

Histograms

Lecture 14
Section 4.4.4

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Outline

- 1 Introduction
- 2 Histograms
 - Choosing the Classes
 - Getting the Frequencies
 - Drawing the Graph
- 3 Histograms on the TI-83
- 4 Assignment

Outline

1 Introduction

2 Histograms

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3 Histograms on the TI-83

4 Assignment

Introduction

- We will learn a third method of displaying quantitative data, the histogram.

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- 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.

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Histograms

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 the data are distributed among classes and 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

- 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

- Draw a histogram 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

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Drawing Histograms

- Find the maximum value, the minimum value, and the range.
- Minimum = 0.08.
- Maximum = 14.71.
- Range = Max – Min = $14.71 - 0.08 = 14.63$.

Drawing Histograms

- Choose a convenient starting point.
- Divide the scale into classes of equal width. Use a convenient width.
- Then the number of classes will be

$$\text{No. of classes} = \frac{\text{Range}}{\text{Class Width}}$$

- The choice must satisfy:
 - Not too many classes (15 is too many for small data sets)
 - Not too few classes (4 is too few for any data set)

Drawing Histograms

- Next, write the class intervals in a column.
- Let's let the class width be 2 (other choices are possible).
- Then the number of classes will be at least

$$\frac{14.63}{2} = 7.315,$$

or 8.

Drawing Histograms

- Let's let the starting point be 0.
- Classes, in interval notation:
 - $[0, 2)$ (means "at least 0, but less than 2")
 - $[2, 4)$
 - $[4, 6)$
 - $[6, 8)$
 - $[8, 10)$
 - $[10, 12)$
 - $[12, 14)$
 - $[14, 16)$

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Drawing Histograms

- Count the number of observations in each class.
- Write the **frequency distribution**.

Class	Freq.
[0, 2)	7
[2, 4)	10
[4, 6)	5
[6, 8)	3
[8, 10)	2
[10, 12)	2
[12, 14)	0
[14, 16)	1

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- **Drawing the Graph**

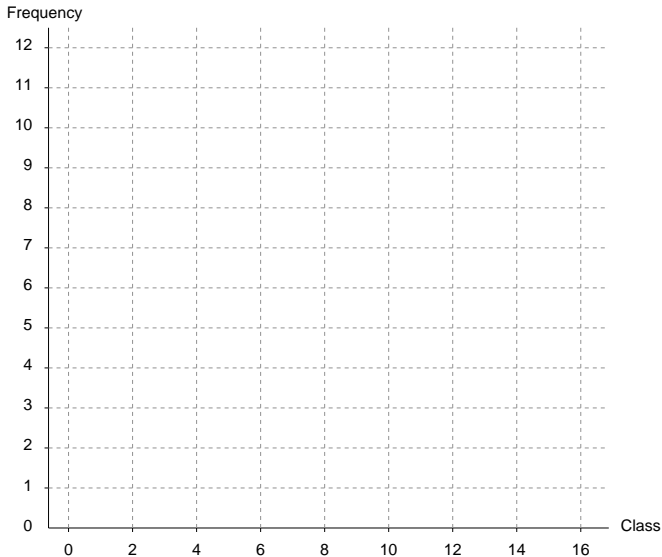
3 Histograms on the TI-83

4 Assignment

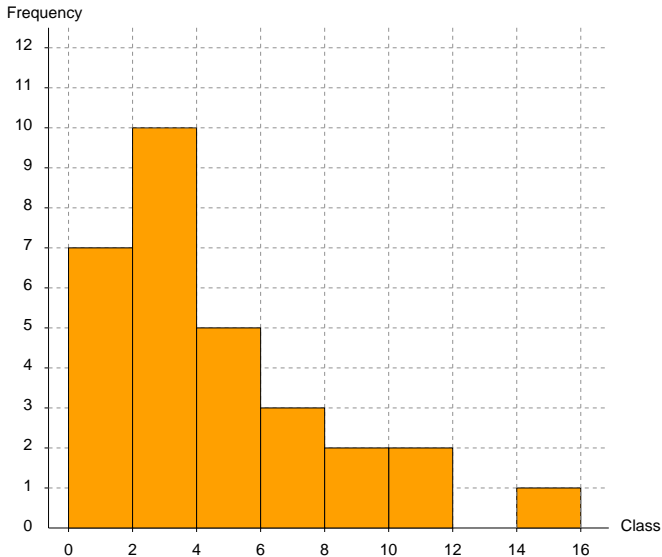
Drawing Histograms

- 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



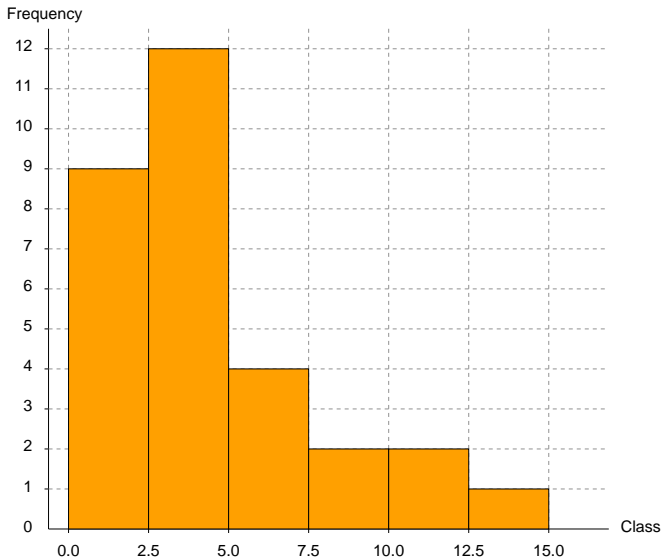
Drawing Histograms



Drawing Histograms

- We could have used a class width of 2.5, producing 6 classes.

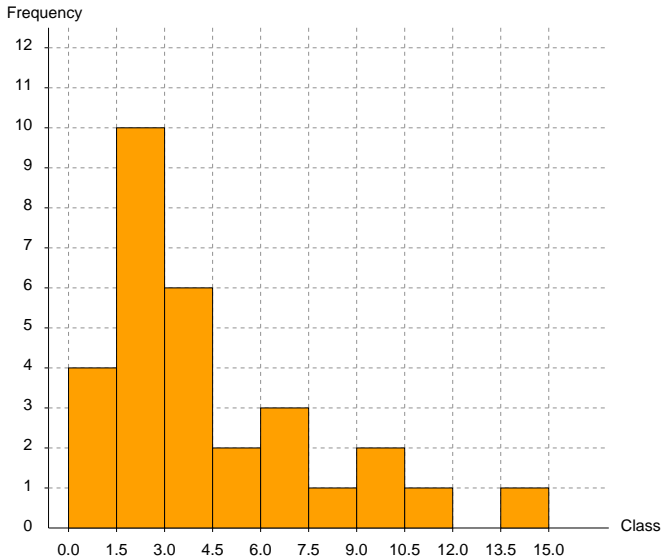
Drawing Histograms



Drawing Histograms

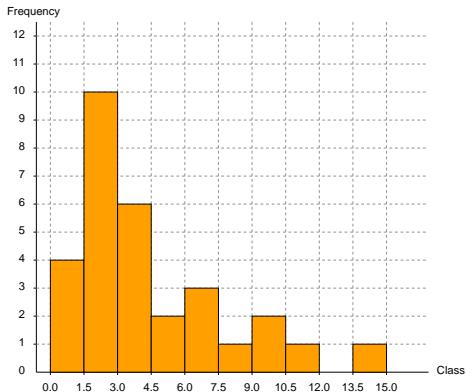
- Or we could have used a class width of 1.5, producing 10 classes.

Drawing Histograms



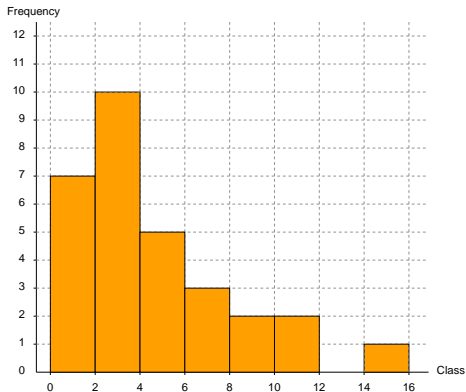
Comparing Histograms

- How do the three histograms compare?



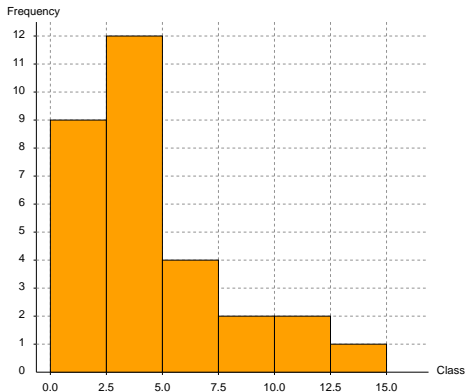
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Comparing Histograms

- How do the three histograms compare?



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TI-83 - Histograms

- The TI-83 will draw histograms.
- We will work through an example, using simpler data than the rainfall data.
- These data represent test scores in a class of 15 students

67	69	80	96	91
67	65	73	94	82
69	87	76	66	90

TI-83 Histogram

- Enter the data into list L_1 .
- $\{67, 69, 80, \dots, 90\} \rightarrow L_1$
- Press `STAT PLOT`
- Select `Plot1`.
- Press `ENTER`.
- Turn `Plot1` on.
- Select histogram type.
- Specify list L_1 .

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.

TI-83 Histogram

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

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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Assignment

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.