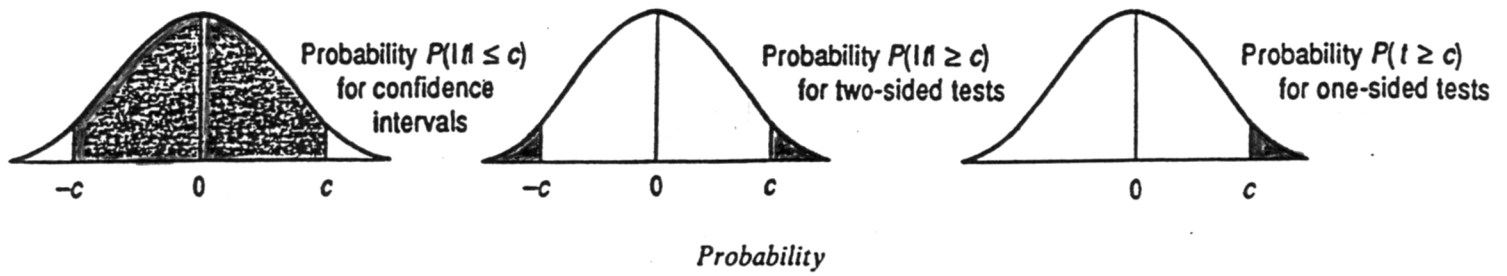


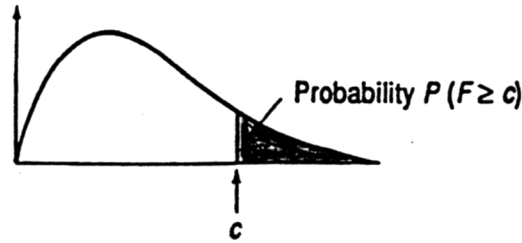
Table A4.1 Critical values for student's *t*-distribution



df	Probability									Confidence Intervals
	.50	.80	.90	.95	.98	.99	.995	.998	.999	Two-Sided Tests
	.50	.20	.10	.05	.02	.01	.005	.002	.001	One-Sided Tests
1	1.000	3.078	6.314	12.706	31.821	63.637	127.32	318.31	636.62	
2	.816	1.886	2.920	4.303	6.965	9.925	14.089	22.326	31.598	
3	.765	1.638	2.353	3.182	4.541	5.841	7.453	10.213	12.924	
4	.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610	
5	.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869	
6	.718	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959	
7	.711	1.415	1.895	2.365	2.998	3.499	4.020	4.785	5.408	
8	.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041	
9	.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781	
10	.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.537	
11	.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437	
12	.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318	
13	.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221	
14	.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140	
15	.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073	
16	.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015	
17	.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965	
18	.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922	
19	.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883	
20	.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850	
21	.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819	
22	.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792	
23	.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767	
24	.685	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745	
25	.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725	
26	.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707	
27	.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690	
28	.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674	
29	.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659	
30	.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646	
40	.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551	
60	.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460	
120	.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373	
∞	.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291	

Source: Abridged from Table 12 of *Biometrika Tables for Statisticians*, Vol. 1, edited by E. S. Pearson and H. O. Hartley (London: Cambridge University Press, 1962).

Table A4.2 Critical values for the F-distribution



		Numerator Degrees of Freedom, df_1											
		1	2	3	4	5	6	8	10	20	40	∞	
Denominator Degrees of Freedom, df_2	P												
	1	.25	5.83	7.50	8.21	8.58	8.82	8.98	9.19	9.32	9.58	9.71	9.85
		.10	39.86	49.50	53.59	55.83	57.24	58.20	59.44	60.19	61.74	62.53	63.33
		.05	161.4	199.5	215.7	224.6	230.2	234.0	238.9	241.9	248.0	251.1	254.3
	2	.25	2.57	3.00	3.15	3.23	3.28	3.31	3.35	3.38	3.43	3.45	3.48
		.10	8.53	9.00	9.16	9.24	9.29	9.33	9.37	9.39	9.44	9.47	9.49
		.05	18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.40	19.45	19.47	19.50
		.01	98.50	99.00	99.17	99.25	99.30	99.33	99.37	99.40	99.45	99.47	99.50
		.001	998.5	999.0	999.2	999.2	999.3	999.3	999.4	999.4	999.4	999.5	999.5
	3	.25	2.02	2.28	2.36	2.39	2.41	2.42	2.44	2.44	2.46	2.47	2.47
		.10	5.54	5.46	5.39	5.34	5.31	5.28	5.25	5.23	5.18	5.16	5.13
		.05	10.13	9.55	9.28	9.12	9.01	8.94	8.85	8.79	8.66	8.59	8.53
		.01	34.12	30.82	29.46	28.71	28.24	27.91	27.49	27.23	26.69	26.41	26.13
.001		167.0	148.5	141.1	137.1	134.6	132.8	130.6	129.2	126.4	125.0	123.5	
4	.25	1.81	2.00	2.05	2.06	2.07	2.08	2.08	2.08	2.08	2.08	2.08	
	.10	4.54	4.32	4.19	4.11	4.05	4.01	3.95	3.92	3.84	3.80	3.76	
	.05	7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.96	5.80	5.72	5.63	
	.01	21.20	18.00	16.69	15.98	15.52	15.21	14.80	14.55	14.02	13.75	13.46	
	.001	74.14	61.25	56.18	53.44	51.71	50.53	49.00	48.05	46.10	45.09	44.05	
5	.25	1.69	1.85	1.88	1.89	1.89	1.89	1.89	1.89	1.88	1.88	1.87	
	.10	4.06	3.78	3.62	3.52	3.45	3.40	3.34	3.30	3.21	3.16	3.10	
	.05	6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.74	4.56	4.46	4.36	
	.01	16.26	13.27	12.06	11.39	10.97	10.67	10.29	10.05	9.55	9.29	9.02	
	.001	47.18	37.12	33.20	31.09	29.75	28.84	27.64	26.92	25.39	24.60	23.79	
6	.25	1.62	1.76	1.78	1.79	1.79	1.78	1.78	1.77	1.76	1.75	1.74	
	.10	3.78	3.46	3.29	3.18	3.11	3.05	2.98	2.94	2.84	2.78	2.72	
	.05	5.99	5.14	4.76	4.53	4.39	4.28	4.15	4.06	3.87	3.77	3.67	
	.01	13.75	10.92	9.78	9.15	8.75	8.47	8.10	7.87	7.40	7.14	6.88	
	.001	35.51	27.00	23.70	21.92	20.81	20.03	19.03	18.41	17.12	16.44	15.75	
7	.25	1.57	1.70	1.72	1.72	1.71	1.71	1.70	1.69	1.67	1.66	1.65	
	.10	3.59	3.26	3.07	2.96	2.88	2.83	2.75	2.70	2.59	2.54	2.47	
	.05	5.59	4.74	4.35	4.12	3.97	3.87	3.73	3.64	3.44	3.34	3.23	
	.01	12.25	9.55	8.45	7.85	7.46	7.19	6.84	6.62	6.16	5.91	5.65	
	.001	29.25	21.69	18.77	17.19	16.21	15.52	14.63	14.08	12.93	12.33	11.70	

(continued)

Table A4.2 continued

		Numerator Degrees of Freedom, df_1											
		P	1	2	3	4	5	6	8	10	20	40	∞
Denominator Degrees of Freedom, df_2	8	.25	1.54	1.66	1.67	1.66	1.66	1.65	1.64	1.63	1.61	1.59	1.58
		.10	3.46	3.11	2.92	2.81	2.73	2.67	2.59	2.54	2.42	2.36	2.29
		.05	5.32	4.46	4.07	3.84	3.69	3.58	3.44	3.35	3.15	3.04	2.93
		.01	11.26	8.65	7.59	7.01	6.63	6.37	6.03	5.81	5.36	5.12	4.86
		.001	25.42	18.49	15.83	14.39	13.49	12.86	12.04	11.54	10.48	9.92	9.33
	9	.25	1.51	1.62	1.63	1.63	1.62	1.61	1.60	1.59	1.56	1.54	1.53
		.10	3.36	3.01	2.81	2.69	2.61	2.55	2.47	2.42	2.30	2.23	2.16
		.05	5.12	4.26	3.86	3.63	3.48	3.37	3.23	3.14	2.94	2.83	2.71
		.01	10.56	8.02	6.99	6.42	6.06	5.80	5.47	5.26	4.81	4.57	4.31
		.001	22.86	16.39	13.90	12.56	11.71	11.13	10.37	9.89	8.90	8.37	7.81
	10	.25	1.49	1.60	1.60	1.59	1.59	1.58	1.56	1.55	1.52	1.51	1.48
		.10	3.28	2.92	2.73	2.61	2.52	2.46	2.38	2.32	2.20	2.13	2.06
		.05	4.96	4.10	3.71	3.48	3.33	3.22	3.07	2.98	2.77	2.66	2.54
		.01	10.04	7.56	6.55	5.99	5.64	5.39	5.06	4.85	4.41	4.17	3.91
		.001	21.04	14.91	12.55	11.28	10.48	9.92	9.20	8.75	7.80	7.30	6.76
	12	.25	1.46	1.56	1.56	1.55	1.54	1.53	1.51	1.50	1.47	1.45	1.42
		.10	3.18	2.81	2.61	2.48	2.39	2.33	2.24	2.19	2.06	1.99	1.90
		.05	4.75	3.89	3.49	3.26	3.11	3.00	2.85	2.75	2.54	2.43	2.30
		.01	9.33	6.93	5.95	5.41	5.06	4.82	4.50	4.30	3.86	3.62	3.36
		.001	18.64	12.97	10.80	9.63	8.89	8.38	7.71	7.29	6.40	5.93	5.42
14	.25	1.44	1.53	1.53	1.52	1.51	1.50	1.48	1.46	1.43	1.41	1.38	
	.10	3.10	2.73	2.52	2.39	2.31	2.24	2.15	2.10	1.96	1.89	1.80	
	.05	4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.60	2.39	2.27	2.13	
	.01	8.86	5.51	5.56	5.04	4.69	4.46	4.14	3.94	3.51	3.27	3.00	
	.001	17.14	11.78	9.73	8.62	7.92	7.43	6.80	6.40	5.56	5.10	4.60	
16	.25	1.42	1.51	1.51	1.50	1.48	1.48	1.46	1.45	1.40	1.37	1.34	
	.10	3.05	2.67	2.46	2.33	2.24	2.18	2.09	2.03	1.89	1.81	1.72	
	.05	4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.49	2.28	2.15	2.01	
	.01	8.53	6.23	5.29	4.77	4.44	4.20	3.89	3.69	3.26	3.02	2.75	
	.001	16.12	10.97	9.00	7.94	7.27	6.81	6.19	5.81	4.99	4.54	4.06	
18	.25	1.41	1.50	1.49	1.48	1.46	1.45	1.43	1.42	1.38	1.35	1.32	
	.10	3.01	2.62	2.42	2.29	2.20	2.13	2.04	1.98	1.84	1.75	1.66	
	.05	4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.41	2.19	2.06	1.92	
	.01	8.29	6.01	5.09	4.58	4.25	4.01	3.71	3.51	3.08	2.84	2.57	
	.001	15.38	10.39	8.49	7.46	6.81	6.35	5.76	5.39	4.59	4.15	3.67	

Table A4.2 continued

		Numerator Degrees of Freedom, df_1											
		P	1	2	3	4	5	6	8	10	20	40	∞
Denominator Degrees of Freedom, df_2	20	.25	1.40	1.49	1.48	1.46	1.45	1.44	1.42	1.40	1.36	1.33	1.29
		.10	2.97	2.59	2.38	2.25	2.16	2.09	2.00	1.94	1.79	1.71	1.61
		.05	4.35	3.49	3.10	2.87	2.71	2.60	2.45	2.35	2.12	1.99	1.84
		.01	8.10	5.85	4.94	4.43	4.10	3.87	3.56	3.37	2.94	2.69	2.42
		.001	14.82	9.95	8.10	7.10	6.46	6.02	5.44	5.08	4.29	3.86	3.38
	30	.25	1.38	1.45	1.44	1.42	1.41	1.39	1.37	1.35	1.30	1.27	1.23
		.10	2.88	2.49	2.28	2.14	2.05	1.98	1.88	1.82	1.67	1.57	1.46
		.05	4.17	3.32	2.92	2.69	2.53	2.42	2.27	2.16	1.93	1.79	1.62
		.01	7.56	5.39	4.51	4.02	3.70	3.47	3.17	2.98	2.55	2.30	2.01
		.001	13.29	8.77	7.05	6.12	5.53	5.12	4.58	4.24	3.49	3.07	2.59
	40	.25	1.36	1.44	1.42	1.40	1.39	1.37	1.35	1.33	1.28	1.24	1.19
		.10	2.84	2.44	2.23	2.09	2.00	1.93	1.83	1.76	1.61	1.51	1.38
		.05	4.08	3.23	2.84	2.61	2.45	2.34	2.18	2.08	1.84	1.69	1.51
		.01	7.31	5.18	4.31	3.83	3.51	3.29	2.99	2.80	2.37	2.11	1.80
		.001	12.61	8.25	6.60	5.70	5.13	4.73	4.21	3.87	3.15	2.73	2.23
	60	.25	1.35	1.42	1.41	1.38	1.37	1.35	1.32	1.30	1.25	1.21	1.15
		.10	2.79	2.39	2.18	2.04	1.95	1.87	1.77	1.71	1.54	1.44	1.29
		.05	4.00	3.15	2.76	2.53	2.37	2.25	2.10	1.99	1.75	1.59	1.39
		.01	7.08	4.98	4.13	3.65	3.34	3.12	2.82	2.63	2.20	1.94	1.60
		.001	11.97	7.76	6.17	5.31	4.76	4.37	3.87	3.54	2.83	2.41	1.89
120	.25	1.34	1.40	1.39	1.37	1.35	1.33	1.30	1.28	1.22	1.18	1.10	
	.10	2.75	2.35	2.13	1.99	1.90	1.82	1.72	1.65	1.48	1.37	1.19	
	.05	3.92	3.07	2.68	2.45	2.29	2.17	2.02	1.91	1.66	1.50	1.25	
	.01	6.85	4.79	3.95	3.48	3.17	2.96	2.66	2.47	2.03	1.76	1.38	
	.001	11.38	7.32	5.79	4.95	4.42	4.04	3.55	3.24	2.53	2.11	1.54	
∞	.25	1.32	1.39	1.37	1.35	1.33	1.31	1.28	1.25	1.19	1.14	1.00	
	.10	2.71	2.30	2.08	1.94	1.85	1.77	1.67	1.60	1.42	1.30	1.00	
	.05	3.84	3.00	2.60	2.37	2.21	2.10	1.94	1.83	1.57	1.39	1.00	
	.01	6.64	4.61	3.78	3.32	3.02	2.80	2.51	2.32	1.88	1.59	1.00	
	.001	10.83	6.91	5.42	4.62	4.10	3.74	3.27	2.96	2.27	1.84	1.00	

Source: Abridged from Table 18 of *Biometrika Tables for Statisticians*, Vol. 1, edited by E. S. Pearson and H. O. Hartley (London: Cambridge University Press, 1962).