

# Math 21 – Pointers for Section 3.4

## **z-Scores**

The z-score is a measure that tells us how standard deviations above the mean (positive z-score) or below the mean (negative z-score) a value is. We use z-scores to compare two data values to see which is more extreme.

To find a z-score, subtract the mean from the value. Then divide that answer by the standard deviation.

Rounding: We usually round z-scores to 2 decimal places.

## **Percentiles**

A percentile is a measure of position, telling what percent of the way a value is between the minimum and maximum values. We will not compute percentiles in this class, but you should be familiar with the concept.

If your height is at the 8<sup>th</sup> percentile, that means that 8% of people have a height less than yours. (You are taller than 8% of people.)

If your IQ is at the 95<sup>th</sup> percentile, that means that your IQ is higher than 95% of people.

## **Quartiles**

The first quartile, Q1, separates the first quarter (25%) of a set of data from the rest.

The third quartile, Q3, separates the first three quarters (75%) of a set of data from the rest. You can think of it as separating the top quarter from the rest.

The median takes on the role of the second quartile, at the 50% mark.

To find the quartiles

- Write the set of data in ascending order, from low to high.
- Divide the set into two equal sized groups, and find the median.
- The first quartile, Q1, is the “median” of the first group.
- The third quartile, Q3, is the “median” of the second group.

## **Interquartile Range (IQR)**

The interquartile range (or IQR) is the range between the two quartiles.

$$\text{IQR} = Q3 - Q1.$$

### StatCrunch

You can calculate Q1, Q3, and IQR at the same time.

- Enter all of the data in one column, 1 value per line.
- Press the Stat button, and select Summary Stats > Columns
- Select the column containing your data.
- For Statistics, make sure that at least “Q1”, “Q3”, and “IQR” are selected.
- Click on Compute!

By the way, you could find percentiles by typing the correct number in the box labeled Percentiles before you click on Compute!

### Outliers

To find whether a value is an outlier, we will calculate a lower fence and an upper fence. Any data value that is not between the fences is an outlier.

Before calculating the fences, you must first determine the first quartile (Q1), the third quartile (Q3), and the interquartile range (IQR).

**Lower Fence:**  $L.F. = Q_1 - 1.5(IQR)$

**Upper Fence:**  $U.F. = Q_3 + 1.5(IQR)$

This cannot be done in StatCrunch, you will have to do the calculations by hand. (You can use StatCrunch to find Q1, Q3, and IQR first, though.)

In the next section we will learn a graph that will show you which values are outliers.