Boxplots
TI-83 Boxplots
Modified Boxplots
TI-83 Modified Boxplots
Assignment
Answers to Even-numbered Exercises

Boxplots

Lecture 17
Section 5.3.3

Robb T. Koether

Hampden-Sydney College

Wed, Sep 23, 2009

Outline

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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

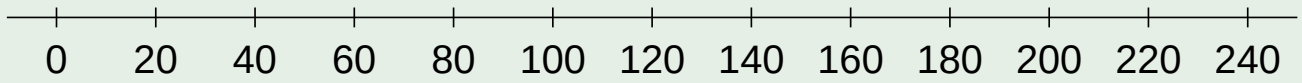
Example (Boxplot)

- Draw a boxplot of the sample

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

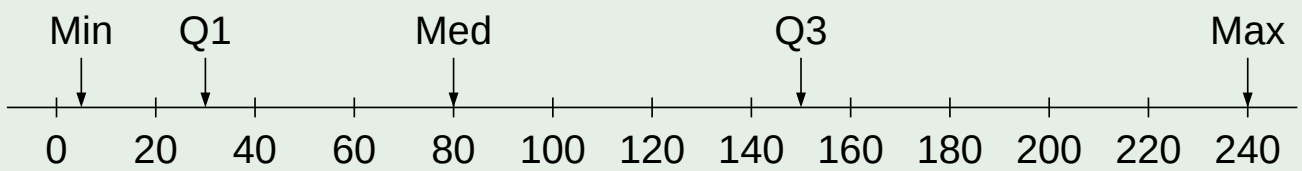
Example

Example (Boxplot)



Example

Example (Boxplot)



Example

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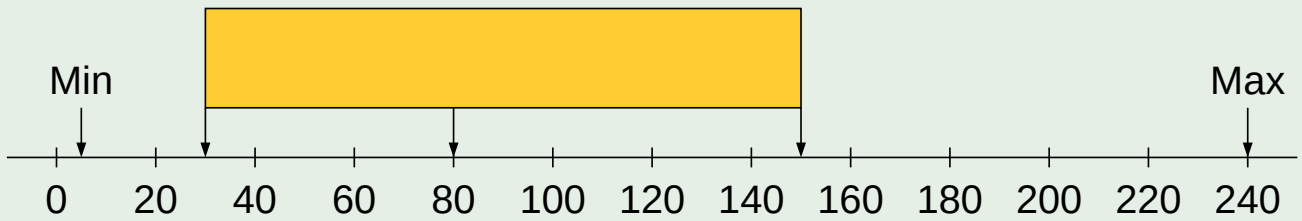
Example (Boxplot)



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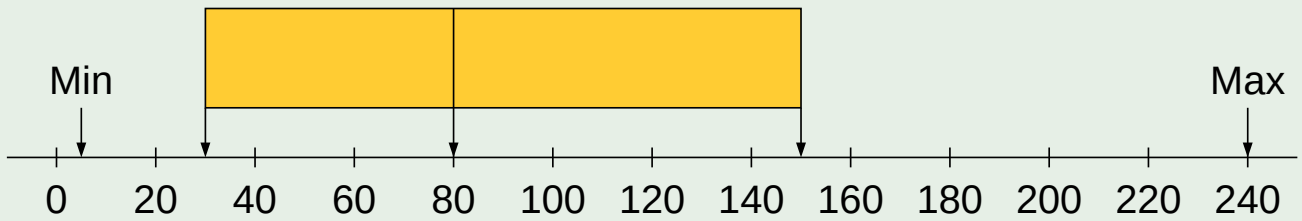
Example (Boxplot)



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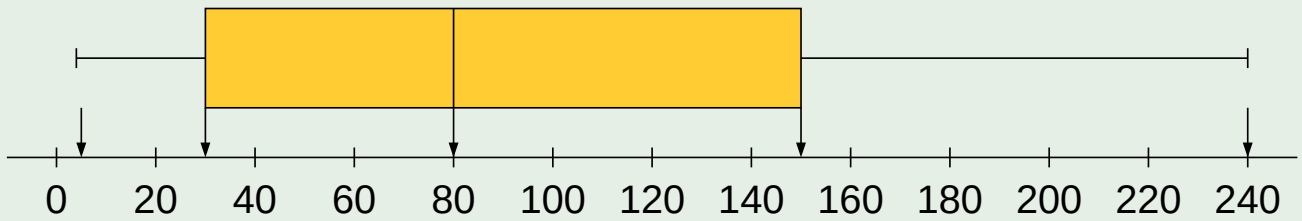
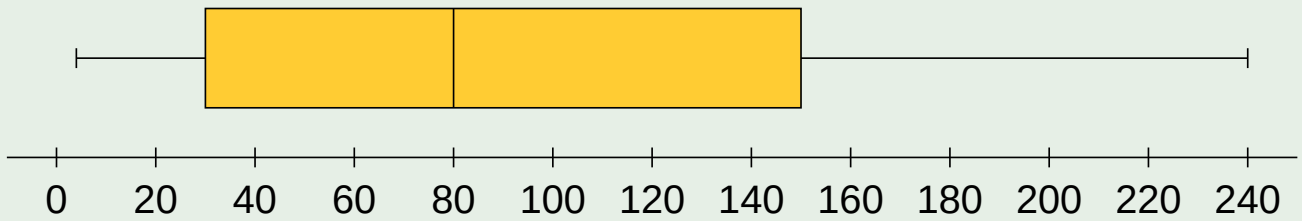
Example (Boxplot)



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?

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TI-83 Boxplots

- Press `STAT PLOT`.
- Select `Plot1`
- Turn Plot1 `On`.
- Under `Type`, select the boxplot icon (2nd row, 2nd icon).
- Specify list L_1.
- Press `ZOOM`.
- Select `ZoomStat` (#9) and press `ENTER` (or press 9).

TI-83 - Boxplots

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.

TI-83 - Boxplots

Example (TI-83 Boxplots)

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

15.09	2.82	24.18	0.20	15.60	22.04
7.44	5.16	9.14	37.36	10.19	2.16
17.50	28.12	11.23	8.66	7.24	6.50
4.88	13.08	4.01	11.28	1.96	12.09
2.92	7.67	4.39	6.60	6.50	25.43

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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.

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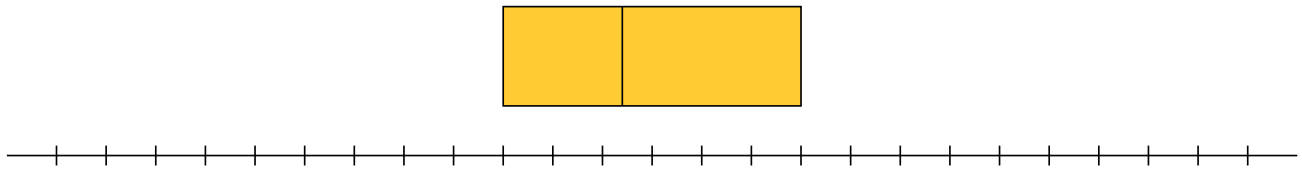
- To draw a modified boxplot,
  - Draw the box part of the boxplot as usual.
  - Compute STEP $= 1.5 \times$ IQR.
  - The inner fences are at $Q_1 -$ STEP and $Q_3 +$ STEP.



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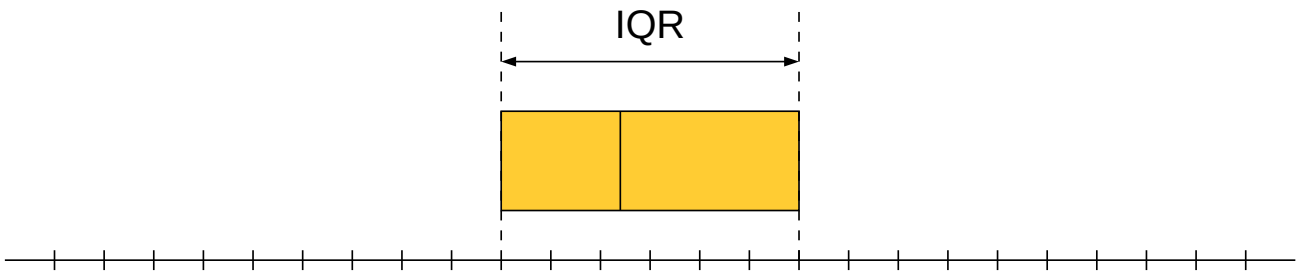

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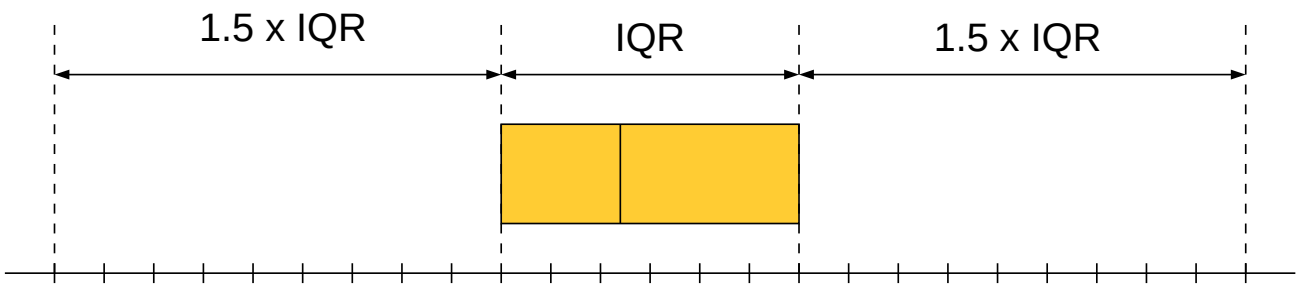
  - Compute STEP $= 1.5 \times$ IQR.
  - The inner fences are at $Q_1 -$ STEP and $Q_3 +$ STEP.



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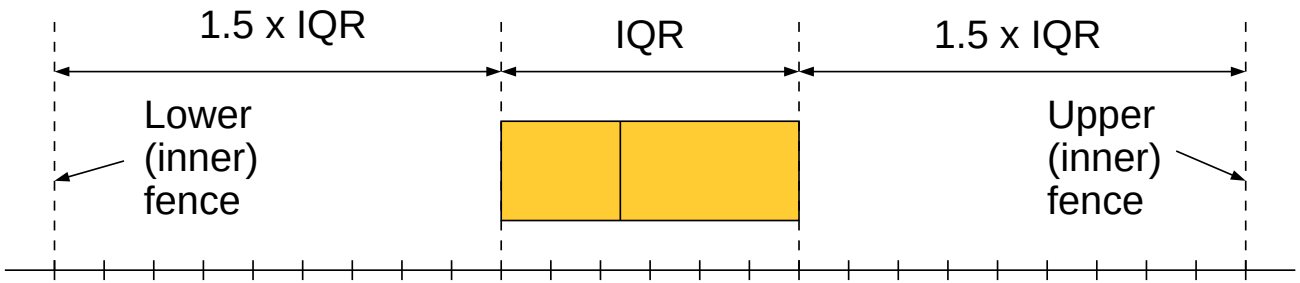
- To draw a modified boxplot,
  - Draw the box part of the boxplot as usual.
  - Compute STEP $= 1.5 \times$ IQR.
  - The inner fences are at $Q_1 -$ STEP and $Q_3 +$ STEP.



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- 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.

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Practice

- Draw a modified boxplot of the sample

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

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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 rainfall data.

15.09	2.82	24.18	0.20	15.60	22.04
7.44	5.16	9.14	37.36	10.19	2.16
17.50	28.12	11.23	8.66	7.24	6.50
4.88	13.08	4.01	11.28	1.96	12.09
2.92	7.67	4.39	6.60	6.50	25.43

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Practice

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

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

Box Plots

- For an example of modified boxplots, see DePaul University's web page on retention.

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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.

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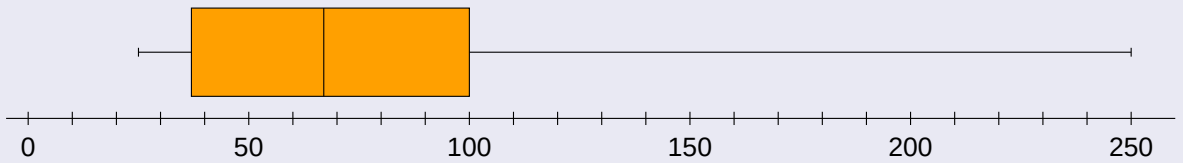
Page 333, Exercise 12

5.12 (a)



(b) It is more than 50%, but not more than 75%.

(c) $\$37,000$