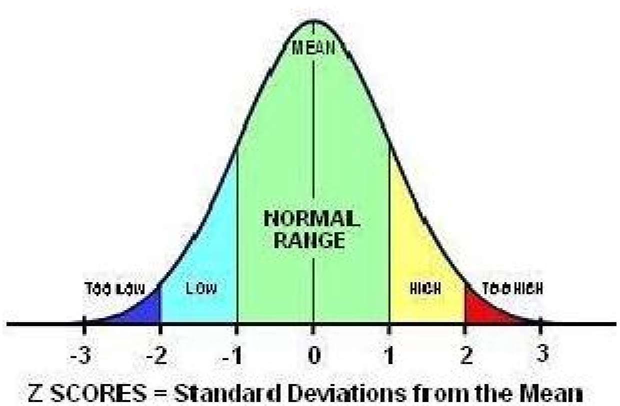
5.4
Z - Scores

A standardized value that indicates the number of standard deviations of a data value above or below the mean. It is calculated using the following formula:

$$z = \frac{x - \mu}{\sigma}$$

$\mu =$ Mean
$\sigma =$ Standard Deviation



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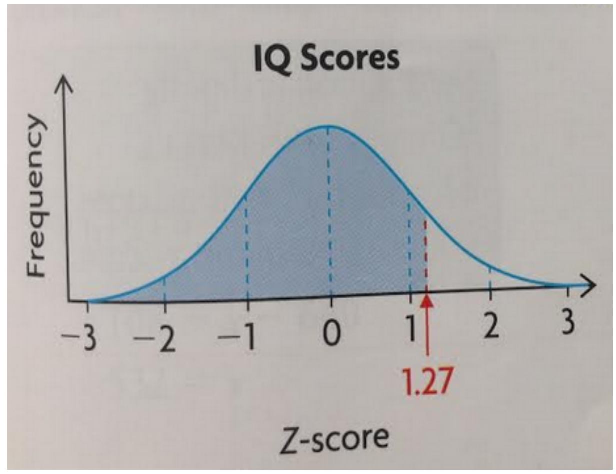
Ex. Determine the percent of the data to the left and right of the Z-score.

Z = 1.27

Step 1. Plot the Z-score on the standardized normal distribution curve.



Step. 2. Locate the Z-score on the table to determine corresponding the percent of data.

z	0.0	0.01	0.06	0.07
0.0	0.5000	0.5040	0.5239	0.5279
0.1	0.5398	0.5438	0.5636	0.5675
1.1	0.8643	0.8665	0.8770	0.8790
1.2	0.8849	0.8869	0.8962	**0.8980**
1.3	0.9032	0.9049	0.9131	0.9147

Step. 3. Interpretation

The value in the Z-score table is 0.8980.

This means , 89.80% of the data values are to the left of Z-score 1.27.

This also means , (100% - 89.80% = 10.20%) of the data values are to the right of 119.

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Ex. Determine the percent of the data between the given pair of the Z-score.

$$Z = -1 \quad \text{and} \quad Z = 1.27$$

Step 1. Follow the previous example for each Z-score, and determine the percent of the data to the left of each of Z-score.

Percent of data to the left of 1.27 is 89.80%

Percent of data to the left of -1.0 is 15.85%

Step. 2.

Percent of the data between the given pair of the Z-scores is

89.80% - 15.85% = 73.95%

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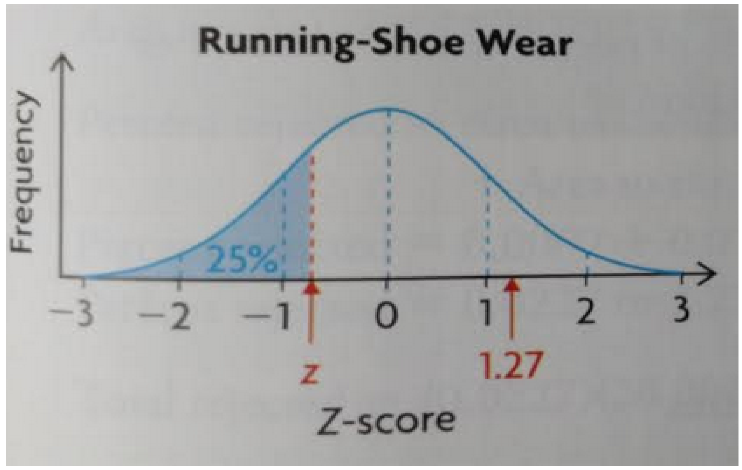
Ex. Determine the Z-score when 25% of the data lies to the left of the Z-score.

Step.1. Display the percent of data on the standard normal distribution curve.



Step. 2. Convert percent to decimal, and search the Z-score table for a value that is close to the calculated value.

In this case, 25% = .25
Search Z-score table for a value close to .25

z	0.09	0.08	0.07	0.06	0.05
−0.7	0.2148	0.2177	0.2206	0.2236	0.2266
−0.6	0.2451	0.2483	0.2514	0.2546	0.2578
−0.5	0.2776	0.2810	0.2843	0.2877	0.2912

Z = - 0.67

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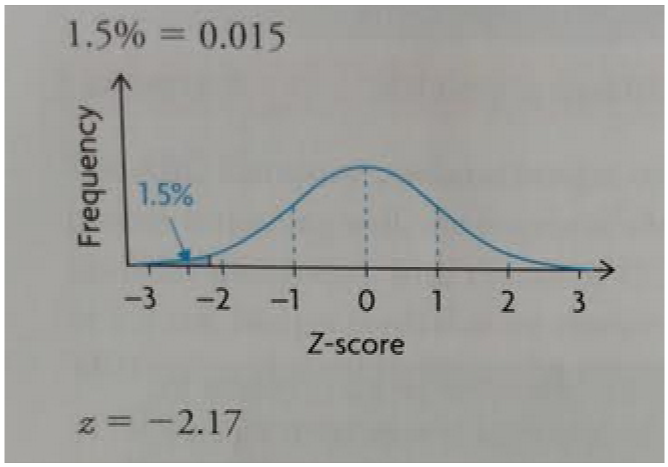
Ex. A manufacturer of personal music players has determined that the mean life of the players is 32.4 months, with a standard deviation of 6.3 months. What length of warranty should be offered if the manufacturer wants to restrict repairs to less than 1.5% of all the players sold?

Step.1. Determine the corresponding Z-score (as we did in previous example)



Step.2. Determine the corresponding x-value as explained below.

$$z = \frac{x - \mu}{\sigma}$$

$$(-2.17) = \frac{x - (32.4)}{(6.3)}$$

$$-13.671 = x - 32.4$$

$$18.729 = x$$

Step.3. Interpretation

The manufacturer should offer an 18-month warranty to restrict repairs to less than 1.5% of all the players sold.

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