

Приложение ТА

Таблицы

Таблица 1. Функция стандартного нормального распределения

$$\Phi(z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^z e^{-\frac{t^2}{2}} dt$$

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767

Таблица

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Таблица 1. Функция стандартного нормального распределения
 $\Phi(z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^z e^{-\frac{t^2}{2}} dt$ (окончание)

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9980	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990

Пример. Пусть z — распределенная по стандартному нормальному закону $N(0, 1)$. $P\{z < 0.31\} = \Phi(0.31) = 0.6217$ (см. четвертую строку, второй столбец в первой части таблицы).

Таблица 2. Двусторонние квантили распределения Стьюдента $t_{\alpha}(n)$

α n	0.20	0.40	0.50	0.60	0.80	0.90	0.95	0.98	0.99
1	0.325	0.727	1.000	1.376	3.078	6.314	12.706	31.821	63.657
2	0.289	0.617	0.816	1.061	1.886	2.920	4.303	6.965	9.925
3	0.277	0.584	0.765	0.978	1.638	2.353	3.182	4.541	5.841
4	0.271	0.569	0.741	0.941	1.533	2.132	2.776	3.747	4.604
5	0.267	0.559	0.727	0.920	1.476	2.015	2.571	3.365	4.032
6	0.265	0.553	0.718	0.906	1.440	1.943	2.447	3.143	3.707
7	0.263	0.549	0.711	0.896	1.415	1.895	2.365	2.998	3.499
8	0.262	0.546	0.706	0.889	1.397	1.860	2.306	2.896	3.355
9	0.261	0.543	0.703	0.883	1.383	1.833	2.262	2.821	3.250
10	0.260	0.542	0.700	0.879	1.372	1.812	2.228	2.764	3.169

n — число степеней свободы, α — доверительный уровень.

Таблица 4. 95%-квантили распределения Фишера $F(k_1, k_2)$

$k_1 \backslash k_2$	1	2	3	4	5	6	7	8	9	10
1	161	200	216	225	230	234	237	239	241	242
2	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4
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
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	2.18	2.09	2.02	1.96	1.91
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83

k_1 — число степеней свободы числителя, k_2 — число степеней свободы знаменателя.

Таблица 4. 95%-квантили распределения Фишера $F(k_1, k_2)$ (окончание)

$k_1 \backslash k_2$	12	15	20	24	30	40	60	120	∞
1	244	246	248	249	250	251	252	253	254
2	19.4	19.4	19.4	19.4	19.5	19.5	19.5	19.5	19.5
3	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37
6	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
30	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	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

k_1 — число степеней свободы числителя, k_2 — число степеней свободы знаменателя.

Пример. Пусть F — случайная величина, распределенная по закону Фишера $F(3, 5)$. $F_{0.95}(3, 5) = 5.41$, т.е. $P(F < 5.41) = 0.95$ (см. пятая строка, третий столбец).

Таблица 2. Двусторонние квантили распределения Стьюдента $t_{\alpha}(n)$ (окончание)

$\alpha \backslash n$	0.20	0.40	0.50	0.60	0.80	0.90	0.95	0.98	0.99
11	0.260	0.540	0.697	0.876	1.363	1.796	2.201	2.718	3.106
12	0.259	0.539	0.695	0.873	1.356	1.782	2.179	2.681	3.055
13	0.259	0.538	0.694	0.870	1.350	1.771	2.160	2.650	3.012
14	0.258	0.537	0.692	0.868	1.345	1.761	2.145	2.624	2.977
15	0.258	0.536	0.691	0.866	1.341	1.753	2.131	2.602	2.947
16	0.258	0.535	0.690	0.865	1.337	1.746	2.120	2.583	2.921
17	0.257	0.534	0.689	0.863	1.333	1.740	2.110	2.567	2.898
18	0.257	0.534	0.688	0.862	1.330	1.734	2.101	2.552	2.878
19	0.257	0.533	0.688	0.861	1.328	1.729	2.093	2.539	2.861
20	0.257	0.533	0.687	0.860	1.325	1.725	2.086	2.528	2.845
21	0.257	0.532	0.686	0.859	1.323	1.721	2.080	2.518	2.831
22	0.256	0.532	0.686	0.858	1.321	1.717	2.074	2.508	2.819
23	0.256	0.532	0.685	0.858	1.319	1.714	2.069	2.500	2.807
24	0.256	0.531	0.685	0.857	1.318	1.711	2.064	2.492	2.797
25	0.256	0.531	0.684	0.856	1.316	1.708	2.060	2.485	2.787
26	0.256	0.531	0.684	0.856	1.315	1.706	2.056	2.479	2.779
27	0.256	0.531	0.684	0.855	1.314	1.703	2.052	2.473	2.771
28	0.256	0.530	0.683	0.855	1.313	1.701	2.048	2.467	2.763
29	0.256	0.530	0.683	0.854	1.311	1.699	2.045	2.462	2.756
30	0.256	0.530	0.683	0.854	1.310	1.697	2.042	2.457	2.750
40	0.255	0.529	0.681	0.851	1.303	1.684	2.021	2.423	2.704
60	0.254	0.527	0.679	0.848	1.296	1.671	2.000	2.390	2.660
100	0.254	0.526	0.677	0.845	1.290	1.660	1.984	2.364	2.626
200	0.254	0.525	0.676	0.843	1.286	1.652	1.972	2.345	2.601
∞	0.253	0.524	0.675	0.842	1.282	1.645	1.960	2.326	2.576

n — число степеней свободы, α — доверительный уровень.

Пример. Пусть t — случайная величина, распределенная по закону Стьюдента с 5 степенями свободы. $t_{0.95}(5) = 2.571$, т.е. $P(-2.571 < t < 2.571) = 0.95$ (см. пятую строку, третий справа столбец в первой части таблицы).

Таблица 3. Квантили распределения $\chi^2(n)$

$\alpha \backslash n$	0.005	0.010	0.025	0.050	0.100	0.900	0.950	0.975	0.990	0.995
1	0.000039	0.00016	0.00098	0.0039	0.0158	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.1026	0.2107	4.61	5.99	7.38	9.21	10.60
3	0.0717	0.115	0.216	0.352	0.584	6.25	7.81	9.35	11.34	12.84
4	0.207	0.297	0.484	0.711	1.064	7.78	9.49	11.14	13.28	14.86
5	0.412	0.554	0.831	1.15	1.61	9.24	11.07	12.83	15.09	16.75
6	0.676	0.872	1.24	1.64	2.20	10.64	12.59	14.45	16.81	18.55
7	0.989	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	24.71	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
80	51.17	53.54	57.15	60.39	64.28	96.58	101.88	106.63	112.33	116.32
100	67.33	70.06	74.22	77.93	82.36	118.50	124.34	129.56	135.81	140.17
120	83.85	86.92	91.58	95.70	100.62	140.23	146.57	152.21	158.95	163.64

n — число степеней свободы, α — доверительный уровень.

Пример. Пусть χ^2 — случайная величина, распределенная по закону χ^2 с 5 степенями свободы. $\chi^2_{0.95}(5) = 11.07$, т.е. $P(\chi^2 < 11.07) = 0.95$ (см. пятая строка, седьмой столбец).