How can Z-scores be found when given a specific area? Can you provide some examples?

Authored by

stats writer

April 29, 2024

Z-scores, also known as standard scores, are a statistical measure that indicates the number of standard deviations a data point is above or below the mean of a normal distribution. They are useful for comparing data points from different distributions and determining the relative position of a data point within a distribution.

To find the Z-score when given a specific area, one can use a Z-score table or a statistical calculator. These tools provide the Z-score corresponding to a given area under the normal curve. For example, if we want to find the Z-score for an area of 0.95, we can look up the corresponding Z-score of 1.96 in the Z-score table.

Another way to find Z-scores is by using the Z-score formula, which is $Z = (x - \mu) / \sigma$, where x is the data point, μ is the mean, and σ is the standard deviation. This formula calculates the Z-score for a specific data point in a normal distribution.

For example, if we have a normal distribution with a mean of 50 and a standard deviation of 10, and we want to find the Z-score for a data point of 60, we can use the formula $Z = (60-50) / 10 = 1$. This means that the data point of 60 is one standard deviation above the mean and has a Z-score of 1.

In summary, Z-scores can be found when given a specific area by using a Z-score table, a statistical calculator, or the Z-score formula. They are a useful tool for understanding the relative position of a data point within a normal distribution.

Find Z-Scores Given Area (With Examples)

There are three ways to find the z-score that corresponds to a given area under a normal distribution curve

1. Use the .

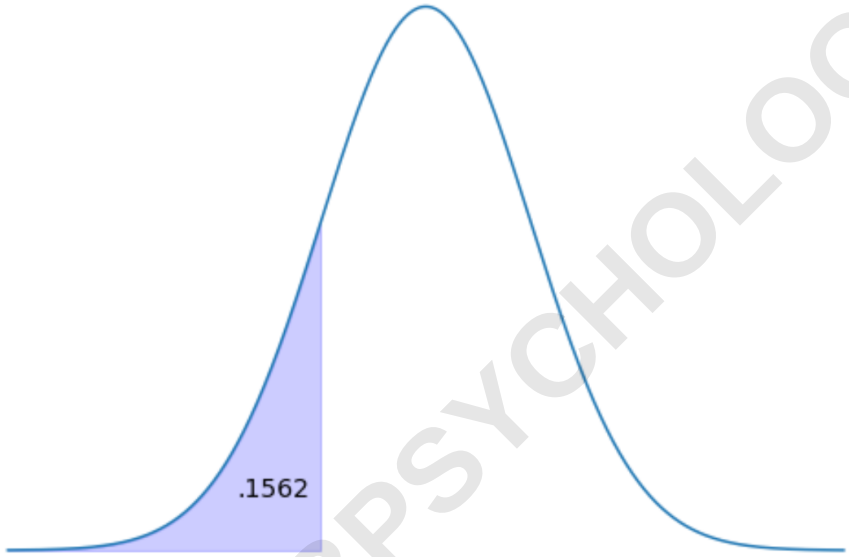
2. Use the .

3. Use the .

The following examples show how to use each of these methods to find the z-score that corresponds to a given area under a normal distribution curve.

Example 1: Find Z-Score Given Area to the Left

Find the z-score that has 15.62% of the distribution's area to the left.



Method 1: Use the z-table.

The z-score that corresponds to a value of .1562 in the is -1.01.

z	0	0.01	0.02	0.03	0.04	0.05	0.06
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685

2. Use the Percentile to Z-Score Calculator.

According to the , the z-score that corresponds to a percentile of .1562 is -1.01.

Percentile (between 0 and 1)

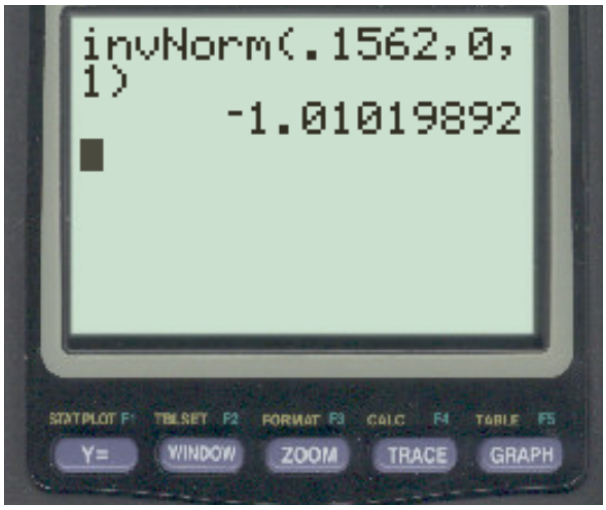
0.1562

CALCULATE

Z-Score: -1.0102

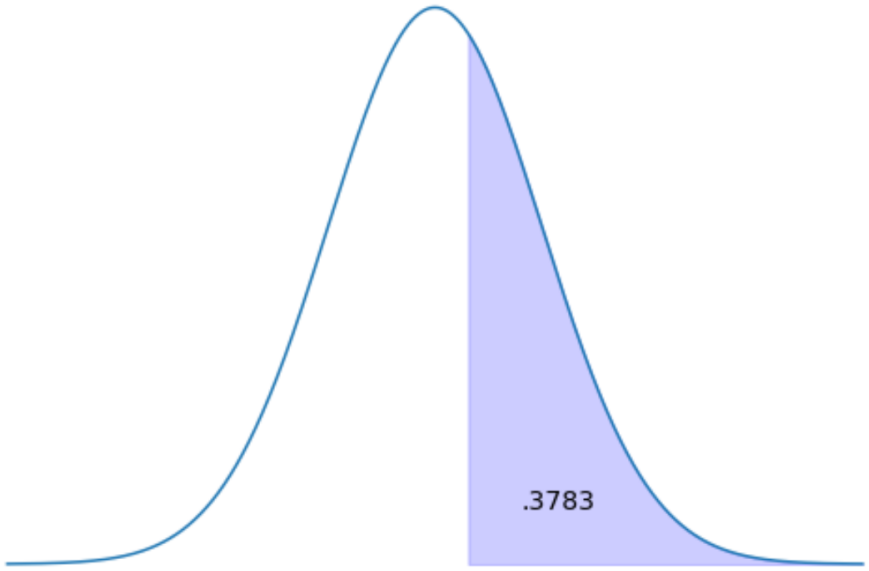
3. Use the invNorm() function on a TI-84 calculator.

Using the on a TI-84 calculator, the z-score that corresponds to an area of .1562 to the left is -1.01.



Example 2: Find Z-Score Given Area to the Right

Find the z-score that has 37.83% of the distribution's area to the right.



Method 1: Use the z-table.

The z table shows the area to the *left* of various z-scores. Thus, if we know the area to the right is .3783 then the area to the left is 1 - .3783 = .6217

The z-score that corresponds to a value of .6217 in the is .31

z	0	0.01	0.02	0.03	0.04	0.05	0.06
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686

2. Use the Percentile to Z-Score Calculator.

According to the , the z-score that corresponds to a percentile of .6217 is .3099.

Percentile (between 0 and 1)

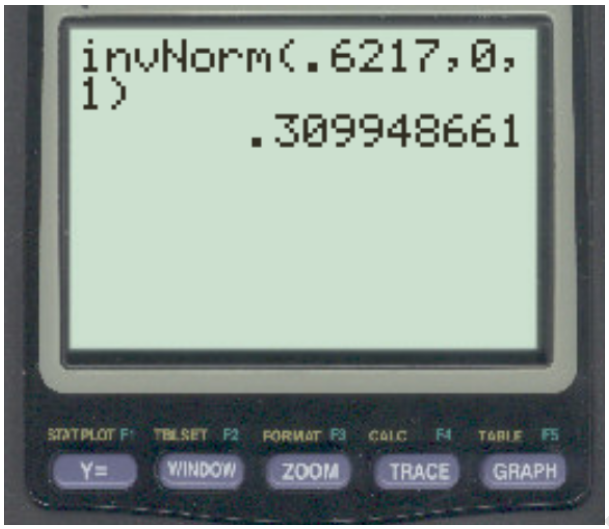
0.6217

CALCULATE

Z-Score: 0.3099

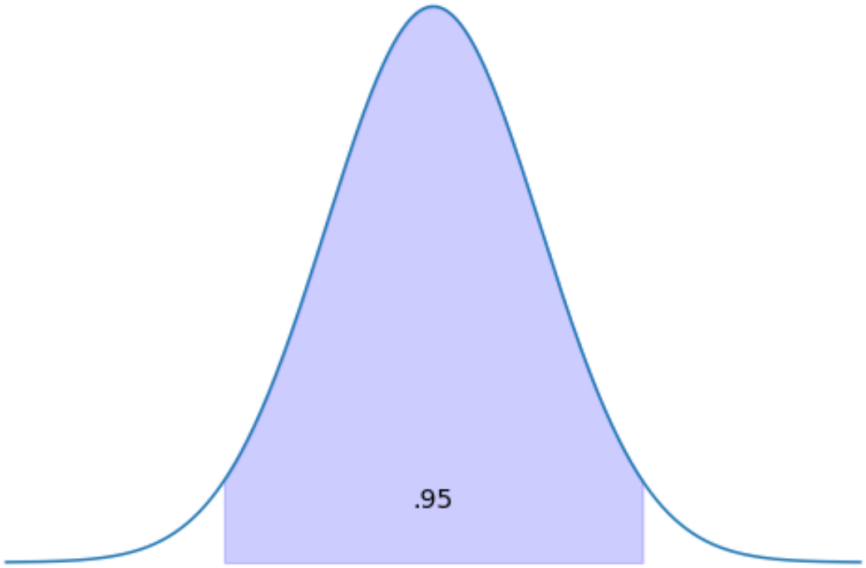
3. Use the invNorm() function on a TI-84 calculator.

Using the on a TI-84 calculator, the z-score that corresponds to an area of .6217 to the left is .3099.



Example 3: Find Z-Scores Given Area Between Two Values

Find the z-scores that have 95% of the distribution's area between them.



Method 1: Use the z-table.

If 95% of the distribution is located between two z-scores, it means that 5% of the distribution lies outside of the z-scores.

Thus, 2.5% of the distribution is less than one of the z-scores and 2.5% of the distribution is greater than the other z-score.

Thus, we can look up .025 in the z-table. The z-score that corresponds to .025 in the is -1.96.

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003

Thus, the z-scores that contain 95% of the distribution between them are -1.96 and 1.96.

2. Use the Percentile to Z-Score Calculator.

According to the , the z-score that corresponds to a percentile of .025 is -1.96.

Percentile (between 0 and 1)

0.025

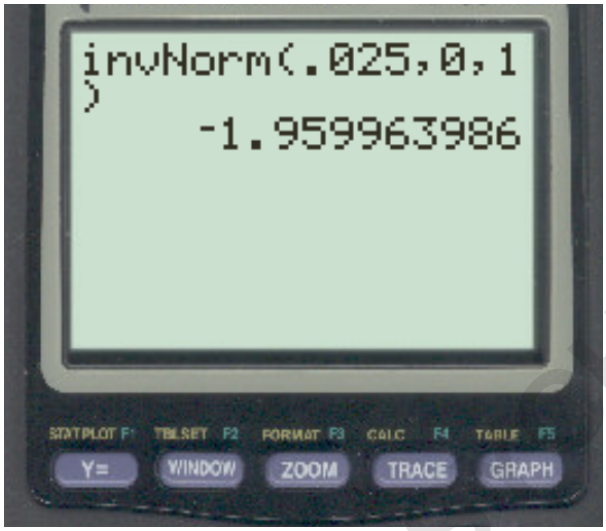
CALCULATE

Z-Score: -1.9600

Thus, the z-scores that contain 95% of the distribution between them are -1.96 and 1.96.

3. Use the invNorm() function on a TI-84 calculator.

Using the on a TI-84 calculator, the z-score that corresponds to an area of .025 to the left is -1.96.



Thus, the z-scores that contain 95% of the distribution between them are -1.96 and 1.96.