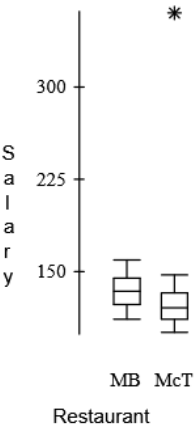### Statistics Chapter 4: Mooseburgers and McTofu – KEY

Here are the weekly payrolls for two imaginary restaurants, Mooseburgers and McTofu.

1. Find the 5 number summaries.

Statistic	M-burgers	McTofu
Min	110	100
Q1	123	110
Median	133.5	120
Q3	144	132
Max	160	360

2. Create parallel boxplots. Label your graph clearly.

    Boxplots are at the right.

3. Write a few sentences comparing the distributions.
    The distribution of salaries at Mooseburgers is symmetric, with a typical
    salary of about $134.50. The distribution of salaries at McTofu is also symmetric, with the exception of one
    very high salary, Sally's $360. A typical salary at McTofu is lower, around $120. The distributions of
    salaries are fairly compact at both restaurants, with interquartile ranges of $21 at Mooseburgers and $20.50 at
    McTofu. In fact, with the exception of the outlier, the distribution of salaries at McTofu is similar to the
    distribution of salaries at Mooseburgers, but generally about $15 lower.

4. Which restaurant pays the higher average salary?   McTofu

5. Why is the mean salary misleading?
    The mean salary at McTofu is pulled up by a salary that is an outlier. Sally's salary of $360 is much higher
    than the salary of a typical McTofu employee.

6. At which restaurant would you rather work? Give a sound statistical justification for your
    decision.
    Even though McTofu had a higher mean salary, $142.36, compared to Mooseburgers' mean of $134.40, I
    would rather work at Mooseburgers. Salaries are typically higher there.

4-10

Chapter 4

Stories Quantitative Data Tell
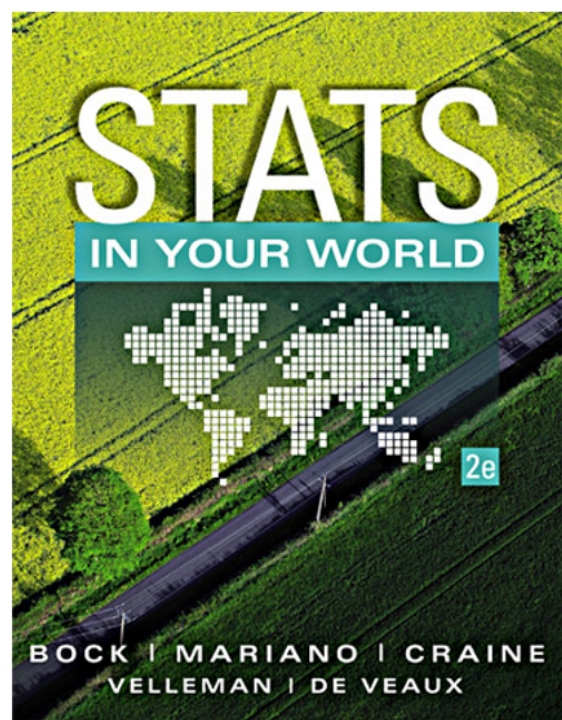
<u>Vocabulary Review:</u> From Unit 3, what words can be used to describe...
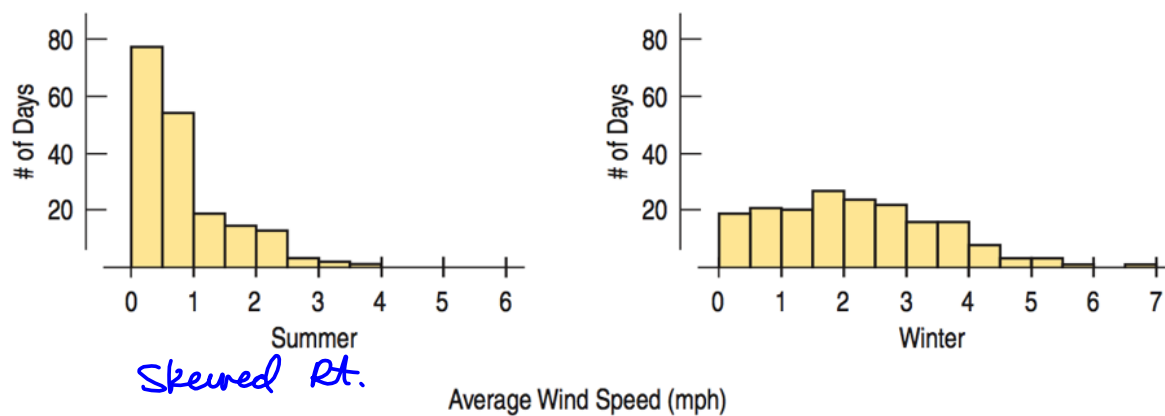
<u>Shape</u>: Roughly symmetric, skewed, uniform, bimodal

<u>Center</u>: Mean, Median

<u>Spread</u>: IQR, Std. dev.,
    ↳ "middle 50%"
         (half)

Comparing Groups

- It is almost always more interesting to compare groups.
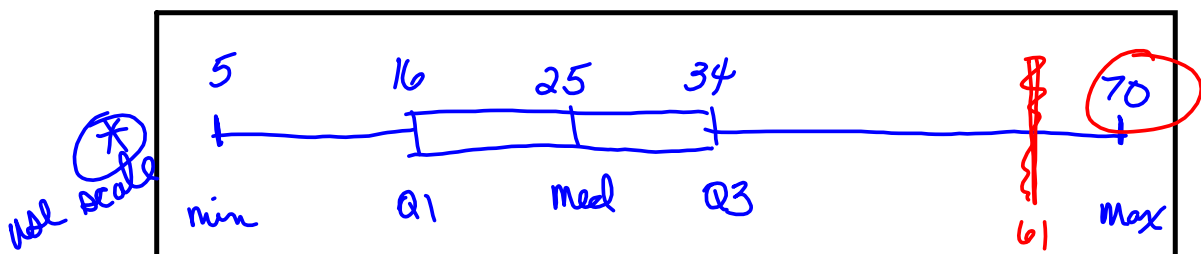- With histograms, note the shapes, centers, and spreads of the two distributions.

Summer

Skewed Rt.

Average Wind Speed (mph)

Winter

- What does this graphical display tell you?

- In the Summer there were many days with little to No wind (< 2.5mph)
- In the winter, wind is more uniform (0-4 mph)

Boxplot Review:

Sketch a boxplot and label each component

as min, Q1, Q2 (median) Q3, max.

Assign numbers to each of the components
listed above and find the IQR.

$IQR = Q3 - Q1 = 34 - 16 = \boxed{18}$　← measures spread

median = 25　　　　　　　← measures center

Max = 70 seems pretty high

Upper fence = $Q3 + 1.5 IQR$
$34 + 1.5(18)$
61
70 is an outlier
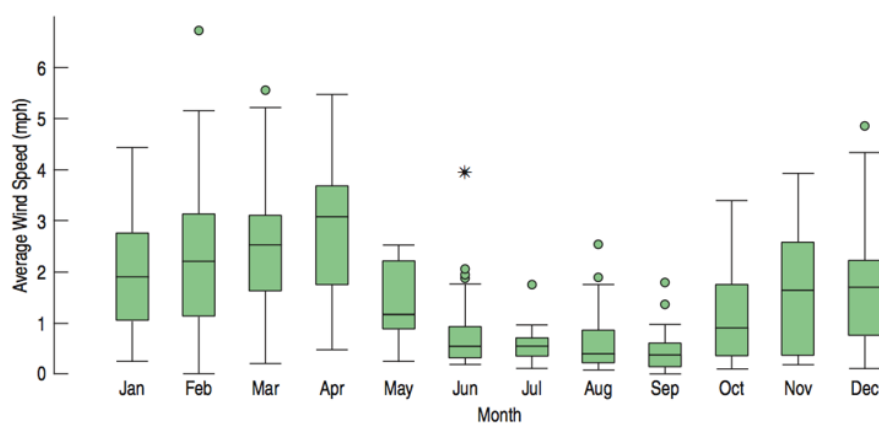
Lower fence = $Q1 - 1.5 IQR$
$= 16 - 1.5(18)$
$= -11$　　　5 is Not an outlier

Comparing Groups (cont.)

- Boxplots offer an ideal balance of information and simplicity, hiding the details while displaying the overall summary information.
- We often plot them side by side for groups or categories we wish to compare.

- What do these boxplots tell you?

What About Outliers?

- If there are any clear outliers and you are reporting the mean and standard deviation, report them with the outliers present and with the outliers removed. The differences may be quite revealing.

- Note: The median and IQR are not likely to be affected by the outliers.

Why? _because median is the middle piece of data and IQR is the measure of middle half only (both Not include ~~max~~ outliers)_
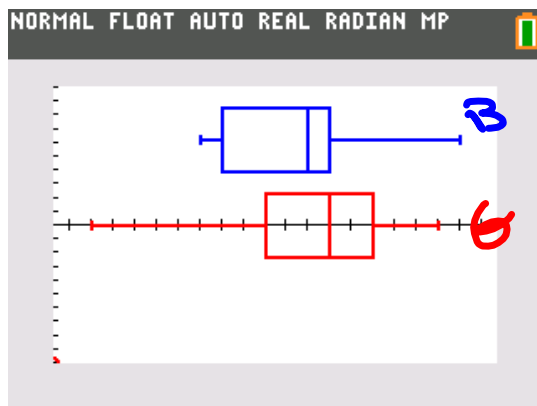
Starting on the bottom of page 92 from your text,

Please follow the TI Tips comparing groups with boxplots to generate the boxplot example.

How do the boys and girls compare in terms of agility with each other based on the boxplots?

Performance on 4th Grade Agility Test

Boys: 22, 17, 18, 29, 22, 22, 23, 24, 17, 21

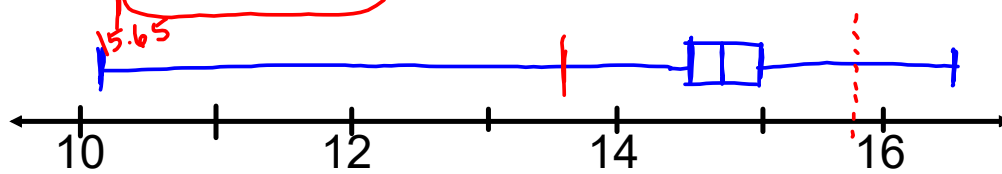Girls: 25, 20, 12, 19, 28, 24, 22, 21, 25, 25, 26, 16, 27, 22

Finding Outliers Using the *1.5 IQR Rule*

Lower fence = Q1 - 1.5IQR

Upper fence = Q3 + 1.5IQR

Ex: Make a boxplot and find the outliers in the following data set:

10.2, 14.1, 14.4. 14.4, 14.4, 14.5, 14.5, 14.6, 14.7, 14.7, 14.7,
14.9, 15.1, 15.9, 16.4

13.65

15.65

$$IQR = Q3 - Q1 = 14.9 - 14.4 = .5$$

$$1.5 * IQR = 1.5(.5) = .75$$

$$Upper\ Fence = Q3 + 1.5\ IQR$$
$$= 14.9 + .75 = 15.65$$

$$Lower\ Fence = Q1 - 1.5\ IQR$$
$$= 14.4 - .75 = 13.65$$

Outliers: 10.2, 15.9, 16.4

<u>Homework:</u>

<u>Read 87-93</u>

pg 104-105 Exercises# 6,10

Worksheet - Practice Finding Outliers