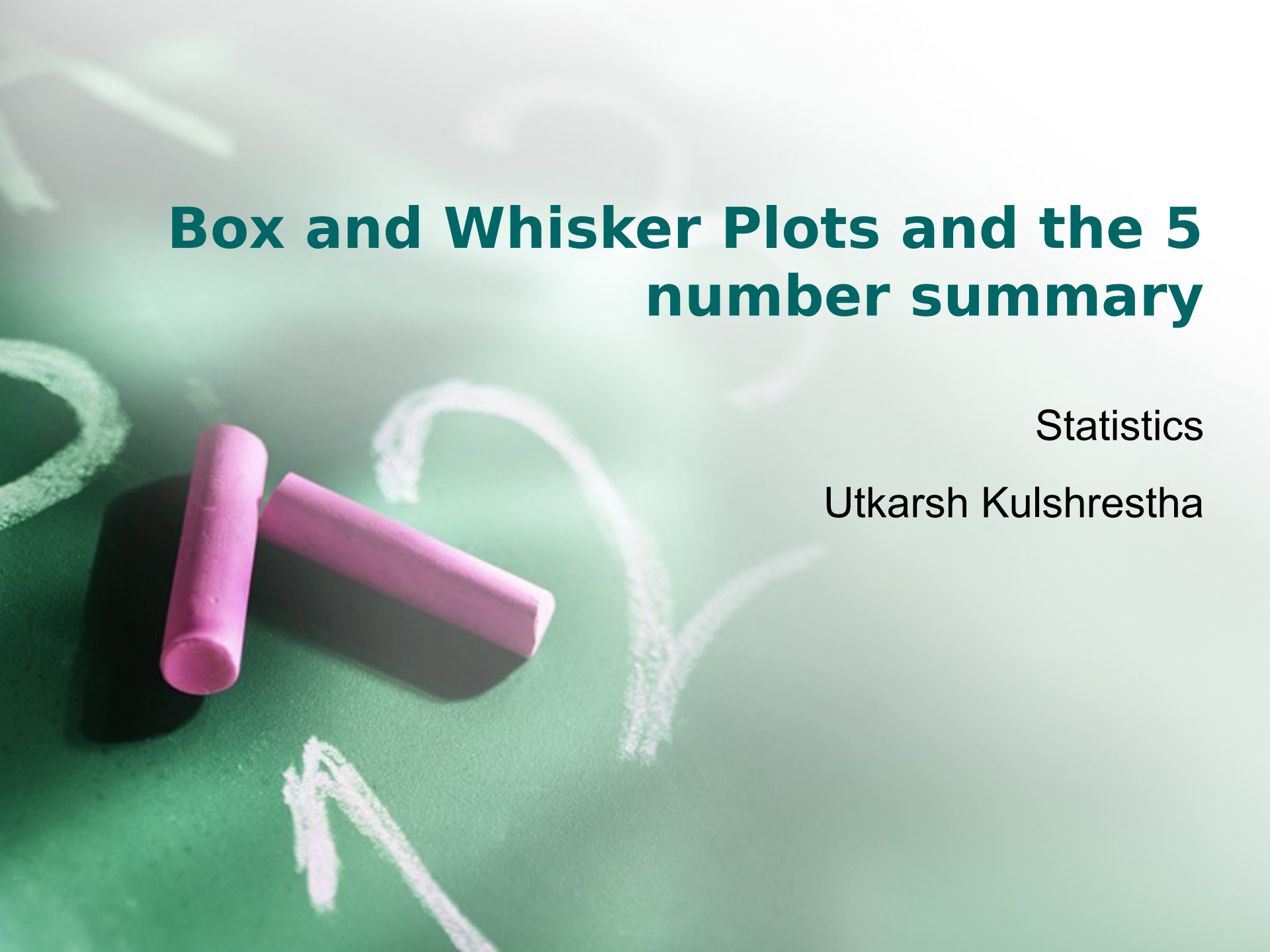

Box and Whisker Plots and the 5 number summary

Statistics

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Box and Whisker Plots

A **box plot** summarizes data using the median, upper and lower quartiles, and the extreme (least and greatest) values. It allows you to see important characteristics of the data at a glance.

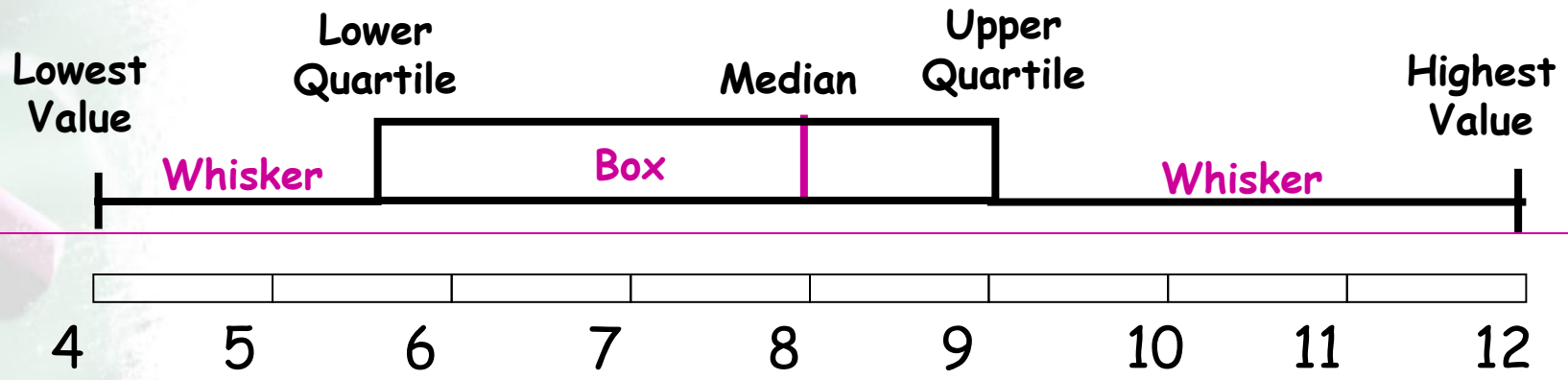
The 5 Number Summary

- The five number summary is another name for the visual representation of the **box and whisker plot.**

- The five number summary consist of :
  - *The median (2nd quartile)*
  - *The 1st quartile*
  - *The 3rd quartile*
  - *The maximum value in a data set*
  - *The minimum value in a data set*

Box and Whisker Diagrams.

Anatomy of a Box and Whisker Diagram.



Constructing a box and whisker plot

Step 1 - take the set of numbers given…

34, 18, 100, 27, 54, 52, 93, 59, 61, 87, 68, 85, 78, 82, 91

Place the numbers in order from least to greatest:

18, 27, 34, 52, 54, 59, 61, 68, 78, 82, 85, 87, 91, 93, 100

Constructing a box and whisker plot

- Step 2 - Find the median.
- Remember, the median is the middle value in a data set.

18, 27, 34, 52, 54, 59, 61, 68, 78, 82, 85, 87, 91, 93, 100

68 is the median of this data set.

Constructing a box and whisker plot

- Step 3 – Find the lower quartile.
- The lower quartile is the median of the data set to the left of 68.

(18, 27, 34, 52, 54, 59, 61,) 68, 78, 82, 85, 87, 91, 93, 100

52 is the lower quartile

Constructing a box and whisker plot

- Step 4 – Find the upper quartile.
- The upper quartile is the median of the data set to the right of 68.

18, 27, 34, 52, 54, 59, 61, 68, (78, 82, 85, 87, 91, 93, 100)

87 is the upper quartile

Constructing a box and whisker plot

- Step 5 – Find the maximum and minimum values in the set.
- The maximum is the greatest value in the data set.
- The minimum is the least value in the data set.

18, 27, 34, 52, 54, 59, 61, 68, 78, 82, 85, 87, 91, 93, 100

18 is the minimum and 100 is the maximum.

Constructing a box and whisker plot

- Step 5 – Find the inter-quartile range (IQR).
- The inter-quartile (IQR) range is the difference between the upper and lower quartiles.
  - Upper Quartile = 87
  - Lower Quartile = 52
  - 87 – 52 = 35
  - 35 = IQR

The 5 Number Summary

- Organize the 5 number summary
  - *Median – 68*
  - *Lower Quartile – 52*
  - *Upper Quartile – 87*
  - *Max – 100*
  - *Min – 18*

Even Numbered Data Sets

If the data set has an ***even number*** *of pieces of data*, we find the **mean** of the two middle numbers to find the **median** of the set

2, 4, 5, 6, 7, 8, 9, 11, 19, 20

7 + 8 = 15

15 divided by 2 = 7.5

The median is 7.5

Even Numbered Data Sets

- The median splits the data set in half.

  [2, 4, 5, 6, 7] **7.5** [8, 9, 11, 19, 20]

- From here we can then find the upper and lower quartiles as well as the upper and lower extremes.

Lower Quartile

- The lower quartile is the median of the bottom half of the data (to the left of the median).

[2, 4, **5**, 6, 7] **7.5** [8, 9, 11, 19, 20]

Lower Quartile for this data = 5

Upper Quartile

- The upper quartile is the median of the top half of the data (to the right of the median).

[2, 4, 5, 6, 7] **7.5** [8, 9, **11**, 19, 20]

The upper quartile for this data set = 11

Interquartile Range

- *To find the interquartile range, subtract the lower quartile from the upper quartile.*

Upper Quartile – Lower Quartile = _____

[2, 4, **5**, 6, 7] **7.5** [8, 9, **11**, 19, 20]

11 – 5 =6

The interquartile range for this data = 6

Lower Extreme

- *The lower extreme is the lowest number in the data set.*

[**2**, 4, 5, 6, 7] **7.5** [8, 9, 11, 19, 20]

The lower extreme for this data set = 2

Upper Extreme

- *The upper extreme is the highest number in the data set.*

[2, 4, 5, 6, 7] **7.5** [8, 9, 11, 19, **20**]

The upper extreme for this data set = 20

Range

- The range of the data can be found by subtracting the lower extreme from the upper extreme.

[**2**, 4, 5, 6, 7] **7.5** [8, 9, 11, 19, **20**]

20 – 2 = 18

The range for this data set = 18

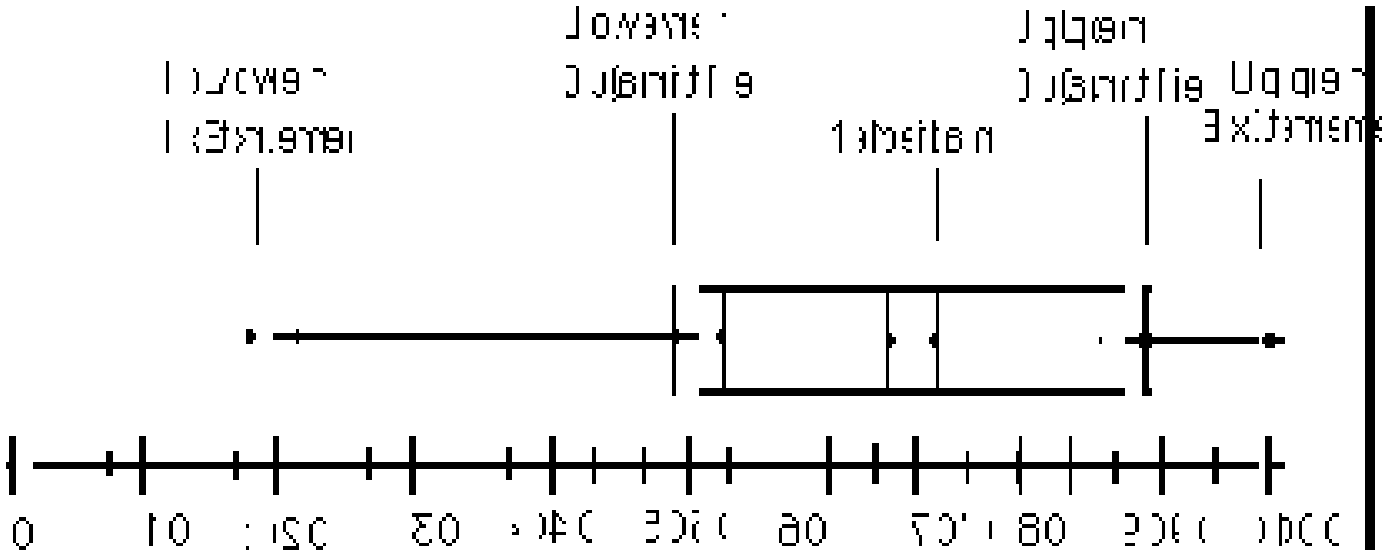
Even Numbered Data Sets

[2, 4, **5**, 6, 7] **7.5** [8, 9, **11**, 19, 20]

- *Median = 7.5*
- *Lower Quartile = 5*
- *Upper Quartile = 11*
- *Upper Extreme = 20*
- *Lower Extreme = 2*

Graphing The Data

- Notice, the Box includes the lower quartile, median, and upper quartile.
- The Whiskers extend from the Box to the max and min.



Interpreting the Box Plot:

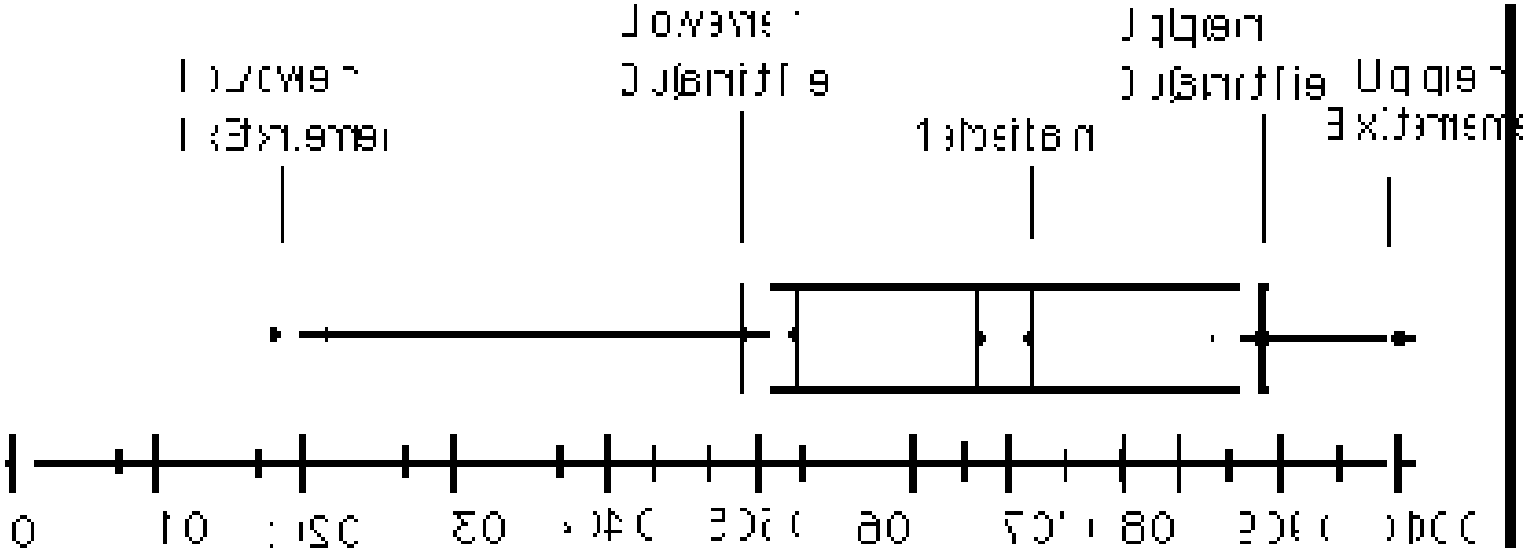
Study your Box and Whisker Plot to determine what it is telling you. Make a statement about what it is saying, then support the statement with facts from your graph.

You should include the following in your interpretation:

- **Range** or spread of the data and what it means to your graph
- **Quartiles**—compare them. What are they telling you about the data?
- **Median**- this is an important part of the graph, and should be an important part of the interpretation.
- **Percentages** should be used to interpret the data, where relevant.

Analyzing The Graph

- The data values found inside the box represent the middle half (50%) of the data.
- The line segment inside the box represents the median



Practice

- Use the following set of data to create the 5 number summary.

3, 7, 11, 11, 15, 21, 23, 39, 41, 45, 50, 61, 87, 99, 220

Median

- What is the median or 2nd quartile?

  3, 7, 11, 11, 15, 21, 23, 39, 41, 45, 50, 61, 87, 99, 220

- The median is 39

Lower Quartile (1st Quartile)

- What is the lower or 1st quartile?

(3, 7, 11, 11, 15, 21, 23), 39, 41, 45, 50, 61, 87, 99, 220

- The lower quartile is 11

Upper Quartile (3rd Quartile)

- What is the upper or 3rd quartile?

3, 7, 11, 11, 15, 21, 23, 39, (41, 45, 50, 61, 87, 99, 220)

- The upper quartile is 61

Maximum

- What is the maximum?

  3, 7, 11, 11, 15, 21, 23, 39, 41, 45, 50, 61, 87, 99, 220

- The max is 220

Minimum

- What is the minimum?

  3, 7, 11, 11, 15, 21, 23, 39, 41, 45, 50, 61, 87, 99, 220

- The min is 3

The 5 Number Summary

- Median - 39
- Lower Quartile - 11
- Upper Quartile - 61
- Max - 220
- Min - 3

Bye Bye

This is finished but Statistics not!!!