Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) calculate the 1st and 3rd quartiles, "by hand"
b) calculate the interquartile range, "by hand"
c) use fathom to make a box-and-whisker plot

If time permits, show Khan academy clip:

https://www.khanacademy.org/math/probability/descriptive-statistics/box-and-whisker-plots/v/reading-box-and-whisker-plots

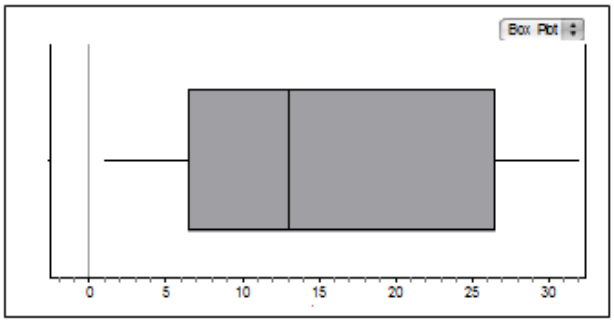
Box and whisker plot

VIDEO 3:18 minutes

MBF 3CI Date: Oct. 21, 2016

3.5 Measures of Spread: Part 2

There are **more** ways to measures spread. Another way is to calculate **quartiles** and create **box-and-whisker plots.**



A set of data that has been ordered and divided into four groups, with (approximately) an equal number of values, has been divided into **quartiles.**

Ex. 1: Using the data 1, 27, 2, 15, 32, 4, 26, 11 calculate the:

a) median, first quartile, and third quartile
b) interquartile range
c) box-and-whisker plot (using FATHOM)

ANSWERS:

a) 1, 2, 4, 11, 15, 26, 27, 32
- Median datum = between 4th and 5th datum (why?)
- Median=13 (sometimes called Q2)
- Q1=1st Quartile
  - 1, 2, 4, 11
  - Q1=3
- Q3=3rd Quartile
  - 15, 26, 27, 32
  - Q3=26.5

b) Interquartile Range = Q3 - Q1
= 26.5 - 3
= 23.5

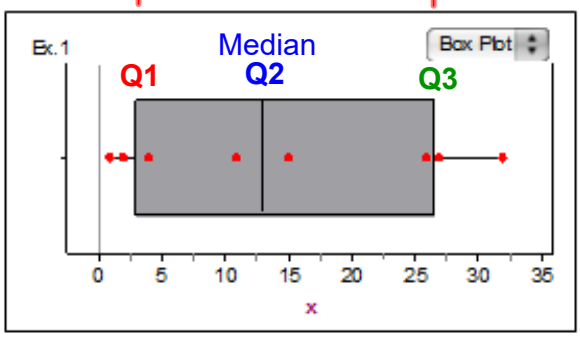
c)

Middle **Half** of data is between Q1 and Q3

Middle **Half**

Ex.1

	x
1	1
2	27
3	2
4	15
5	32
6	4
7	26
8	11



On your own, answer these questions in the space below.
Use FATHOM **only** to create the box-and-whisker plot in part d).

1. For this entire population of class marks on a test:
   90, 62, 77, 84, 63, 81, 67, 63, 54, 41, 89

   a) Find the first, second and third quartile.

   41, 54, 62, 63, 63, 67, 77, 81, 84, 89, 90

   Q2 (Median) = 67
   Q1 = 62
   Q3 = 84

   b) Find the range of the data.

   Range = 90 - 41
   = 49

   c) Calculate the interquartile range.

   IQR = Q3 - Q1
   = 84 - 62
   = 22

   d) **Using FATHOM** create the above box-and-whisker plot.
   Save this file in your Handin folder. (Name it "**marks1**")

   Do this first, using these numbers.

I have a created a "starter file" with all the data for you.
Open it, from the class folder.

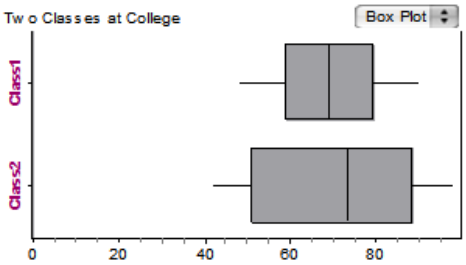
2. Go to page 140 in the textbook.
   The data lists compare two first-year math classes' midterm marks at Caldwell College

   a) ***I have a created a "starter file" with all the data for you.*** It is called class2 starter file.

   b) Open the file, then drag a new Graph onto the workspace. (Object Menu: Object, New, Graph)
   Highlight the column Class1. **Now holding down the Shift key**, highlight Class2 as well.
   Both columns should be highlighted now.

   c) In the new graph window, click and drag both of these columns to the **horizontal** axis.

   d) Finally, select "Box Plot" for the graphs. **Your graphs should now look like:**



   e) If your axis is different, right-click on the graph and select "Inspect Graph" and then choose the "Properties" tab.
   Change "xLower" to 0 and "xUpper" to 100 (since the marks can be anywhere from 0 to 100%).

   f) **Using the Box Plot**, estimate the median for both classes:

   Class1 median: 69 % Class2 median: 73 %

   g) **Using your answer from f)** which class performed better? Explain.

   Class 2 performed better based on these numbers, because the median is higher.
   (73% vs. 69%)

   h) **Using the Box Plot**, explain why the median is not always the best indicator of how well a class performed.

   It is not always the best indicator, because it does not indicate how much more spread out the marks are compared to Class1.

   Class1 had more consistent scores with a smaller interquartile range (20 vs 35), as is seen in the box plot.

   i) In your opinion, which class performed better? Explain.

   Class2 performed better.
   They had a higher median, and higher scores overall.
   (even though they also had the lowest scores, too)

j) You can find the medians and quartiles of the classes exactly, using formulas in FATHOM.
To find the median, first and third quartiles for Class1, follow these steps:
i) Highlight the column "Class1". Right-click in the blank space and select "Inspect Collection".
ii) Select the "Measures" tab, and create three new statistical measures.
Name them "Median", "Q1" and Q3".
iii) Double-click in the "Formula" space for median. In the formula window, type median(Class1).
Finally, hit "OK". **The result should be 69.**
iv) Double-click in the "Formula" space for Q1. In the formula window, type Q1(Class1).
Finally, hit "OK". **The result should be 59.**
v) Double-click in the "Formula" space for Q3. In the formula window, type Q3(Class1).
Finally, hit "OK". **The result should be 79.**
vi) Look at the Box Plot for Class1 only. The statistics 59, 69 and 79 should make sense.

k) **Repeat part j) for Class2**, but you MUST name the *Measures* "Median2", "Q1_2" and Q3_2",
but in the *formula window*, type median(Class2), Q1(Class2), and Q3(Class2).
Save this file in your **Handin folder**. (***Re-name it*** "**class2 DONE**")

Median=73.5
Q1=51
Q3=88

3. Go to p.556 in the text. Near the bottom left change the answers for 1b) and c) to….
1b) first quartile: 107; third quartile: 140
1c) 33

4. Go to p.145. Now complete, **using FATHOM**: p.145 #1 and p.146 #9.
DID YOU MAKE CHANGES TO THE ANSWERS IN THE BACK???
CHECK YOUR ANSWERS IN THE BACK.