

## Histograms

Robb T.  
Koether

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Review

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Classes

Getting the  
Frequencies

Drawing the Graph

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Assignment

# Histograms

## Lecture 14 Section 4.4.4

Robb T. Koether

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# Outline

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### Exercise 4.25, p. 249.

The following is a list of homework scores for two students:

Student A: 80, 52, 86, 94, 76, 48, 92, 69, 79, 45.

Student B: 73, 87, 81, 75, 78, 82, 84, 74, 80, 76.

- Construct a back-to-back stem-and-leaf plot of the data.
- Which student do you think has done better work?  
Explain your answer.

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## Solution

(a) The back-to-back stem-and-leaf display:

Student A		Student B
5 8	4	
2	5	
9	6	
9 6	7	3 5 8 4 6
6 0	8	7 1 2 4 0
2 4	9	

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## Solution

(b) I think Student B did better work. Even though he didn't get any A's, his work was consistent acceptable.

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- We will learn a third method of displaying quantitative data, the histogram.
- This method takes more effort than the other two, but it is more flexible and produces a much better display.
- And, it can be done on the TI-83.

# Introduction

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## Definition (Classes)

A **class** is an interval of values. Typically, it includes the lower endpoint and does not include the upper endpoint.

## Definition (Histogram)

A **histogram** is a graphical display of quantitative data in which each class is represented by a rectangle. The size of the rectangle is proportional to the number of observations in the class.

# Histograms vs. Bar Graphs

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Assignment

- Bar graphs are for qualitative data
- Histograms are for quantitative data.
- We indicate this difference by leaving a gap between the bars of a bar graph and no gap between the rectangles of a histogram.

# Example

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Assignment

- Draw a histogram of the rainfall data, in centimeters.

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	0.74

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Assignment

- Find the maximum value, the minimum value, and the range.
- Minimum = 0.20.
- Maximum = 37.36.
- Range = Max – Min =  $37.36 - 0.20 = 37.16$ .

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Assignment

- Divide the data into classes of equal width.
- The classes must not overlap.
- Choose a convenient starting point.
- Choose a convenient class width.
- Write the endpoints of each class.

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Assignment

- Let's let the class width be 5 (other choices are possible).
- Then the number of classes will be at least  $37.16/5 = 7.432$ , or 8.
- Or we could begin by deciding to use 8 classes (other choices are possible).
- Then the width must be at least  $37.16/8 = 4.645$ , or 5.

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Assignment

- Let's let the starting point be 0.
- Classes:
  - 0.00 up to 4.99 (but not including 5.00)
  - 5.00 up to 9.99
  - 10.00 up to 14.99
  - 15.00 up to 19.99
  - 20.00 up to 24.99
  - 25.00 up to 29.99
  - 30.00 up to 34.99
  - 35.00 up to 39.99

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Assignment

- We may write the classes in either of two ways.
- Interval notation: [low, high).
  - [0.00, 5.00),
  - [5.00, 10.00),
  - [10.00, 15.00), etc.
- [ and ] mean “include endpoints.”
- ( and ) mean “exclude endpoints.”

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Assignment

- Range notation: low - high
  - 1.000 - 1.499,
  - 1.500 - 1.999,
  - 2.000 - 2.499, etc.
- With this notation, the endpoints are assumed to be included.
- Therefore, be sure the endpoints do not overlap.
- Yet be sure that no possible values are left out.

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Assignment

- Count the number of observations in each class.
- This is the frequency of the class.

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Assignment

- Draw horizontal and vertical axes.
- On the horizontal axis, show the class limits.
- On the vertical axis, show uniform reference points representing frequencies or percentages that are appropriate for the data, starting at 0.
- Over each class, draw a rectangle whose height is the frequency, or relative frequency, of that class.

# Drawing Histograms

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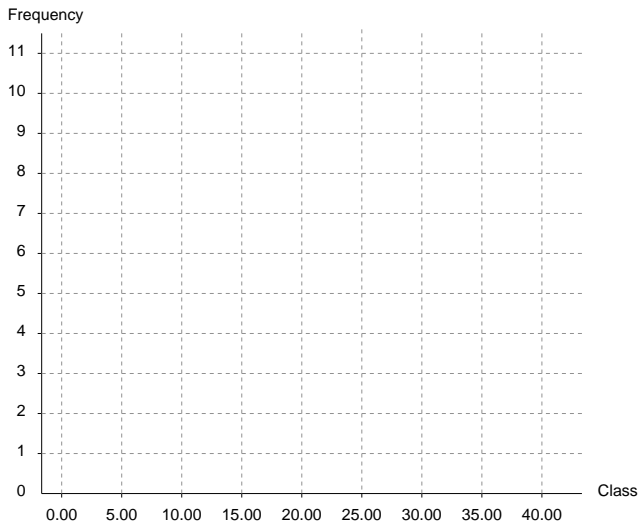
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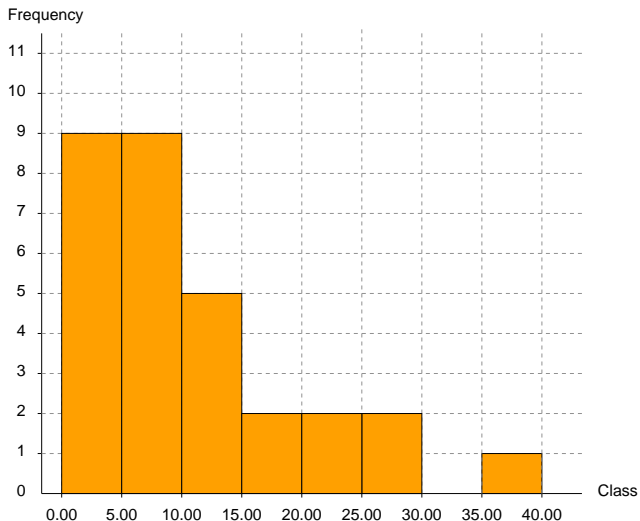
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Assignment

- We could have used 7 classes of width 6.

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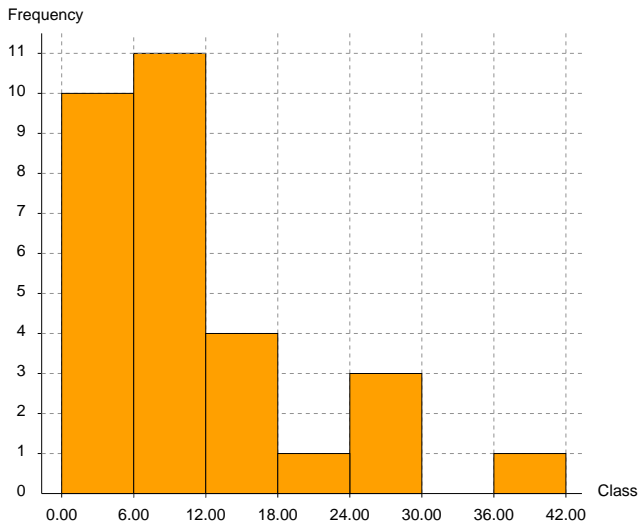
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- Or we could have used 10 classes of width 4.

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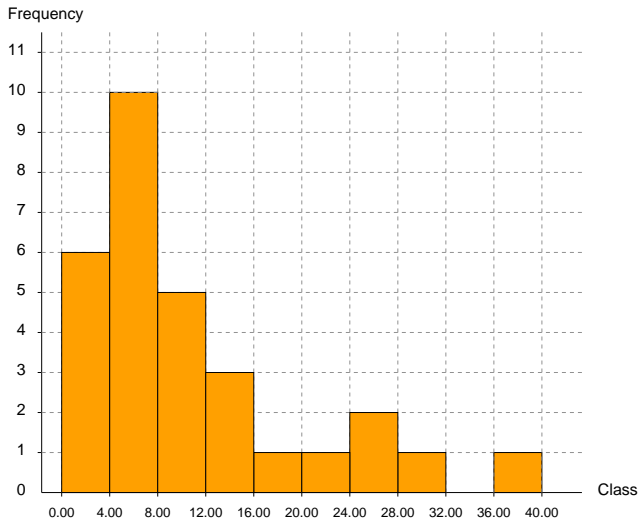
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Assignment

- Guidelines:
  - Never use too few or too many classes.
  - Usually 5 to 12 classes is about right.
  - Use simple round numbers for the class boundaries.
  - Mark off the vertical axis uniformly, showing regular reference points, not the actual frequencies.
  - The vertical scale must start at 0.

# TI-83 - Histograms

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## TI-83 Histogram

- Enter the data into list  $L_1$ .
- $\{2.82, 24.18, 0.20, \dots, 0.74\} \rightarrow L_1$
- Press **STAT PLOT**
- Select **Plot1**.
- Press **ENTER**.
- Turn **Plot1** on.
- Select histogram type.
- Specify list  $L_1$ .

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## TI-83 Histogram

- Press `WINDOW`
- Set `Xmin` to the starting point.
- Set `Xmax` to the last endpoint.
- Set `Xscl` to the class width.
- Set `Ymin` to 0 (or  $-1$  for a margin).
- Set `Ymax` to the maximum frequency.
- Press `GRAPH`. The histogram appears.

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## TI-83 Histogram

- Or, press ZOOM.
- Select ZoomStat (#9). The histogram appears.

# TI-83 - Frequency Distributions

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## TI-83 Histogram

- After getting the histogram, press `TRACE`.
- The display shows the first class and its frequency.
- Use the left arrow to see the other class frequencies.

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## Homework

- Read Section 4.4.4, pages 252 - 259.
- Let's Do It! 4.14, 4.16.
- Page 259, exercises 30, 31, 33 - 36, 38.
- Chapter 4 review, p. 284, exercises 58, 59, 67 - 69.