12.5 Problem Solving with the Normal Distribution

# Objective 1: Solve applied problems involving normal distributions

The table below can be used to find the percentile of any data item in a normal distribution. Convert the data item to a *z-score* and find the corresponding percentile in the table*.*

**TABLE OF *Z-SCORES* AND PERCENTILES**

| **z-score Percentile** | **z-score Percentile** | **z-score Percentile** | **z-score Percentile** |
| --- | --- | --- | --- |
| -4.0 0.003 | -1.0 15.87 | 0.0 50.00 | 1.1 86.43 |
| -3.5 0.02 | -0.95 17.11 | 0.05 51.99 | 1.2 88.49 |
| -3.0 0.13 | -0.90 18.41 | 0.10 53.98 | 1.3 90.32 |
| -2.9 0.19 | -0.85 19.77 | 0.15 55.96 | 1.4 91.92 |
| -2.8 0.26 | -0.80 21.19  | 0.20 57.93 | 1.5 93.32 |
| -2.7 0.35 | -0.75 22.66 | 0.25 59.87 | 1.6 94.52 |
| -2.6 0.47 | -0.70 24.20 | 0.30 61.79 | 1.7 95.54 |
| -2.5 0.62 | -0.65 25.78 | 0.35 63.68 | 1.8 96.41 |
| -2.4 0.82 | -0.60 27.43 | 0.40 65.54 | 1.9 97.13 |
| -2.3 1.07 | -0.55 29.12 | 0.45 67.36 | 2.0 97.72 |
| -2.2 1.39 | -0.50 30.85 | 0.50 69.15 | 2.1 98.21 |
| -2.1 1.79 | -0.45 32.64 | 0.55 70.88 | 2.2 98.61 |
| -2.0 2.28 | -0.40 34.46 | 0.60 72.57 | 2.3 98.93 |
| -1.9 2.87 | -0.35 36.32 | 0.65 74.22 | 2.4 99.18 |
| -1.8 3.59 | -0.30 38.21 | 0.70 75.80 | 2.5 99.38 |
| -1.7 4.46 | -0.25 40.13 | 0.75 77.34 | 2.6 99.53 |
| -1.6 5.48 | -0.20 42.07 | 0.80 78.81 | 2.7 99.65 |
| -1.5 6.68 | -0.15 44.04 | 0.85 80.23 | 2.8 99.74 |
| -1.4 8.08 | -0.10 46.02 | 0.90 81.59 | 2.9 99.81 |
| -1.3 9.68 | -0.05 48.01 | 0.95 82.89 | 3.0 99.87 |
| -1.2 11.51 | 0.0 50.00 | 1.0 84.13 | 3.5 99.98 |
| -1.1 13.57 | No data | No data | 4.0 99.997 |

The table below summarizes methods of finding the percentage of data items in a region of a normal distribution.

**DETERMINING THE PERCENTAGE OF DATA ITEMS IN A REGION**

| **Information desired** | **Illustration** | **Procedure to calculate** |
| --- | --- | --- |
| Percentage of data items less than a given data item which has   | The graph is a normal distribution that has point b right of the mean and is shaded leftward from point b. | Equal to the table percentile for  |
| Percentage of data items greater than a given data item which has  | The graph is a normal distribution that has point a left of the mean and is shaded rightward from point a | Equal to 100 minus the table percentile for  |
| Percentage of data items between two given data items which have  and *.* | The graph is a normal distribution that has point a left of the mean, point b right of the mean, and is shaded between points a and b | Equal to the table percentile for minus the table percentile for  |