A lot of large data sample can be referred to a being normally distributed. When data is normally distributed, it has certain characteristics:

1. The mean, median, and the mode are all equivalent
2. The data fits a bell shaped curve (normal curve)
3. About 68% of the data falls within 1 standard deviation from the mean
4. About 95% of the data falls within 2 standard deviation from the mean
5. About 99.7% of the data falls within 3 standard deviation from the mean

**EXAMPLES ➔ Using the empirical rule**

A machine fills 12 ounce Potato Chip bags. It places chips in the bags. Not all bags weigh exactly 12 ounces. The weight of the chips placed is normally distributed with a mean of 12.4 ounces and with a standard deviation of 0.2 ounces.

The company has asked you to determine the following probabilities to aid in consumer relations concerning the weight of the bags purchased.

a. If you purchase a bag filled by this dispenser what is the likelihood it has less than 12 ounces?

b. If you purchase a bag filled by this dispenser what is the likelihood it has more than 12 ounces?
c. If you purchase a bag filled by this dispenser what is the likelihood it has less than 12.6 ounces?

d. If you purchase a bag filled by this dispenser what is the likelihood it has between 12 and 12.6 ounces?

e. What weight of the bag is represented by the 84th percentile? Explain your answer.

A study of elite distance runners found a mean body weight of 63.1 kilograms (kg), with a standard deviation of 4.8 kg.
a. Use the Empirical Rule to find intervals centered at the mean that will include 68%, 95%, and 99.7% of the weights of the runners. Draw the normal curve to the right.

68%: ____________________

95%: ____________________

99.7%: ________________

b. What weight would represent the 84th percentile? Explain below.

c. A weight in what range would represent the bottom 16% of the weights?

d. What percent of weights are higher than 77.5?

Z – scores tell us how many standard deviations a term is above or below the mean. We can use z – scores to normalize data.

FORMULA FOR Z-score:  \[ Z = \frac{x - \mu}{\sigma} \]
EXAMPLE 1: Calculating the Z-Score of a data point

If we have a data set where $\mu = 8$ and $\sigma = 2$, find the Z-Score for the following data points.

a) $x = 12$  

b) $x = 6$  

c) $x = 7$

Conclusion about Z-scores…

- Has a ______________ value if the element lies above the mean
- Has a ______________ value if the element lies below the mean

Why Do We Find The Z-Score?

A way to compare apples and oranges!

EXAMPLE 1: Comparing Apples to Oranges → Which One is Larger?

The average apple has a diameter of 3.25 inches with a standard deviation of .5 inch. The average orange has a diameter of 4.5 inches and has a standard deviation of 1 inch. If I have an apple with a diameter of 4 inches and an orange with a diameter of 5.5 inches, which fruit is largest compared to others of its kind?

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<thead>
<tr>
<th>APPLES</th>
<th>ORANGES</th>
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<tbody>
<tr>
<td>$\mu$:</td>
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<td>$\sigma$:</td>
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<td>$x_i$:</td>
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Homework → Worksheet