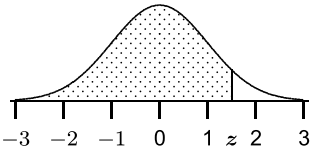
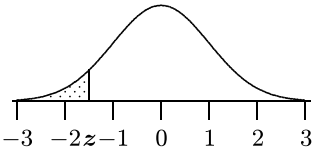
Appendix A. Standard Normal Tables



The table lists the values under the standard normal curve from $-\infty$ to z.

z	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
0.0z	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1z	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2z	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3z	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4z	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5z	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6z	0.7258	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7518	0.7549
0.7z	0.7580	0.7612	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8z	0.7882	0.7910	0.7939	0.7967	0.7996	0.8023	0.8051	0.8079	0.8106	0.8133
0.9z	0.8160	0.8186	0.8212	0.8238	0.8264	0.8290	0.8315	0.8340	0.8365	0.8389
1.0z	0.8414	0.8438	0.8462	0.8485	0.8508	0.8532	0.8554	0.8577	0.8599	0.8622
1.1z	0.8643	0.8665	0.8687	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2z	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3z	0.9032	0.9049	0.9066	0.9083	0.9099	0.9115	0.9131	0.9147	0.9162	0.9178
1.4z	0.9193	0.9207	0.9222	0.9237	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5z	0.9332	0.9345	0.9358	0.9370	0.9382	0.9394	0.9406	0.9418	0.9430	0.9441
1.6z	0.9452	0.9463	0.9474	0.9485	0.9495	0.9505	0.9516	0.9526	0.9535	0.9545
1.7z	0.9554	0.9564	0.9573	0.9582	0.9591	0.9600	0.9608	0.9617	0.9625	0.9633
1.8z	0.9641	0.9649	0.9656	0.9664	0.9671	0.9679	0.9686	0.9693	0.9700	0.9706
1.9z	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9762	0.9767
2.0z	0.9773	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9813	0.9817
2.1z	0.9822	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9858
2.2z	0.9861	0.9865	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3z	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9914	0.9916
2.4z	0.9918	0.9920	0.9923	0.9925	0.9927	0.9929	0.9931	0.9933	0.9934	0.9936
2.5z	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6z	0.9954	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7z	0.9965	0.9967	0.9968	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8z	0.9975	0.9975	0.9976	0.9977	0.9978	0.9978	0.9979	0.9980	0.9980	0.9981
2.9z	0.9981	0.9982	0.9983	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0z	0.9987	0.9987	0.9988	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990



The table lists the values under the standard normal curve from $-\infty$ to z.

z	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
-0.0z	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
-0.1z	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.2z	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.3z	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.4z	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.5z	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.6z	0.2742	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2482	0.2451
-0.7z	0.2420	0.2388	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.8z	0.2118	0.2090	0.2061	0.2033	0.2004	0.1977	0.1949	0.1921	0.1894	0.1867
-0.9z	0.1840	0.1814	0.1788	0.1762	0.1736	0.1710	0.1685	0.1660	0.1635	0.1611
-1.0z	0.1586	0.1562	0.1538	0.1515	0.1492	0.1468	0.1446	0.1423	0.1401	0.1378
-1.1z	0.1357	0.1335	0.1313	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.2z	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.3z	0.0968	0.0951	0.0934	0.0917	0.0901	0.0885	0.0869	0.0853	0.0838	0.0822
-1.4z	0.0807	0.0793	0.0778	0.0763	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.5z	0.0668	0.0655	0.0642	0.0630	0.0618	0.0606	0.0594	0.0582	0.0570	0.0559
-1.6z	0.0548	0.0537	0.0526	0.0515	0.0505	0.0495	0.0484	0.0474	0.0465	0.0455
-1.7z	0.0446	0.0436	0.0427	0.0418	0.0409	0.0400	0.0392	0.0383	0.0375	0.0367
-1.8z	0.0359	0.0351	0.0344	0.0336	0.0329	0.0321	0.0314	0.0307	0.0300	0.0294
-1.9z	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0238	0.0233
-2.0z	0.0227	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0187	0.0183
-2.1z	0.0178	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0142
-2.2z	0.0139	0.0135	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.3z	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0086	0.0084
-2.4z	0.0082	0.0080	0.0077	0.0075	0.0073	0.0071	0.0069	0.0067	0.0066	0.0064
-2.5z	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.6z	0.0046	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.7z	0.0035	0.0033	0.0032	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.8z	0.0025	0.0025	0.0024	0.0023	0.0022	0.0022	0.0021	0.0020	0.0020	0.0019
-2.9z	0.0019	0.0018	0.0017	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-3.0z	0.0013	0.0013	0.0012	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010

Appendix B. Normal Cutoffs

Significance Levels	> Right Tailed Tests	< Left Tailed Tests	≠ Two Tailed Tests	Confidence Levels
25%	0.674	-0.674	± 1.150	75%
20%	0.841	-0.841	± 1.281	80%
15%	1.036	-1.036	± 1.440	85%
10%	1.281	-1.281	± 1.644	90%
9%	1.340	-1.340	± 1.695	91%
8%	1.405	-1.405	± 1.750	92%
7%	1.476	-1.476	± 1.811	93%
6%	1.555	-1.555	± 1.881	94%
5%	1.644	-1.644	± 1.960	95%
4%	1.750	-1.750	± 2.053	96%
3%	1.881	-1.881	± 2.170	97%
2.5%	1.960	-1.960	± 2.241	97.5%
2%	2.053	-2.053	± 2.326	98%
1%	2.326	-2.326	± 2.575	99%
0.5%	2.575	-2.575	± 2.807	99.5%
			Confidence Limits	

Appendix C. Sample Final Examination

1.

(a) Find the mean and standard deviation for the following sample data.

71	67	64
71	66	62
70	66	60

(b) Assuming that the above data are from a population which is normally distributed, approximate the 25^{th} percentile for the population.

(c) Assuming that the above data are from a population which is normally distributed, approximately what percentage of the population scores below 67?

2. In New York City there are a large number of street vendors selling food products. Since the products are stored and prepared on the vendor's carts, the City Department of Health suspects that more stringent licensing and inspection standards should be imposed on street vendors than are imposed on regular restaurants.

The City inspected samples from 220 street vendors last July 4 and found that 179 had unsafe bacterial levels.

(a) Find a 95% confidence interval for the percentage of all street vendors having food with high bacterial levels.

(b) Does this study provide evidence that more stringent health and inspection standards should be imposed on street vendors than on regular restaurants? Give at least three reasons why or why not.

3. In the past, the amount of sick leave taken by workers at the Springfield Nuclear Power Plant has averaged 2.2 days per month.[1] Management has tried to reduce this figure by including sick leave as an item on a worker's monthly performance review. Management randomly selected 481 employees working in the plant and, for a trial period of April - August, recorded the sick leave days taken on these employees' monthly efficiency reports. For this sample, there were an average of 2.1 days of sick leave taken per month with a standard deviation of 1.2 days.

(a) Does this data support, at a significance level of $\alpha = 5\%$, management's contention that sick leave taken has been reduced?

(b) If you were advising management on how to reduce sick leave, would you recommend continuation of this policy? Give at least three reasons why or why not.

[1] For obvious reasons, data relating to Homer Simpson were excluded from this study.

4. The standard drug therapy for a chronic nervous disorder costs $200 per month for treatment. The disorder itself, while severely debilitating, is not life threatening. However, ten percent of all patients will experience life-threatening complications after long term use of the therapy.

A new therapy is proposed which will only cost $50 per month. However in clinical trials involving 500 patients, 63 experienced life-threatening complications after long term use.

(a) Do the above data show, at a significance level of $\boldsymbol{\alpha} = 5\%$, that the complication rate under the new therapy is higher than under the standard therapy?

(b) You are a physician working in a free clinic and your budget is fixed and very small. On the basis of the above, would you change to the new therapy for your patients suffering from this disorder? Give at least three reasons why or why not.

5. As a rule, infants do not walk by themselves until they are over fourteen months old. A recent study investigated whether a set of special "pre-walking" exercises might shorten this time. A total of 24 infants (all one-week old Caucasians) were included in the study. They were randomly divided into four groups as follows:

- **Group A**: Received the "pre-walking" exercises for 12 minutes per day for seven weeks.
- **Group B**: Received 12 minutes per day of monitored exercises for seven weeks but were not given the special "pre-walking" exercises.
- **Group C**: Were monitored weekly for seven weeks for health and for physical and mental growth, but received no special instruction.
- **Group D**: Were seen only at the first and seventh week of the study.

At the end of the seventh week the formal training ended and the parents were told they could continue with whatever training (or lack of training) they desired. Listed below are the ages (in months) when the infants in each group first walked alone:

	Group A	Group B	Group C	Group D
sample mean	10.12	11.38	11.71	12.35
sample size	6	6	6	6

The overall sample mean was 11.35 months and the overall standard deviation was 1.29. All parents were volunteers in the study; group assignments were made after the 23 volunteers were identified.

(a) At the $\boldsymbol{\alpha} = 5\%$ level, is this data significant?

(b) Why do you suppose that the researches included both groups C and D?

(c) Discuss at least three factors which could have contributed to the results not mentioned above. Discuss how you might have attempted to control for these factors.

6. A sample of 512 white males, aged 50-60, were tested for serum cholesterol (mg/100mL) and systolic blood pressure (mm Hg). The resulting data showed that the average blood pressure was 119.5 with standard deviation of 7.12 and the average cholesterol level was 195 with a standard deviation of 16.36. In addition it was shown that these two variables have a correlation coefficient of 0.94.

(a) You are working in a homeless shelter and have access to a blood pressure meter but not to a lab for measuring serum cholesterol. You are confronted with a white male, aged 50-60, who has systolic blood pressure of 140. Predict his serum cholesterol.

(b) Suppose you obtain medication and treat the above individual for his high blood pressure. At the end of six months you observe his blood pressure is 100. Would it be correct to conclude that the serum cholesterol has also fallen? Discuss why or why not.

7. In a study of physical attractiveness and mental disorder, a random sample of 231 mental patients rated one another for attractiveness; the resulting sample mean was 3.94 and the sample standard deviation was 0.75.

(a) Construct a 95% confidence interval for the "attractiveness" rating of all mental patients.

(b) When members of the general population rate one another for attractiveness using this scale the average attractiveness rating is 4.03. Can we conclude that mentally ill patients are less attractive (as measured by this attractiveness scale) than members of the general population? Support your answer.