Section 12.8 (Homework)

#21. \( \underline{10} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10} = 10^4 = 10000 \)
13.5 Measures of Central Tendency

Averages are referred to as measures of central tendency. They are numbers near the center of ranked data that are commonly used to represent the group of data.
The arithmetic mean, or mean, is symbolized by $\bar{X}$ and is the sum of the data divided by the number of pieces of data.

$$\bar{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

$\bar{X} = \frac{\sum x}{n}$

- $X$’s: scores
- $n$: number of scores
- $\sum$: “sigma”
- $\sum$ is read as “sum what comes after it”
The **median** is the value in the middle of a set of ranked data.

The **mode** is the piece of data that occurs most frequently.

The **midrange** = \( \frac{\text{lowest value} + \text{highest value}}{2} \).
State Median Family Income

- State Median Family Income by Family Size [Excel File] [HTML Version]
- State Median Family Income by Numbers of Earners In Family [Excel File] [HTML Version]
Examples: In each of the following, find the mean, median, mode and midrange of the set of data.

1. 7, 8, 11, 13, 15, 13, 15, 40, 43, 375

   ascending order: 7, 8, 11, 13, 13, 15, 15, 40, 43, 375

   mean = \( \bar{X} = \frac{7+8+11+13+13+15+15+40+43+375}{10} = \frac{537}{10} = 53.7 \)

   median = \( \frac{13+13}{2} = \frac{26}{2} = 13 \)

   mode = 13

   midrange = \( \frac{7+375}{2} = 191 \)
2. 5, 3, 6, 6, 6, 9, 11

ascending order: 3, 5, 6, 6, 6, 9, 11

mean = \frac{3+5+6+6+6+9+11}{7}

= \frac{46}{7} = \boxed{6.6}

median = \boxed{6}

mode = \boxed{6}

midrange = \frac{3+11}{2} = \frac{14}{2} = \boxed{7}
3. \[ n = 14 \]

\[ \frac{\sum x}{n} = \frac{92}{14} = 6.6 \]

median = \[ \frac{4+4}{2} = \frac{8}{2} = 4 \]

Modes are 1 and 4 (distribution is bimodal)

midrange = \[ \frac{1+21}{2} = \frac{22}{2} = 11 \]

Example: find the mode: 1, 3, 5, 7

Text: no mode
4. **Employee Salaries.** The salaries of 10 employees of a small company follow.

<table>
<thead>
<tr>
<th>Salary 1</th>
<th>Salary 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>26000</td>
<td>62000</td>
</tr>
<tr>
<td>23000</td>
<td>22000</td>
</tr>
<tr>
<td>29000</td>
<td>25000</td>
</tr>
<tr>
<td>24000</td>
<td>79000</td>
</tr>
<tr>
<td>24000</td>
<td>27000</td>
</tr>
</tbody>
</table>

Calculate the

a.) mean
b.) median
c.) mode
d.) midrange
e.) If the employees wanted to demonstrate the need for a raise, which average would they use to show they are being underpaid: the mean or the median? Explain.
f.) If the management did not want to give the employees a raise, which average would they use: the mean or the median? Explain.
ascending order
(by columns)

22000  26000
23000  27000
24000  29000
24000  62000
25000  79000

\[ \bar{X} = \frac{\sum X}{n} = \frac{341000}{10} = 34100 \]

\[ b) \text{ median} = \frac{24000 + 26000}{2} = 25500 \]
c) mode = \( \#24,000 \).
d) midrange = \( \frac{22,000 + 79,000}{2} \) = \( \frac{101,000}{2} \) = \( \#50,500 \).
e) Employees: use median \( \#25,500 \) (Most employees make closer to \( \#25,500 \) than \( \#34,000 \)).
f) Management: use mean \( \#34,000 \). (They are paying \( \#34,000 \) or \( \#34,100 \) per employee.)
13.6 Measures of Dispersion

Measures of dispersion are used to indicate the spread of data.

The Range = highest value - lowest value

The Standard deviation = \[ \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}} \]