

Section 3.4 Measures of Positions (“Ranking”)

Z -Score

k^{th} Percentiles: P_1 through P_{99}

Quartiles Q_1, Q_2, Q_3

Interquartile Range (IQR)

Fences

Outliers

Five-Number Summary

Boxplots

Z -Score

For population: $z = \frac{x - \mu}{\sigma}$

For sample: $z = \frac{x - \bar{x}}{s}$

Measures deviation of a value from the mean in terms of the number of standard deviations.

Unitless!

k^{th} Percentiles: P_k (P_1 through P_{99})

Determine the k^{th} Percentile P_k :

Step 1: Arrange the data in ascending order.

Step 2: Compute the index i :

$$i = \left(\frac{k}{100} \right) (n + 1)$$

Step 3:

- (a) If i is an integer, then P_k is the i^{th} data value**
- (b) If i is not an integer (e.g. 5.2), let a and $a + 1$ be the two integers between which i lies (e.g. 5.2 sits between 5 and 6), then P_k is the average of P_a and P_{a+1} .**

Quartiles Q_1, Q_2, Q_3 :

$$Q_1 = P_{25}$$

$$Q_2 = P_{50} = \text{Median}$$

$$Q_3 = P_{75}$$

Interquartile Range (IQR):

$$\text{IQR} = Q_3 - Q_1$$

Lower Fence: $Q_1 - 1.5(\text{IQR})$

Upper Fence: $Q_3 + 1.5(\text{IQR})$

Outliers:

Those lying outside of the region bounded by the two fences.

Five-Number Summary: Min, Q_1, Q_2, Q_3, Max

Boxplot:

Example: 20 data points:

6.6, 7.0, 7.7, 8.5, 8.9, 9.1, 9.3, 9.5, 9.6, 9.9, 10.1, 10.3, 10.8, 11.3, 11.8, 12.2, 13.7, 14.3, 18.5, 18.8

