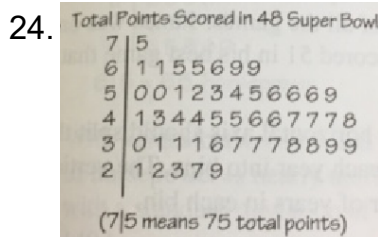


Homework Day 5 Answers:

6. $Q1 = 318$ $Q3 = 342$ $IQR = 24$

7. $Q1 = 20$ $Q3 = 32.5$ $IQR = 12.5$

1. D ($Q1 = 0$ which represents the 1st 25% of the data, in order. Therefore, at least the first 25% of counties had no infant deaths)



26. a) median = 46 b) $Q1 = 37$ c) $Q3 = 55.5$

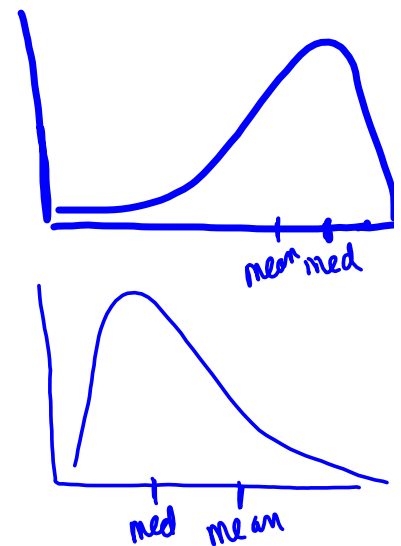
28. The distribution of total points scored in the Super Bowl is roughly symmetric. Teams typically score a total of about 46 points with half of the games totally between 37 and 55.5 points. Only 1/4 of the teams scored above 55.5. Only one team scored a 75.

When the mean is less than the median, the data will be **skewed left** because there are a few abnormally low values bringing down the mean.

When the mean is greater than the median, the data will be **skewed right** because there are a few abnormally high values bringing up the mean.

For **symmetric data**, mean = median (approximately).

Sketch:



Teaching tip

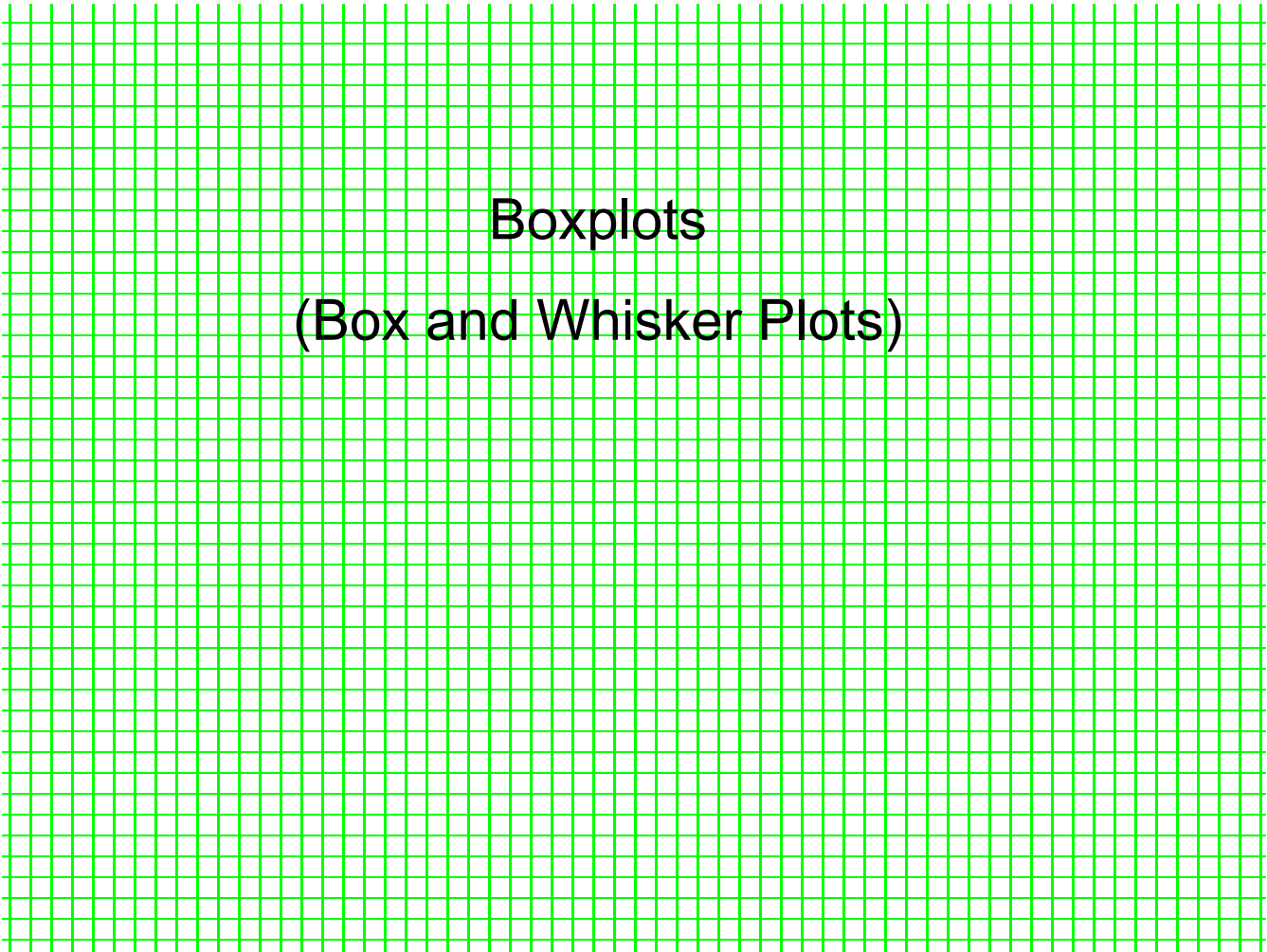
- This can be a great time for a physical activity. Have 15 students come to the front of the class. Have each student write/guess a number (How many states have you visited? Guess how many songs are in the teacher's music library. Etc...). Arrange the 15 students from smallest to biggest and then count your way to the 5 # summary. Then make a boxplot on the board. Check for outliers...
- You have made a human boxplot!

Summary Statistics

- While you can count your way to a 5-number summary by hand for small data sets, we usually use technology to provide us with the summary.


- **To describe data:**

- ★ **For uniform/symmetrical data use mean and range to describe the middle and the spread.**
- ★ **For skewed data use median and IQR**



Boxplots (Box and Whisker Plots)

Video #5: Boxplots

 <http://www.learner.org/courses/againstallodds/unitpages/unit05.html>

Fill in the Video Guide

Video Guide Answers:

1. What *variable* is used to compare different brands of hot dogs?

1. The different brands of hot dogs were compared by their calories.

2. What name do we give to the value for which one-quarter of the data values falls at or below it?

2. The one-quarter point is called the first quartile.

3. What numbers make up a five-number summary?

3. The values in a five-number summary are the minimum, first quartile (Q_1), median, third quartile (Q_3), and maximum.

4. How do you calculate the interquartile range?

4. The interquartile range or $IQR = Q_3 - Q_1$.

5. Boxplots show that poultry hot dogs as a group differ from all-beef hot dogs. Compare the distribution of calories between the two types of hot dogs.

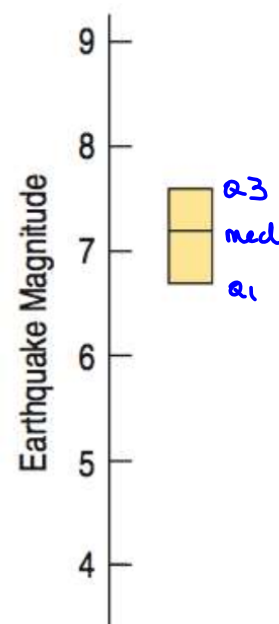
5. The median of the poultry hot dogs is below the minimum for the beef hot dogs. So, half of the brands of poultry hot dogs have fewer calories than the lowest calorie brand of all-beef hot dogs.

Tsunami earthquake magnitudes: Making Boxplots

- A **boxplot** is a graphical display of the five-number summary.
- Boxplots are useful when comparing groups.
- Boxplots are particularly good at pointing out outliers.

Constructing Boxplots

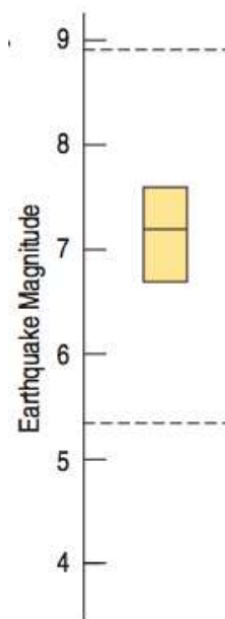
1. Draw a single vertical axis spanning the range of the data. Draw short horizontal lines at the lower and upper quartiles and at the median. Then connect them with vertical lines to form a box.



(Can be drawn vertically or horizontally)

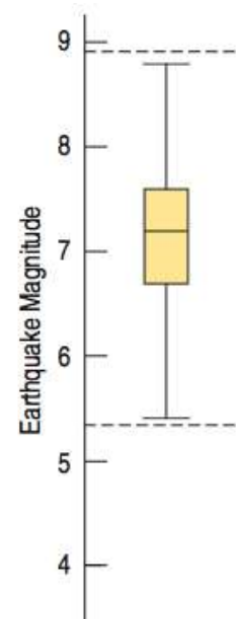
Constructing Boxplots (cont.)

2. Erect “fences” around the main part of the data.
 - The upper fence is 1.5 IQRs above the upper quartile.
 - The lower fence is 1.5 IQRs below the lower quartile.
 - Note: the fences only help with constructing the boxplot and should not appear in the final display.



Constructing Boxplots (cont.)

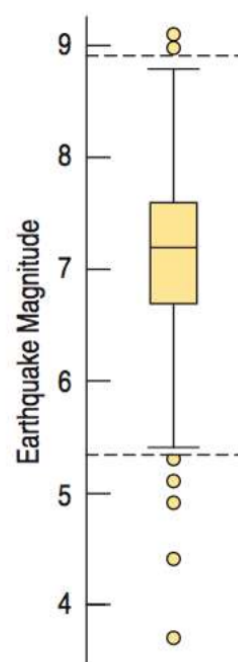
3. Use the fences to grow “whiskers.”
 - Draw lines from the ends of the box up and down to the *most extreme data values found within the fences*.
 - If a data value falls outside one of the fences, we do *not* connect it with a whisker.



* can be vertical or horizontal

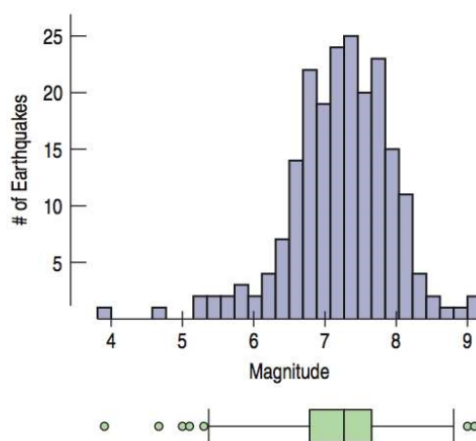
Constructing Boxplots (cont.)

4. Add the **outliers** by displaying any data values beyond the fences with special symbols.
 - We often use a different symbol for “far outliers” that are farther than 3 IQRs from the quartiles.



Wind Speed: Making Boxplots (cont.)

- Compare the histogram and boxplot for earthquake magnitudes:



- How does each display represent the distribution?

Exercises:

1. A consumer testing laboratory measured the calories per hot dog in 20 brands of beef hot dogs. Here are the results:

186	181	176	149	184	190	158	139	175	148
152	111	141	153	190	157	131	149	135	132

a. Find the five-number summary of this distribution. Explain how you arrived at your answer.

b. Compute the range and interquartile range. Explain what these numbers tell you about the variability in calories in different brands of all-beef hot dogs.

c. Would a beef hot dog with 175 calories be in the top quarter of the data? Support your answer.

NORMAL FLOAT AUTO REAL Radian MP 

1-Var Stats

$\uparrow Sx=22.642008$
 $\sigma x=22.06869955$
 $n=20$
 $\min X=111$
 $Q_1=140$
 $Med=152.5$
 $Q_3=178.5$
 $\max X=190$

Range =

Max - Min

$$190 - 111 = 79$$

IQR = $Q_3 - Q_1$

$$178.5 - 140 = 38.5$$

No because
178.5 and
above are
the top
25%.

2. Return to the data on all-beef hot dog calories from exercise 1.
 - a. Draw a basic boxplot for the calories per hot dog.
 - b. In which quarter – the first, second, third, or fourth – are the data most concentrated? Explain how you can answer this question based on the boxplot from (a).
 - c. In which quarter – the first, second, third, or fourth – is the data most spread out? Explain how you can answer this question based on the boxplot from (a).
 - d. If a data value is more than $1.5 \times \text{IQR}$ below the first quartile or more than $1.5 \times \text{IQR}$ above the third quartile, it is considered an outlier. Should any of the calorie counts for the beef hot dogs be classified as outliers? Explain.

If time...

3. Make a stemplot of the calories in the sample of beef hot dogs from exercise 1. What do you learn from the stemplot that you could not learn from the boxplot?

Homework:

Review Questions: #1 and 3

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