

Boxplots

Lecture 17
Section 5.3.3

Robb T. Koether

Hampden-Sydney College

Wed, Feb 15, 2012

Outline

- 1 Boxplots
 - TI-83 Boxplots
- 2 Modified Boxplots
 - TI-83 Modified Boxplots
- 3 Assignment

Outline

1 Boxplots

- TI-83 Boxplots

2 Modified Boxplots

- TI-83 Modified Boxplots

3 Assignment

Definition (Boxplot)

A **boxplot** is a graphical display of a five-number summary.

- The interquartile range is represented by a rectangle over a vertical scale.
- The median is represented by a vertical line through the rectangle.
- The maximum and minimum are represented by “tails” or “whiskers” attached to the ends of the rectangle.

Example

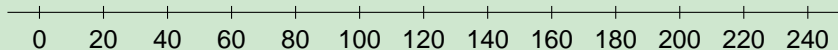
Example (Boxplot)

- Draw a boxplot of the sample

5, 20, 30, 45, 60, 80, 100, 140, 150, 200, 240.

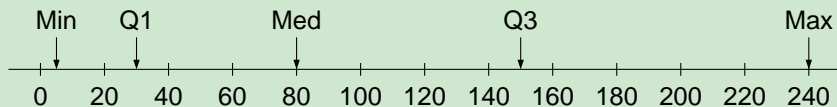
Example

Example (Boxplot)



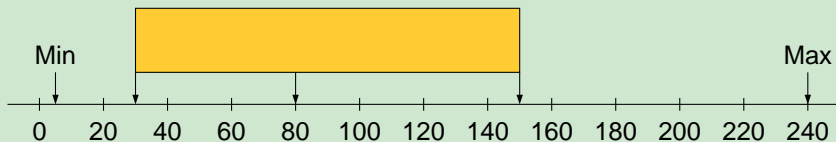
Example

Example (Boxplot)



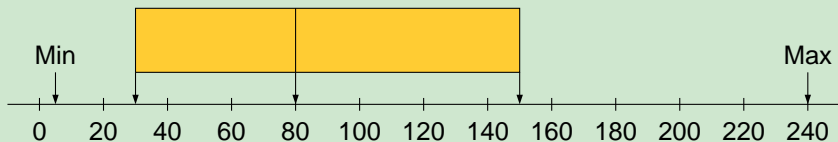
Example

Example (Boxplot)



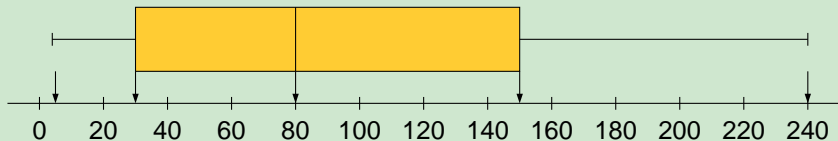
Example

Example (Boxplot)



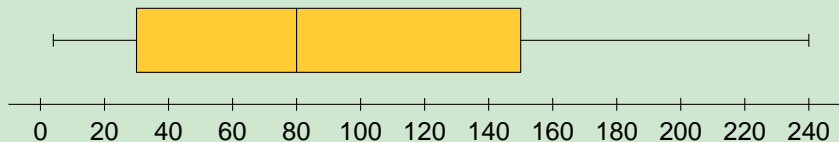
Example

Example (Boxplot)



Example

Example (Boxplot)



Boxplots and Shape

- What would a boxplot for a uniform distribution look like?
- What would a boxplot for a symmetric distribution look like?
- What would a boxplot for a right-skewed distribution look like?
- What would a boxplot for a symmetric bimodal distribution look like?

Outline

- 1 Boxplots
 - TI-83 Boxplots
- 2 Modified Boxplots
 - TI-83 Modified Boxplots
- 3 Assignment

TI-83 Boxplots

- Press `STAT PLOT`.
- Select `Plot1`
- Turn `Plot1 On`.
- Under `Type`, select the boxplot icon (2nd row, 2nd icon).
- Specify list `L1`.
- Press `ZOOM`.
- Select `ZoomStat (#9)` and press `ENTER` (or press `9`).

TI-83 Boxplots

- To get the five-number summary from the boxplot,
 - Press `TRACE`.
 - Use the arrow keys to see the values of the minimum, Q_1 , the median, Q_3 , and the maximum.

Example (TI-83 Boxplots)

- Use the TI-83 to draw a boxplot of the rainfall data.

9.52	0.08	6.14	8.68	2.93	2.03
3.60	14.71	4.01	0.85	6.89	11.07
4.42	3.41	2.85	2.56	1.92	5.15
1.58	4.44	0.77	4.76	1.15	3.02
1.73	2.60	2.56	10.01	2.46	6.49

Outline

- 1 Boxplots
 - TI-83 Boxplots
- 2 Modified Boxplots
 - TI-83 Modified Boxplots
- 3 Assignment

Modified Boxplots

Definition (Outlier)

An **outlier** is any value that is more than 1.5 IQR below Q_1 or more than 1.5 IQR above Q_3 .

Definition (Extreme outlier)

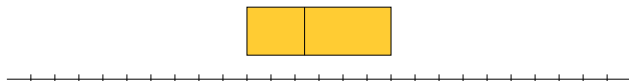
An **extreme outlier** is any value that is more than 3 IQR below Q_1 or more than 3 IQR above Q_3 .

Definition (Modified boxplot)

A **modified boxplot** is a boxplot in which the outliers (and extreme outliers) are indicated by separate dots.

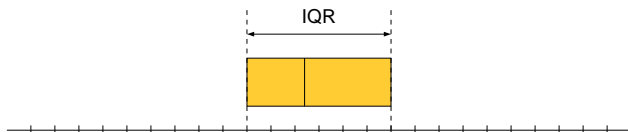
Modified Boxplots

- To draw a modified boxplot,
 - Draw the box part of the boxplot as usual.
 - Compute $\text{STEP} = 1.5 \times \text{IQR}$.
 - The inner fences are at $Q_1 - \text{STEP}$ and $Q_3 + \text{STEP}$.



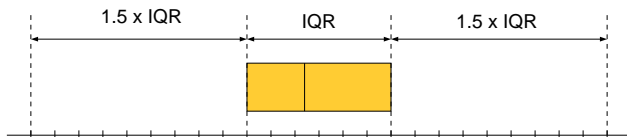
Modified Boxplots

- To draw a modified boxplot,
 - Draw the box part of the boxplot as usual.
 - Compute $\text{STEP} = 1.5 \times \text{IQR}$.
 - The inner fences are at $Q_1 - \text{STEP}$ and $Q_3 + \text{STEP}$.



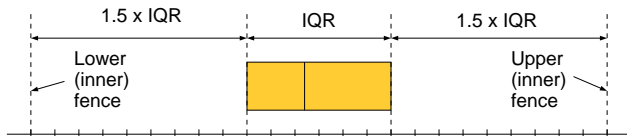
Modified Boxplots

- To draw a modified boxplot,
 - Draw the box part of the boxplot as usual.
 - Compute $\text{STEP} = 1.5 \times \text{IQR}$.
 - The inner fences are at $Q_1 - \text{STEP}$ and $Q_3 + \text{STEP}$.



Modified Boxplots

- To draw a modified boxplot,
 - Draw the box part of the boxplot as usual.
 - Compute $\text{STEP} = 1.5 \times \text{IQR}$.
 - The inner fences are at $Q_1 - \text{STEP}$ and $Q_3 + \text{STEP}$.



Modified Boxplots

- Extend the whiskers from the box to the smallest and largest values that are within the inner fences.
- Any values that are outside the inner fences should be drawn as individual dots.
- These dots represent outliers.

Modified Boxplots

Practice

- Draw a modified boxplot of the sample

9, 13, 38, 40, 42, 43, 46, 47, 49, 53, 55, 60, 84.

Outline

- 1 Boxplots
 - TI-83 Boxplots
- 2 Modified Boxplots
 - TI-83 Modified Boxplots
- 3 Assignment

TI-83 - Modified Boxplots

TI-83 Modified Boxplots

- Follow the same steps as for a regular boxplot, but for the `Type`, select the modified-boxplot icon, the first icon in the second row. It looks like a boxplot with a couple of extra dots.

TI-83 - Modified Boxplots

Example

TI-83 Modified Boxplots

- Use the TI-83 to draw a modified boxplot of the April rainfall data.

2.63	4.25	3.82	3.88	3.04	2.48
2.14	2.60	4.48	2.25	1.05	2.72
4.86	4.05	14.59	5.33	3.61	5.72
1.33	1.26	2.47	0.80	4.12	1.87
1.39	1.47	2.06	3.41	0.74	2.82

TI-83 - Modified Boxplots

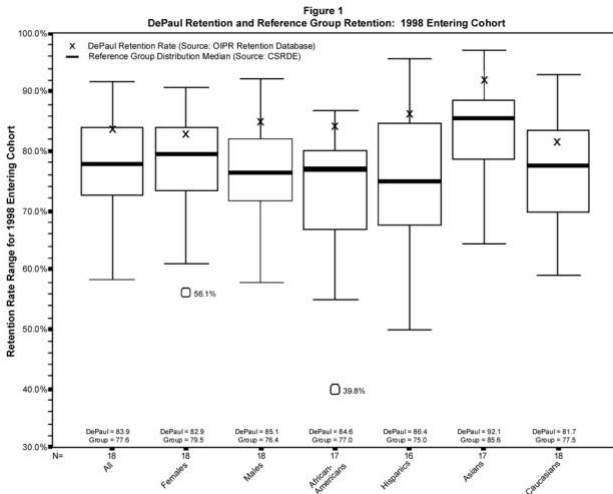
Practice

- Use the TI-83 to draw a modified boxplot of the sample data of the September and the April rainfall data together, using two Stat Plots.

Box Plots

- For an example of modified boxplots, see [DePaul University's web page on retention.](#)

Box Plots



Outline

- 1 Boxplots
 - TI-83 Boxplots
- 2 Modified Boxplots
 - TI-83 Modified Boxplots
- 3 Assignment**

Assignment

Homework

- Read Section 5.3.3, pages 315 - 325.
- Let's Do It! 5.8, 5.9, 5.10, 5.11.
- Page 333, exercises 12, 13, 15, 19.