z Scores

Unfortunately, there are an infinite number of combinations of mean and standard deviation.

Fortunately, there is a way to standardize any combination of mean and standard deviation. The standard is:

	Sample	Population
Mean	$\bar{x} = 0$	$\mu = 0$
Standard Deviation	$s = 1$	$\sigma = 1$

To convert any data point to a standard value, we use the following formula:

Sample	Population
$z = \frac{x - \bar{x}}{s}$	$z = \frac{x - \mu}{\sigma}$

z is called the standard score.

An "unusual value," also called an outlier, is any value that has a z-score of less than -2 or more then +2.

Percentiles

A percentile is a measure of the percent of the data that falls below a certain value.

Standardized test results are often given in percentiles. A person in the 87th percentile scored better than 89% of the other people who took the same test.

You find the value by using **locators**. A locator simply determines which values from the data set you would use to calculate the percentile value.

1. Calculate the locator as follows: $L = p \times n / 100$, where p is the percentile value and n is the number of data points.
2. If the locator is a whole number, then calculate your number by taking the mean of the data points at the locator position and the next position.
3. If the locator is not a whole number, round it up to the next higher whole number, and use the data point in that position.

Quartiles

In statistics we are interested in three particular percentiles called quartiles. The first quartile is 25%, the second is 50%, and the third is 75%.

The 2nd quartile is the median. The 1st quartile is the middle value of the lower half, or 25% of the way. The 3rd quartile is the middle value of the upper half, or 75% of the way.

Inter-Quartile Range

The inter-quartile range is the difference between the 1st and 3rd quartiles. This tells us the spread of the middle half of the data.

The Five-Number Summary and Box Plots

The five-number summary consists of:

1. The minimum value
2. The first quartile
3. The median
4. The third quartile
5. The maximum value

A box plot is constructed as follows:

1. Plot the five values on a number line.
2. Above the number line, draw a box that stretches from the first quartile to the third quartile.
3. Draw a vertical line inside the box at the point of the median.
4. Draw a horizontal line extending from the middle of the left side of the box to the minimum.
5. Draw a horizontal line extending from the middle of the right side of the box to the maximum.