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Name Teacher Key

Pre-Algebra Notes

Week 16: Lesson 11.2 and 11.3

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### Box and Whisker Plot (11.2)

#### Vocab

- **Box-and-whisker plot:** a data display that organizes data into four groups.
- The median of the lower half is the lower quartile.
- The median of the upper half is the upper quartile.
- The lower extreme is the least data value, and the upper extreme is the greatest data value.

Example 1: A farmer recorded the number of oranges that an orange tree produced for each of the last 9 years. The data are given below.

572, 452, 457, 460, 360, 407, 380, 380, 264

To display the data given above in a box-and-whisker plot, first order the data to find the median, the quartiles, and the extremes.

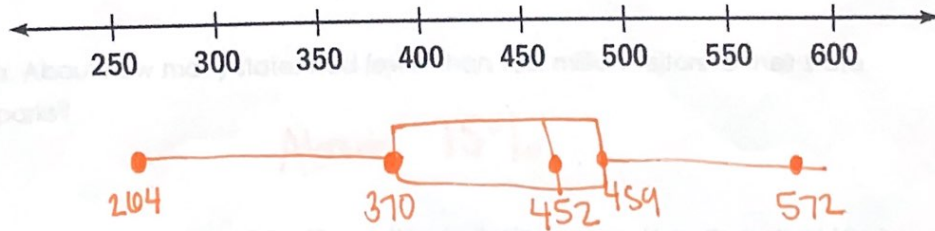
lower
median
upper

264
360
380
407
452
457
458
460
572

lower quartile:  $\frac{360 + 380}{2} = 370$

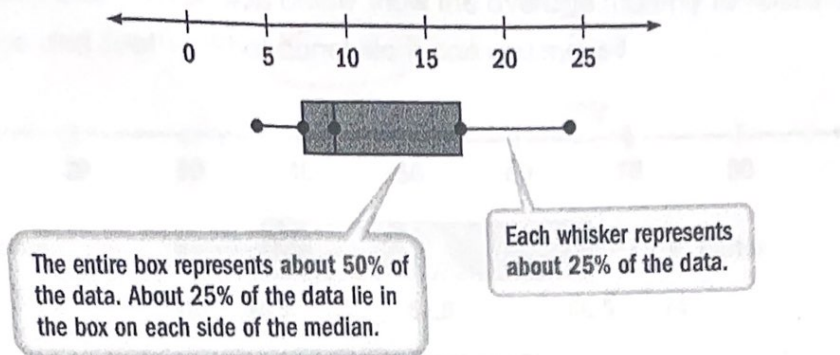
upper:  $\frac{458 + 460}{2} = 459$

Plot the median, the quartiles, and the extremes below a number line.



## Interpreting a Box-and-Whisker plot

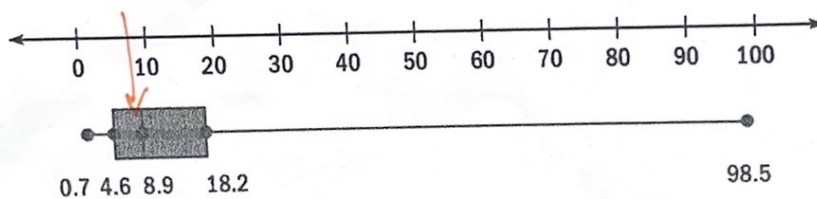
A box-and-whisker plot separates data into four sections: the two parts of the box and two whiskers. All four sections contain approximately the same number of data values.



The lengths of sections tell you how spread out the data are. For instance, the data in Example 1 are more spread out between the lower quartile and the median than they are between the median and the upper quartile.

Example 2:

The box-and-whisker plot below displays the number of visitors (in millions) to the state parks in each of the 50 states in 2000



a. About how many states had fewer than 18.2 million visitors to their state parks?

About 75%

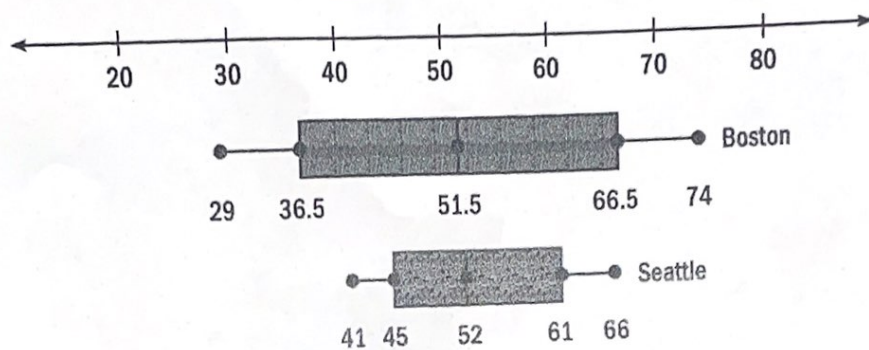
b. West Virginia had 8.0 million visitors to its state parks. How does West Virginia compare with the rest of the states?

between 25-50%

The range of a set of data is the difference of the greatest and least values. The **interquartile range** of a data set is the difference of the upper quartile and the lower quartile.

Example 3:

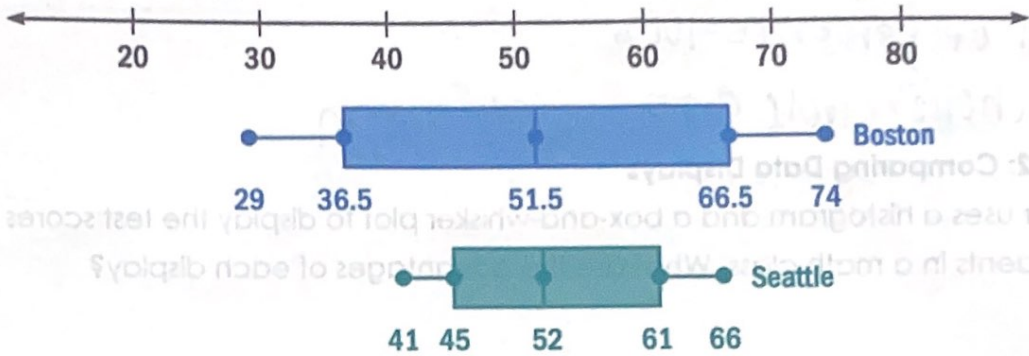
The box-and-whisker plots below show the average monthly temperatures for Boston and Seattle. What conclusions can you make?



The range of a set of data is the difference of the greatest and least values. The **interquartile range** of a data set is the difference of the upper quartile and the lower quartile.

**Example 3:**

The box-and-whisker plots below show the average monthly temperatures for Boston and Seattle. What conclusions can you make?



**Using Data Displays (11.3)**

**Vocab.**

- Data that consist of names, labels, or other nonnumerical values, such as types of animals or colors of hair, are categorical data.
- Data that consist of numbers, such as weights of animals or lengths of hair, are numerical data.
- \*\*When you choose a data display, one factor you should consider is whether the data are categorical or numerical.

**SUMMARY** Choosing Appropriate Data Displays

- Use a *line graph* to display numerical data that change over time.
- Use a *scatter plot* to see trends in paired numerical data.
- Use a *bar graph* to compare categorical data.
- Use a *circle graph* to represent categorical data as parts of a whole.
- Use a *stem-and-leaf plot* to organize numerical data based on their digits.
- Use a *histogram* to compare the frequencies of numerical data that fall in equal intervals.
- Use a *box-and-whisker plot* to organize numerical data into four groups of approximately equal size.

### Example 1: Choosing an Appropriate Data Display

The table shows the results of a survey that asked students to name their favorite type of movie. Which display(s) can you use to display the data?

Favorite Type of Movie	
Type	Percent
Drama	17%
Comedy	44%
Action	28%
Sci-Fi	9%
Other	2%

conversation about data presented

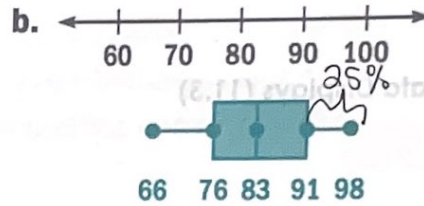
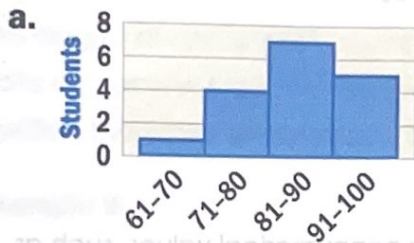
Solution:

movies = categorical data  
sum of percents = 100%

Best choice = circle graph or bar graph

### Example 2: Comparing Data Displays

A teacher uses a histogram and a box-and-whisker plot to display the test scores of the students in a math class. What are the advantages of each display?



Solution A:

\* histogram = quickly compare numbers.  
- compared side by side

Solution B:

\* box-whisker = easily divided into low, middle, high groups.

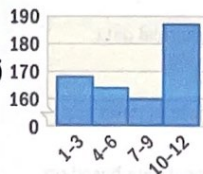
↳ can be turned to percents.

i.e. 25% of the class scored 91 or better

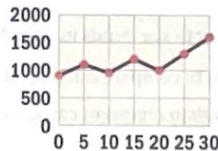
### Misleading Data:

Talk about why these are misleading

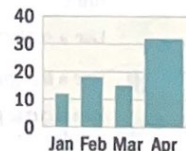
**Misleading Data Displays** The way a data display is drawn can lead people to make incorrect conclusions. Three examples of potentially misleading data displays are shown below.



**Broken Vertical Axis**  
The broken vertical axis exaggerates the differences in the bar lengths.



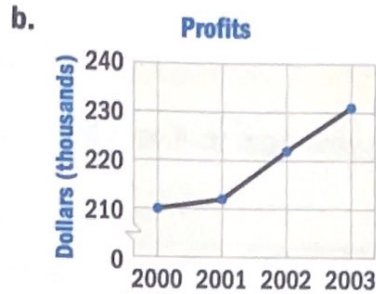
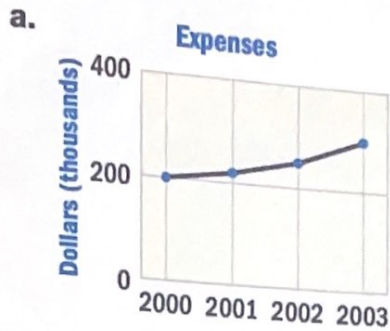
**Large Increments**  
The large increments on the vertical axis minimize the changes in the data.



**Different Widths**  
The different bar widths suggest a comparison of areas, not lengths.

### Example 3: Identifying Misleading Data Displays

The line graphs display a company's expenses and profits for each year from 2000 to 2003. What is misleading about each display?



Solution A:

- The increments on the vertical axis are too large
- It shows that the company's expenses have only "visibly" increased slightly when it's actually by 50%.

Solution B:

- Vertical axis is broken
- Appears to be a dramatic rise in profits but it's only by 10%.