Measures of Variation

Std deviation: "On average how far something is away from the mean."

\[
\text{std deviation} = \sqrt{\text{variance}}
\]

\[
\text{var} = \left(\frac{\text{std}}{2}\right)^2
\]

\[
\begin{align*}
\text{var} &= 81 \\
\text{std} &= 9
\end{align*}
\]

Measures of variation tell you how far the data is spread out.

Range = Max - Min

Population

\[
N = 10
\]

\[
\mu \text{ mean } = 41.5
\]

\[
\text{std dev pop}^2 = 6 = \frac{\sum (x-\mu)^2}{N} = 10.5
\]

\[
\text{std dev sample} = 3
\]
<table>
<thead>
<tr>
<th>Salary (x)</th>
<th>Deviation (x - μ)</th>
<th>Squares (x - μ)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>-1.5</td>
<td>2.25</td>
</tr>
<tr>
<td>23</td>
<td>-18.5</td>
<td>342.25</td>
</tr>
<tr>
<td>41</td>
<td>-0.5</td>
<td>0.25</td>
</tr>
<tr>
<td>50</td>
<td>8.5</td>
<td>72.25</td>
</tr>
<tr>
<td>49</td>
<td>7.5</td>
<td>56.25</td>
</tr>
<tr>
<td>32</td>
<td>-9.5</td>
<td>90.25</td>
</tr>
<tr>
<td>41</td>
<td>-0.5</td>
<td>0.25</td>
</tr>
<tr>
<td>29</td>
<td>-12.5</td>
<td>156.25</td>
</tr>
<tr>
<td>52</td>
<td>10.5</td>
<td>110.25</td>
</tr>
<tr>
<td>58</td>
<td>16.5</td>
<td>272.25</td>
</tr>
</tbody>
</table>

\[\Sigma(x-\mu) = 0 \quad \Sigma(x-\mu)^2 = 1102.5\]

\[\sigma = \sqrt{\frac{\Sigma(x-\mu)^2}{N}} = \sqrt{\frac{1102.5}{10}} = 10.5\]

**Interpret**

On avg, there is a spread of $10,500 from the mean of $41,000 salary at the corporation.

**Range:** The difference between max and min salaries at corporation is $35,000.
\[
\frac{\text{population}}{N} \quad \frac{\text{sample}}{n} \\
\mu \quad \bar{x} \\
\sigma = \sqrt{\frac{(x-\mu)^2}{N}} \quad s_x = \sqrt{\frac{(x-\bar{x})^2}{n-1}}
\]

\[\bar{x} = 393 \text{ cal} \]
\[s_x = \sqrt{\frac{63006}{8}} = 88.75\]

Total Calories

\[\begin{align*}
383 & \quad 40 \\
360 & \quad -43 \\
460 & \quad 117 \\
310 & \quad -33 \\
500 & \quad 157 \\
267 & \quad -76 \\
265 & \quad -88 \\
262 & \quad 81 \\
350 & \quad 7
\end{align*}\]

\[\sum (x-\bar{x}) = 0 \quad \sum (x-\bar{x})^2 = 63006\]

\[\text{var} = 7875.75\]
Interpret:

On Avg. there was a spread of a total of 88.75 cal in the men sample of fast-food restaurants from a mean of 34.8 cal in a burger.

68.4%: 254 - 432
95%: 165 - 521
99.5%: 76 - 610
Ex 4

$68 + 27 = 75\%$ of the data is between 55 and 101.

95% of all household pay between $75 and $101.

Point A
\[ \bar{x} = 3.5 \]
\[ s_x = 18.7 \]

Point B
\[ \bar{x} = 3.5 \]
\[ s_y = 7 \]

Ex 1 88% of the sample made below your score. 12% made above your score.
Percentile of \( x \) = \( \frac{\text{# of values less than } x}{\text{total # of values}} \times 100 \)