

Lecture 2: Chapter 2

C C Moxley

UAB Mathematics

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§2.2 Frequency Distributions

Definition (Frequency Distribution)

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Example

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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- **class boundaries**

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- **class midpoints**

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- **class width**

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- class boundaries
- class midpoints
- class width

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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First, we want to decide how many classes we will have. How many should we have? 5 looks like a good number. Thus, the class width should be 10. Thus we have classes 50-59, 60-69, 70-79, 80-89, 90-99.

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

Well, $1 + \frac{\log 25}{\log 2} \approx 6$. 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 frequencies 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!

Bell-Curve, Histograms, and Normal Distributions

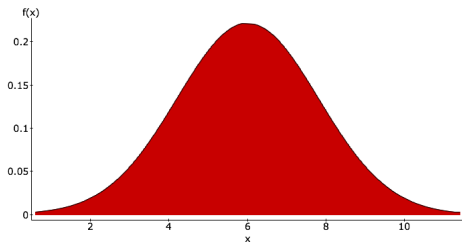
A normal distribution results in a histogram with a bell shape!

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

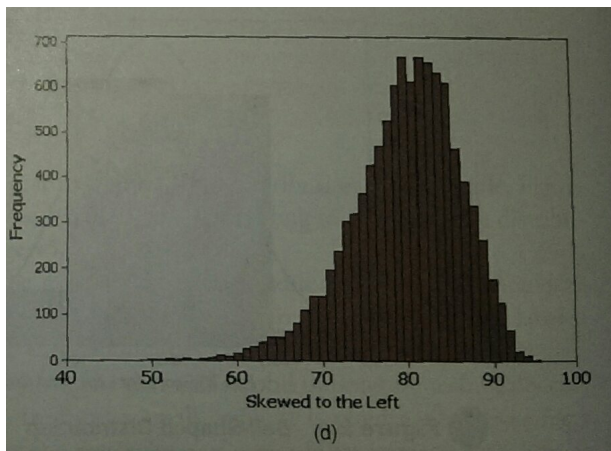
Typical Distributions

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



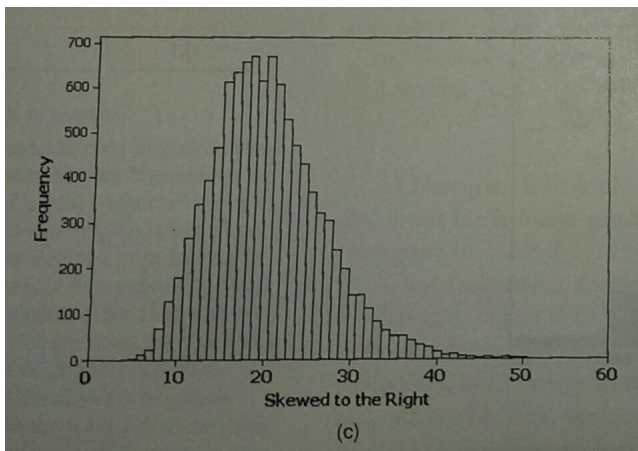
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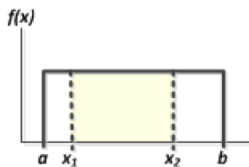
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Typical Distributions

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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The discussion of normal quantile plots and how they can be used to identify normal distributions is not something we will cover in this course. You're welcome to read about it on your own.

§2.4 Deceiving and Enlightening Graphs

Let's quickly 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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Let's quickly 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.