3.3 Measures of Position

measures of position: used to locate the relative position of a data value in a data set.

- **Z-score**: (aka standard score)
  \[ z = \frac{x - \mu}{\sigma} \]

Ex. For a particular test, \( \bar{x} = 60 \) and \( s = 8 \). Find the z-score of a test score of 49.

\[
\begin{align*}
  x &= 49 \\
  \bar{x} &= 60 \\
  s &= 8 \\
  z &= \frac{x - \bar{x}}{s} = \frac{49 - 60}{8} = -1.38
\end{align*}
\]
Ex. Who did better relative to the other test takers?

Ashley took the ACT test and scored a 29. The $\mu = 26$ and $\sigma = 2.1$

Jill took the SAT test and scored a 1170 $\mu = 1080$ and $\sigma = 92$.

Whoever has the higher z-score did better

\[
Z = \frac{X - \mu}{\sigma}
\]

\[
Z_A = \frac{29 - 26}{2.1} \approx 1.43
\]

\[
Z_J = \frac{1170 - 1080}{92} \approx 0.98
\]

Ashley did better relative to other ACT takers than Jill did relative to other SAT takers.
Percentile: divides a dataset into 100 equal groups

\[ P_n = n^{th} \text{ percentile} \]

Ex: I am in the 82nd percentile for US SAT test takers

Interpret: I score higher than as 82% of all other US SAT test takers.