**Measure of Position**

* **Standard score/z score**
  + Sample: z = (X – X-bar)/s
  + Population: z = (X - μ)/σ
  + Measures the # of standard deviations that a data value falls above/below the mean
  + If z score > 0, the value is above the mean
* **Percentiles** – divide the data into 100 equal groups
  + Given value X: percentile of X = (# of values < X + 0.5)/n \* 100%
  + Given percentile p: position of value X c = np/100
    - If c is not a whole number, round up → position of value X
    - If c is a whole number, value of X = average of values at position c and position c+1
* **Deciles** – divide the data into 10 equal groups
  + D1 = P10, D2 = P20, …
* **Quartiles** – divide the data into 4 equal groups
  + Q1 = median of lower half = P25
  + Q2 = median = P50
  + Q3 = median of higher half = P75
  + Five-number summary: Xmin, Q1, Q2, Q3, Xmax → use to draw boxplots
  + Modified boxplot
    - Interquartile range (IQR) = Q3 – Q1
    - Left fence (LF) = Q1 – 1.5 \* IQR
    - Right fence (RF) = Q3 + 1.5 \* IQR
    - Any values < LF or > RF are considered outliers
    - Use smallest/largest value that are not outliers as Xmin/Xmax
    - Mark outliers as stars