23	6.30	18.55	21.03	23.34	26.22	28.30
13	3.57	4.11	5.01	5.89	7.04	19.81	22.36	24.74	27.69	29.82
14	4.07	4.66	5.63	6.57	7.79	21.06	23.68	26.12	29.14	31.32
15	4.60	5.23	6.26	7.26	8.55	22.31	25.00	27.49	30.58	32.80
16	5.14	5.81	6.91	7.96	9.31	23.54	26.30	28.85	32.00	34.27
18	6.26	7.01	8.23	9.39	10.86	25.99	28.87	31.53	34.81	37.16
20	7.43	8.26	9.59	10.85	12.44	28.41	31.41	34.17	37.57	40.00
24	9.89	10.86	12.40	13.85	15.66	33.20	36.42	39.36	42.98	45.56
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89	53.67
40	20.71	22.16	24.43	26.51	29.05	51.81	55.76	59.34	63.69	66.77
60	35.53	37.48	40.48	43.19	46.46	74.40	79.08	83.30	88.38	91.95
120	83.85	86.92	91.58	95.70	100.62	140.23	146.57	152.21	158.95	163.64

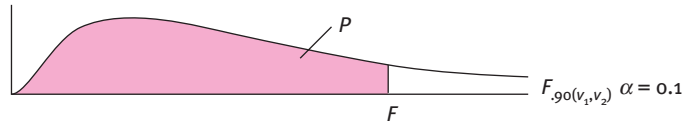
Source: Adapted with permission from *Introduction to Statistical Analysis* (2nd ed.) by W. J. Dixon and F. J. Massey, Jr., © 1957 McGraw-Hill.

**TABLE 3** Upper Percentiles of the  $F$  Distribution

$v$	$1-\alpha$	.75	.90	.95	.975	.99	.995	.9995
1		1.000	3.078	6.314	12.706	31.821	63.657	636.619
2		.816	1.886	2.920	4.303	6.965	9.925	31.598
3		.765	1.638	2.353	3.182	4.541	5.841	12.941
4		.741	1.533	2.132	2.776	3.747	4.604	8.610
5		.727	1.476	2.015	2.571	3.365	4.032	6.859
6		.718	1.440	1.943	2.447	3.143	3.707	5.959
7		.711	1.415	1.895	2.365	2.998	3.499	5.405
8		.706	1.397	1.860	2.306	2.896	3.355	5.041
9		.703	1.383	1.833	2.262	2.821	3.250	4.781
10		.700	1.372	1.812	2.228	2.764	3.169	4.587
11		.697	1.363	1.796	2.201	2.718	3.106	4.437
12		.695	1.356	1.782	2.179	2.681	3.055	4.318
13		.694	1.350	1.771	2.160	2.650	3.012	4.221
14		.692	1.345	1.761	2.145	2.624	2.977	4.140
15		.691	1.341	1.753	2.131	2.602	2.947	4.073
16		.690	1.337	1.746	2.120	2.583	2.921	4.015
17		.689	1.333	1.740	2.110	2.567	2.898	3.965
18		.688	1.330	1.734	2.101	2.552	2.878	3.922
19		.688	1.328	1.729	2.093	2.539	2.861	3.883
20		.687	1.325	1.725	2.086	2.528	2.845	3.850
21		.686	1.323	1.721	2.080	2.518	2.831	3.819
22		.686	1.321	1.717	2.074	2.508	2.819	3.792
23		.685	1.319	1.714	2.069	2.500	2.807	3.767
24		.685	1.318	1.711	2.064	2.492	2.797	3.745
25		.684	1.316	1.708	2.060	2.485	2.787	3.725
26		.684	1.315	1.706	2.056	2.479	2.779	3.707
27		.684	1.314	1.703	2.052	2.473	2.771	3.690
28		.683	1.313	1.701	2.048	2.467	2.763	3.674
29		.683	1.311	1.699	2.045	2.462	2.756	3.659
30		.683	1.310	1.697	2.042	2.457	2.750	3.646
40		.681	1.303	1.684	2.021	2.423	2.704	3.551
60		.679	1.296	1.671	2.000	2.390	2.660	3.460
120		.677	1.289	1.658	1.980	2.358	2.617	3.373
$\infty$		.674	1.282	1.645	1.960	2.326	2.576	3.291

Source: Taken from Table III of R. A. Fisher and F. Yates: *Statistical Tables for Biological, Agricultural, and Medical Research*, published by Longman Group UK Ltd., London (previously published by Oliver & Boyd Ltd., Edinburgh, 1963), and used by permission of the authors and publishers.

**TABLE 4** Selected Percentiles of the *F* Distribution



$v_1$  = degrees of freedom for numerator

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10
1	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86	60.19
2	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38	9.39
3	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24	5.23
4	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94	3.92
5	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32	3.30
6	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96	2.94
7	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72	2.70
8	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56	2.50
9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44	2.42
10	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35	2.32
11	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27	2.25
12	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21	2.19
13	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16	2.14
14	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12	2.10
15	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09	2.06
16	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06	2.03
17	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03	2.00
18	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00	1.98
19	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98	1.96
20	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96	1.94
21	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95	1.92
22	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93	1.90
23	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92	1.89
24	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91	1.88
25	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89	1.87
26	2.91	2.52	2.31	2.17	2.08	2.01	1.96	1.92	1.88	1.86
27	2.90	2.51	2.30	2.17	2.07	2.00	1.95	1.91	1.87	1.85
28	2.89	2.50	2.29	2.16	2.06	2.00	1.94	1.90	1.87	1.84
29	2.89	2.50	2.28	2.15	2.06	1.99	1.93	1.89	1.86	1.83
30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79	1.76
60	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71
120	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68	1.65
$\infty$	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63	1.60

Source: Adapted with permission from *Biometrika Tables for Statisticians*, Vol. 1 (2nd ed.), edited by E. S. Pearson and H. O. Hartley, Cambridge University Press, 1958.

Appendix of Statistical Tables

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12	15	20	24	30	40	60	120	$\infty$
60.71	61.22	61.74	62.00	62.26	62.53	62.79	63.06	63.33
9.41	9.42	9.44	9.45	9.46	9.47	9.47	9.48	9.49
5.22	5.20	5.18	5.18	5.17	5.16	5.15	5.14	5.13
3.90	3.87	3.84	3.83	3.82	3.80	3.79	3.78	3.76
3.27	3.24	3.21	3.19	3.17	3.16	3.14	3.12	3.10
2.90	2.87	2.84	2.82	2.80	2.78	2.76	2.74	2.72
2.67	2.63	2.59	2.58	2.56	2.54	2.51	2.49	2.47
2.50	2.46	2.42	2.40	2.38	2.36	2.34	2.32	2.29
2.38	2.34	2.30	2.28	2.25	2.23	2.21	2.18	2.16
2.28	2.24	2.20	2.18	2.16	2.13	2.11	2.08	2.06
2.21	2.17	2.12	2.10	2.08	2.05	2.03	2.00	1.97
2.15	2.10	2.06	2.04	2.01	1.99	1.96	1.93	1.90
2.10	2.05	2.01	1.98	1.96	1.93	1.90	1.88	1.85
2.05	2.01	1.96	1.94	1.91	1.89	1.86	1.83	1.80
2.02	1.97	1.92	1.90	1.87	1.85	1.82	1.79	1.76
1.99	1.94	1.89	1.87	1.84	1.81	1.78	1.75	1.72
1.96	1.91	1.86	1.84	1.81	1.78	1.75	1.72	1.69
1.93	1.89	1.84	1.81	1.78	1.75	1.72	1.69	1.66
1.91	1.86	1.81	1.79	1.76	1.73	1.70	1.67	1.63
1.89	1.84	1.79	1.77	1.74	1.71	1.68	1.64	1.61
1.87	1.83	1.78	1.75	1.72	1.69	1.66	1.62	1.59
1.86	1.81	1.76	1.73	1.70	1.67	1.64	1.60	1.57
1.84	1.80	1.74	1.72	1.69	1.66	1.62	1.59	1.55
1.83	1.78	1.73	1.70	1.67	1.64	1.61	1.57	1.53
1.82	1.77	1.72	1.69	1.66	1.63	1.59	1.56	1.52
1.81	1.76	1.71	1.68	1.65	1.61	1.58	1.54	1.50
1.80	1.75	1.70	1.67	1.64	1.60	1.57	1.53	1.49
1.79	1.74	1.69	1.66	1.63	1.59	1.56	1.52	1.48
1.78	1.73	1.68	1.65	1.62	1.58	1.55	1.51	1.47
1.77	1.72	1.67	1.64	1.61	1.57	1.54	1.50	1.46
1.71	1.66	1.61	1.57	1.54	1.51	1.47	1.42	1.38
1.66	1.60	1.54	1.51	1.48	1.44	1.40	1.35	1.29
1.60	1.55	1.48	1.45	1.41	1.37	1.32	1.26	1.19
1.55	1.49	1.42	1.38	1.34	1.30	1.24	1.17	1.00

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**TABLE 4** Selected Percentiles of the *F* Distribution, *continued*

$F_{.95}(v_1, v_2)$      $\alpha = 0.05$

$v_1 = \text{degrees of freedom for numerator}$

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91
$\infty$	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83

$v_2 = \text{degrees of freedom for denominator}$

Appendix of Statistical Tables

	12	15	20	24	30	40	60	120	$\infty$
243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3	
19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50	
8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53	
5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63	
4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36	
4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67	
3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23	
3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93	
3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71	
2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54	
2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40	
2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30	
2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21	
2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13	
2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07	
2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01	
2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96	
2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92	
2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88	
2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84	
2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81	
2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78	
2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76	
2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73	
2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71	
2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69	
2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67	
2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65	
2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64	
2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62	
2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51	
1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39	
1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25	
1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00	


**TABLE 4 Selected Percentiles of the  $F$  Distribution, *continued***

$F_{.975}(v_1, v_2) \quad \alpha = 0.025$

$v_1 = \text{degrees of freedom for numerator}$

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10
1	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.7	963.3	968.6
2	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39	39.40
3	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47	14.42
4	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90	8.84
5	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68	6.62
6	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52	5.46
7	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82	4.76
8	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36	4.30
9	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	4.03	3.96
10	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78	3.72
11	6.72	5.26	4.63	4.28	4.04	3.88	3.76	3.66	3.59	3.53
12	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44	3.37
13	6.41	4.97	4.35	4.00	3.77	3.60	3.48	3.39	3.31	3.25
14	6.30	4.86	4.24	3.89	3.66	3.50	3.38	3.29	3.21	3.15
15	6.20	4.77	4.15	3.80	3.58	3.41	3.29	3.20	3.12	3.06
16	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	3.05	2.99
17	6.04	4.62	4.01	3.66	3.44	3.28	3.16	3.06	2.98	2.92
18	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93	2.87
19	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88	2.82
20	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84	2.77
21	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80	2.73
22	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76	2.70
23	5.75	4.35	3.75	3.41	3.18	3.02	2.90	2.81	2.73	2.67
24	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70	2.64
25	5.69	4.29	3.69	3.35	3.13	2.97	2.85	2.75	2.68	2.61
26	5.66	4.27	3.67	3.33	3.10	2.94	2.82	2.73	2.65	2.59
27	5.63	4.24	3.65	3.31	3.08	2.92	2.80	2.71	2.63	2.57
28	5.61	4.22	3.63	3.29	3.06	2.90	2.78	2.69	2.61	2.55
29	5.59	4.20	3.61	3.27	3.04	2.88	2.76	2.67	2.59	2.53
30	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57	2.51
40	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45	2.39
60	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33	2.27
120	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22	2.16
$\infty$	5.02	3.69	3.12	2.79	2.57	2.41	2.29	2.19	2.11	2.05

$v_2 = \text{degrees of freedom for denominator}$

Appendix of Statistical Tables

12	15	20	24	30	40	60	120	$\infty$
976.7	984.9	993.1	997.2	1001	1006	1010	1014	1018
39.41	39.43	39.45	39.46	39.46	39.47	39.48	39.49	39.50
14.34	14.25	14.17	14.12	14.08	14.04	13.99	13.95	13.90
8.75	8.66	8.56	8.51	8.46	8.41	8.36	8.31	8.26
6.52	6.43	6.33	6.28	6.23	6.18	6.12	6.07	6.02
5.37	5.27	5.17	5.12	5.07	5.01	4.96	4.90	4.85
4.67	4.57	4.47	4.42	4.36	4.31	4.25	4.20	4.14
4.20	4.10	4.00	3.95	3.89	3.84	3.78	3.73	3.67
3.87	3.77	3.67	3.61	3.56	3.51	3.45	3.39	3.33
3.62	3.52	3.42	3.37	3.31	3.26	3.20	3.14	3.08
3.43	3.33	3.23	3.17	3.12	3.06	3.00	2.94	2.88
3.28	3.18	3.07	3.02	2.96	2.91	2.85	2.79	2.72
3.15	3.05	2.95	2.89	2.84	2.78	2.72	2.66	2.60
3.05	2.95	2.84	2.79	2.73	2.67	2.61	2.55	2.49
2.96	2.86	2.76	2.70	2.64	2.59	2.52	2.46	2.40
2.89	2.79	2.68	2.63	2.57	2.51	2.45	2.38	2.32
2.82	2.72	2.62	2.56	2.50	2.44	2.38	2.32	2.25
2.77	2.67	2.56	2.50	2.44	2.38	2.32	2.26	2.19
2.72	2.62	2.51	2.45	2.39	2.33	2.27	2.20	2.13
2.68	2.57	2.46	2.41	2.25	2.29	2.22	2.16	2.09
2.64	2.53	2.42	2.37	2.31	2.25	2.18	2.11	2.04
2.60	2.50	2.39	2.33	2.27	2.21	2.14	2.08	2.00
2.57	2.47	2.36	2.30	2.24	2.18	2.11	2.04	1.97
2.54	2.44	2.33	2.27	2.21	2.15	2.08	2.01	1.94
2.51	2.41	2.30	2.24	2.18	2.12	2.05	1.98	1.91
2.49	2.39	2.28	2.22	2.16	2.09	2.03	1.95	1.88
2.47	2.36	2.25	2.19	2.13	2.07	2.00	1.93	1.85
2.45	2.34	2.23	2.17	2.11	2.05	1.98	1.91	1.83
2.43	2.32	2.21	2.15	2.09	2.03	1.96	1.89	1.81
2.41	2.31	2.20	2.14	2.07	2.01	1.94	1.87	1.79
2.29	2.18	2.07	2.01	1.94	1.88	1.80	1.72	1.64
2.17	2.06	1.94	1.88	1.82	1.74	1.67	1.58	1.48
2.05	1.94	1.82	1.76	1.69	1.61	1.53	1.43	1.31
1.94	1.83	1.71	1.64	1.57	1.48	1.39	1.27	1.00

**TABLE 4 Selected Percentiles of the  $F$  Distribution, *concluded***

$$F_{.99}(v_1, v_2) \quad \alpha = 0.01$$

 $v_1 = \text{degrees of freedom for numerator}$ 

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10
1	4052	4999.5	5403	5625	5764	5859	5928	5982	6022	6056
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35	27.23
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18	3.09
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15	3.06
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12	3.03
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09	3.00
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47
$\infty$	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32

 $v_2 = \text{degrees of freedom for denominator}$

Appendix of Statistical Tables

	12	15	20	24	30	40	60	120	$\infty$
6106	6157	6209	6235	6261	6287	6313	6339	6366	
99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50	
27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.13	
14.37	14.20	14.02	13.93	13.84	13.75	13.65	13.56	13.46	
9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02	
7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88	
6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65	
5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86	
5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31	
4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91	
4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60	
4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36	
3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.25	3.17	
3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.09	3.00	
3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.96	2.87	
3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.84	2.75	
3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.75	2.65	
3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.66	2.57	
3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.58	2.49	
3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.52	2.42	
3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.46	2.36	
3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.40	2.31	
3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.35	2.26	
3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21	
2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17	
2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13	
2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10	
2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06	
2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03	
2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01	
2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80	
2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60	
2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38	
2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00	