Lecture 2:
Chapter 2

C C Moxley

UAB Mathematics

3 September 15

§2.2 Frequency Distributions

Definition (Frequency Distribution)

Frequency distributions show how data are distributed among categories (classes) by listing the frequencies (i.e. the number of instances) alongside a category (class).

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Grade	Frequency
A	15
B	18
C	12
D	8
F	5

Components of a Frequency Distribution

- **upper/lower class limits**

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Consider the differences in the following frequency distributions

Example

Grade	Frequency		Grade	Frequency
A	15		90-100	15
B	18		80-89	18
C	12		70-79	12
D	8		60-69	8
F	5		50-59	5

Constructing a Frequency Distribution

A sample of 25 students in MA180 gave the following heart rates in beats per minute: 60, 52, 77, 88, 87, 90, 58, 65, 67, 77, 59, 80, 90, 67, 66, 59, 69, 93, 94, 70, 71, 60, 95, 58, 61. Construct a frequency distribution.

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Constructing a Frequency Distribution

Our resulting frequency distribution would look like this.

Class	Frequency
90-99	5
80-89	3
70-79	4
60-69	8
50-59	5

Relative and Cumulative Frequency Distributions

Our resulting relative frequency distribution would look like this.

Class	Frequency		Class	Relative Frequency
90-99	5		90-99	20%
80-89	3		80-89	12%
70-79	4		70-79	16%
60-69	8		60-69	32%
50-59	5		50-59	20%

Relative and Cumulative Frequency Distributions

Our resulting cumulative frequency distribution would look like this.

Class	Frequency		Class	Cumulative Frequency
90-99	5		≤ 99	25
80-89	3		≤ 89	20
70-79	4		≤ 79	17
60-69	8		≤ 69	13
50-59	5		≤ 59	5

Relative and Cumulative Frequency Distributions

Our resulting cumulative frequency distribution would look like this.

Class	Frequency		Class	Cumulative Frequency
90-99	5		< 100	25
80-89	3		< 90	20
70-79	4		< 80	17
60-69	8		< 70	13
50-59	5		< 60	5

Normal Distribution

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Normal Distribution

Was our previous frequency distribution normal?

Class	Frequency
90-99	5
80-89	3
70-79	4
60-69	8
50-59	5

Simple Distribution Analysis

What might you be able to infer about this sample of student heart rates?

Class	Frequency
140-149	6
130-139	2
120-129	0
110-119	0
100-109	0
90-99	1
80-89	3
70-79	2
60-69	6
50-59	5

A Formula for Number of Classes

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$$1 + \frac{\log n}{\log 2}.$$

In the above formula, n is the number of data points, i.e. records.

Concept Mastery

How many classes should have been used when making our frequency distribution of heart rates for 25 students?

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Well, $1 + \dfrac{\log 25}{\log 2} \approx 6$. So, we would like there to be about six classes.

§2.3 Histograms

Definition (Histogram)

A **histogram** is a graph of a frequency distribution with classes running along the horizontal axis and frequences running along the vertical axis. The bars touch one another in a histogram (unless a class happens to have a frequency of 0).

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Example (Heart Rates)

Convert the frequency distribution to a histogram!

Class	Frequency
90-99	5
80-89	3
70-79	4
60-69	8
50-59	5

Bell-Curve, Histograms, and Normal Distributions

A normal distribution results in a histogram with a bell shape!

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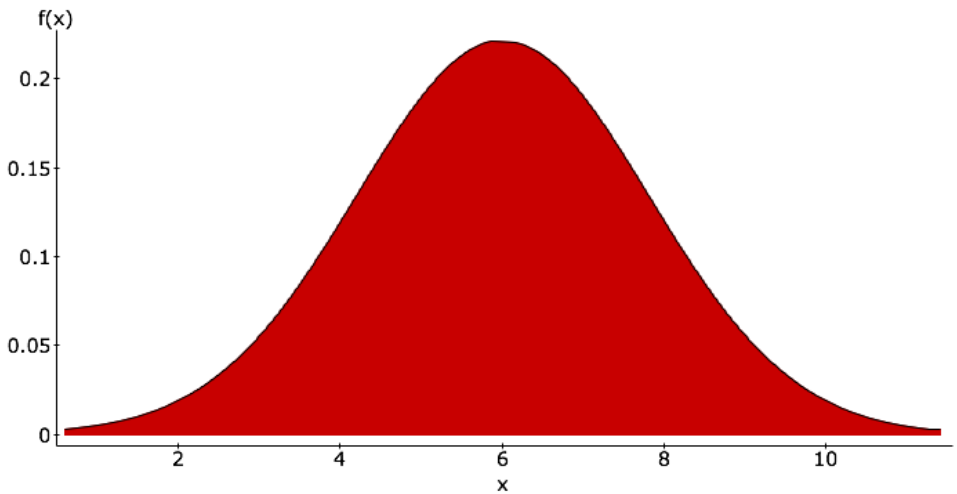
A normal distribution results in a histogram with a bell shape!

Is the histogram from the frequency distribution below bell shaped?

Class	Frequency
90-99	4
80-89	5
70-79	9
60-69	4
50-59	3

Typical Distributions

A normal distribution has a bell shape and should not be skewed left or right.



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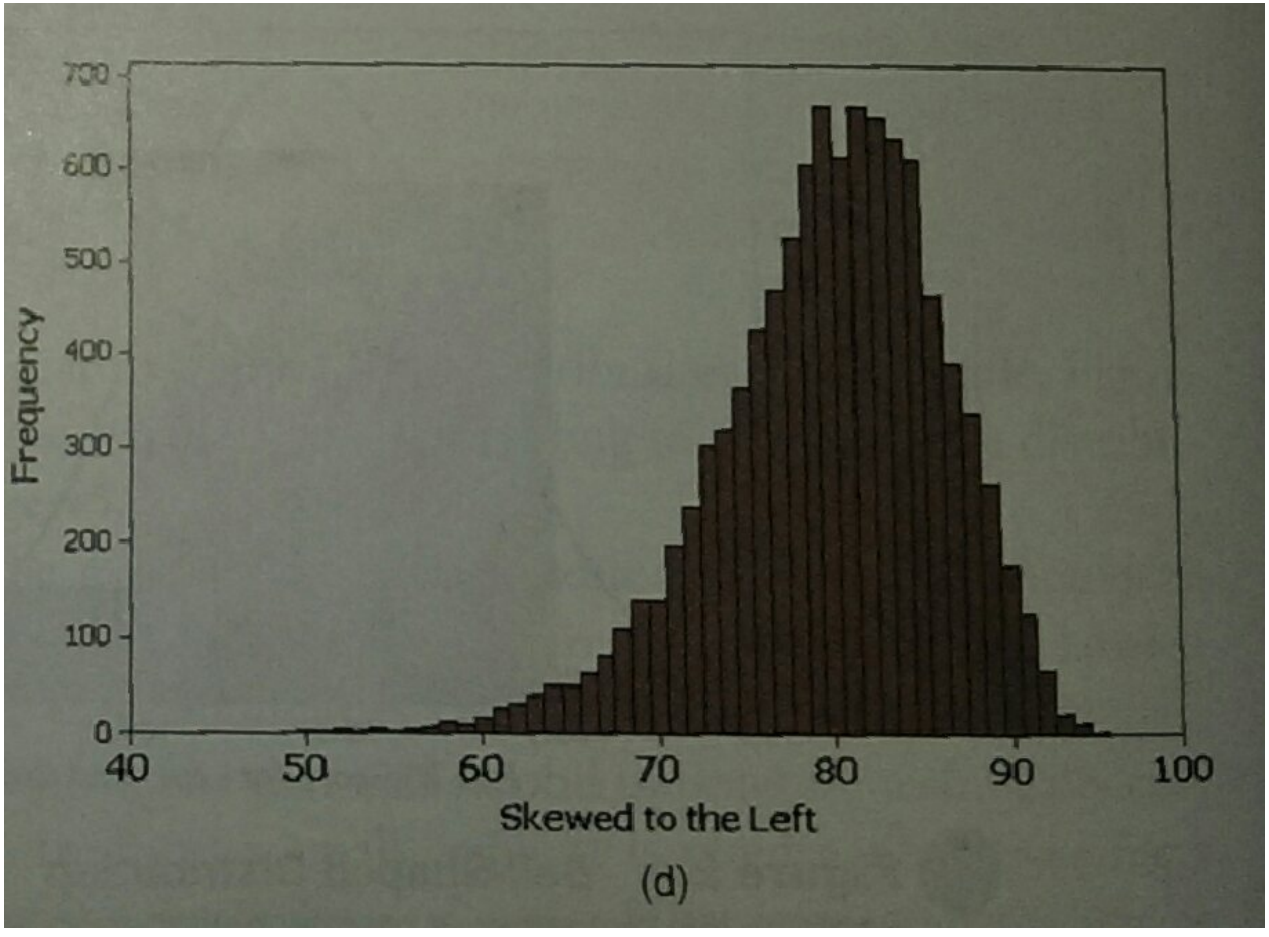

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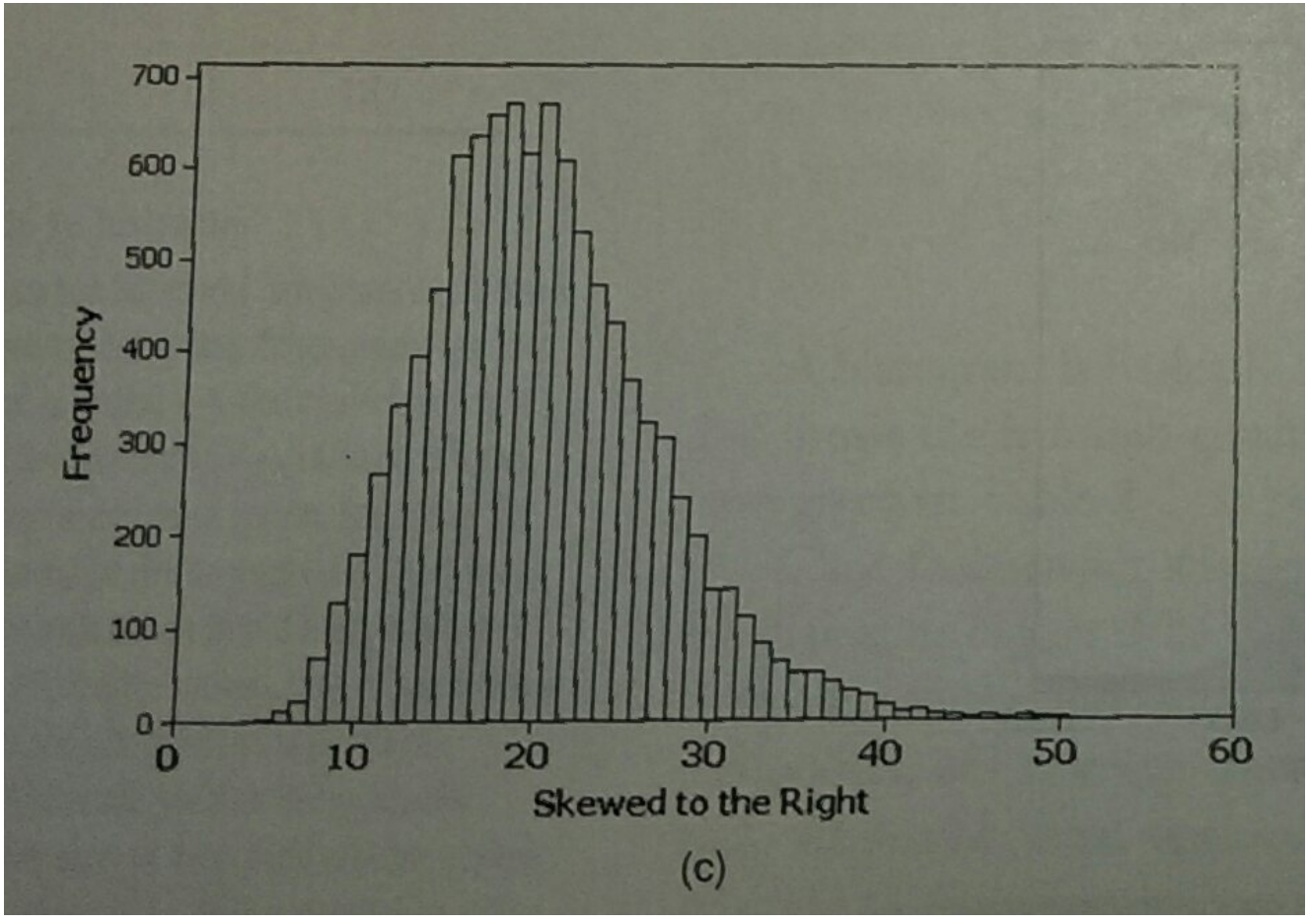
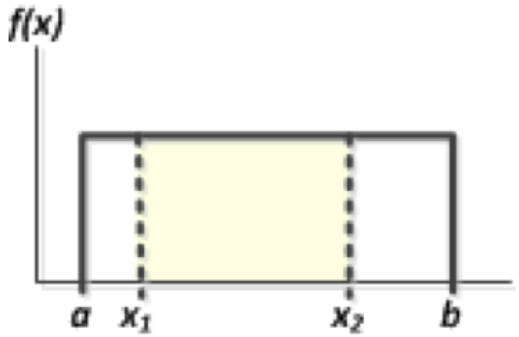


Typical Distributions

A uniform distribution is (relatively) flat.



Other Topics

What would a relative frequency histogram look like?

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What would a cumulative frequency histogram look like?

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What would a relative frequency histogram look like?

What would a cumulative frequency histogram look like?

Discuss normal quantile plots and how they can be used to identify normal distributions.

§2.4 Deceiving and Englightening Graphs

We will discuss correlation coefficients, cluster/gap phenomena, time-series, dotplots and stemplots, bar graphs, Pareto charts, pie charts, frequency polygons, and ogives.

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We will discuss correlation coefficients, cluster/gap phenomena, time-series, dotplots and stemplots, bar graphs, Pareto charts, pie charts, frequency polygons, and ogives. We'll also discuss problems with pictographs and graphs which have non-zero axes.