Calculating the Mean, Median, Mode, Midrange: show formulas and all work

1. x: 2, 3, 7
\[ \bar{x} = \frac{\sum x}{n} = \frac{2 + 3 + 7}{3} = \frac{12}{3} = 4 \]  
Median = 3  
Mode = No mode  
Midrange = \[ \frac{\text{Max + Min}}{2} = \frac{7 + 2}{2} = \frac{9}{2} = 4.5 \]

2. x: 3, 5, 6, 10
\[ \bar{x} = \frac{\sum x}{n} = \frac{3 + 5 + 6 + 10}{4} = \frac{24}{4} = 6 \]  
Median = \[ \frac{5 + 6}{2} = 5.5 \]  
Mode = No mode  
Midrange = \[ \frac{\text{Max + Min}}{2} = \frac{10 + 3}{2} = \frac{13}{2} = 6.5 \]

3. x: 5, 1, 2, 13, 9
Sort the Data  
\[ \bar{x} = \frac{\sum x}{n} = \frac{1 + 2 + 5 + 9 + 13}{5} = \frac{30}{5} = 6 \]  
Median = 5  
Mode = No mode  
Midrange = \[ \frac{\text{Max + Min}}{2} = \frac{13 + 1}{2} = \frac{14}{2} = 7 \]

4. x: 7, 2, 12, 15, 4, 2
Sort the Data  
\[ \bar{x} = \frac{\sum x}{n} = \frac{2 + 2 + 4 + 7 + 12 + 15}{6} = \frac{42}{6} = 7 \]  
Median = \[ \frac{4 + 7}{2} = 5.5 \]  
Mode = 2  
Midrange = \[ \frac{\text{Max + Min}}{2} = \frac{15 + 2}{2} = \frac{17}{2} = 8.5 \]

5. Sort the Data  
\[ \bar{x} = \frac{\sum x}{14} = \frac{120 + 120 + 125 + 130 + 130 + 130 + 135 + 138 + 140 + 140 + 143 + 144 + 150}{14} = 133.9 \]  
Median = 132.5  
Mode = 130  
Midrange = 135

Calculating the Standard Deviation, Variance, Range: show formulas and all work

6. x: 2, 3, 7

<table>
<thead>
<tr>
<th>x</th>
<th>( x - \bar{x} )</th>
<th>((x - \bar{x})^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2 - 4 = -2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3 - 4 = -1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>7 - 4 = 3</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>( \sum = 14 )</td>
<td></td>
</tr>
</tbody>
</table>
\[s = \sqrt{\frac{\sum(x - \bar{x})^2}{n-1}}\quad s = \sqrt{\frac{14}{2}} = \sqrt{7} \approx 2.6\quad s^2 = 7\quad \text{Range} = \text{Max} - \text{Min} = 7 - 2 = 5\]

Calculate the standard deviation again for this data set and this time assume the data is for a population.

\[\sigma = \sqrt{\frac{\sum(x - \mu)^2}{N}}\quad \sigma = \sqrt{\frac{14}{3}} \approx 2.2\]

7. x: 3, 5, 6, 10

<table>
<thead>
<tr>
<th>x</th>
<th>x - \bar{x}</th>
<th>(x - \bar{x})^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3-6=-3</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>5-6=-1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>6-6=0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>10-6=4</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>\sum = 26</td>
<td></td>
</tr>
</tbody>
</table>

\[s = \sqrt{\frac{26}{3}} \approx 2.9\quad s^2 = \frac{26}{3} \approx 8.7\quad \text{Range} = \text{Max} - \text{Min} = 10 - 3 = 7\]

Calculate the standard deviation again for this data set and this time assume the data is for a population.

\[\sigma = \sqrt{\frac{26}{4}} = 2.5\]

8. x: 5, 1, 2, 13, 9

Sort the Data x: 1, 2, 5, 9, 13

<table>
<thead>
<tr>
<th>x</th>
<th>x - \bar{x}</th>
<th>(x - \bar{x})^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-6=-5</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>2-6=-4</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>5-6=-1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>9-6=3</td>
<td>9</td>
</tr>
<tr>
<td>13</td>
<td>13-6=7</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>\sum = 100</td>
<td></td>
</tr>
</tbody>
</table>
\[
\begin{align*}
\sigma &= \sqrt{\frac{100}{4}} \approx 5 \\
\sigma^2 &= 25 \\
\text{Range} &= \text{Max} - \text{Min} = 13 - 1 = 12
\end{align*}
\]

9. \( x: 7, 2, 12, 15, 4, 2 \)  Sort the Data \( x: 2, 2, 4, 7, 12, 15 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( x - \bar{x} )</th>
<th>( (x - \bar{x})^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2 - 7 = -5</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>2 - 7 = -5</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>4 - 7 = -3</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>7 - 7 = 0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>12 - 7 = 5</td>
<td>25</td>
</tr>
<tr>
<td>15</td>
<td>15 - 7 = 8</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>( \sum = 148 )</td>
<td></td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\sigma &= \sqrt{\frac{148}{5}} \approx 5.4 \\
\sigma^2 &= 29.6 \\
\text{Range} &= \text{Max} - \text{Min} = 15 - 2 = 13
\end{align*}
\]

10. Do problem #9 on page 105 in Section 3-3.

\[
\begin{align*}
\sigma &= \sqrt{\frac{1062.92857}{13}} \approx 9.0 \\
\sigma^2 &= \frac{1062.92857}{13} \approx 81.8 \\
\text{Range} &= \text{Max} - \text{Min} = 150 - 120 = 30
\end{align*}
\]

This problem is a pain in the neck because there is a lot of data (n=14) and the mean is not an integer value. You will be very happy to use your TI-83 Plus or TI-84 pre-programmed functions for these calculations! Stay tuned next week when we learn how to use the statistical power of the TI.

Calculating Z-Scores: show formulas and all work

Read Section 3-4, Measures of Relative Standing, then do the following problems.

11. Do problem #5 on page 117. Answers in the back of the book on pg. 654

12. Do problem #7 on page 117. Answers in the back of the book on pg. 654

13. Do problem #9 on page 117. Answers in the back of the book on pg. 654


15. Answers may vary: For your instructor:

Grandpa Karl: 6’2” or 74” Z-Score ~ 1.79 Not Unusual (he is my tallest grandpa)
Grandma Amanda: 5’3” or 63” Z-Score ~ 0.24 Not Unusual (she is my shortest grandma)
Sister Claire: 5’7” or 67” Z-Score ~ 1.36 Not Unusual (she is my tallest sister)
Father Walter: 5’9” or 69” Z-Score = 0.00 Not Unusual
Son Jeffrey: 6’2” or 74” Z-Score ~ 1.79 Not Unusual (my tallest son)

Jeffrey is still growing. His coach thinks he will be 6’3” tall within a year or so. Will he then be unusual?

My immediate family is “ordinary” or “usual.” So I threw in my cousin. We all look up to him!

Cousin Carl: 6’6” or 78” Z-Score ~ 3.21 Unusual (my unusually tall cousin, is also unusually funny)

Me: 5’10” or 70” Z-Score ~ 0.36 Definitely NOT unusually tall (just unusually smart)