

Measures of Center

Section 3-2

Definitions

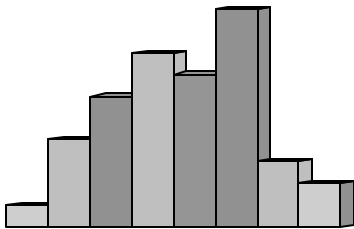
Mean (Arithmetic Mean)

AVERAGE

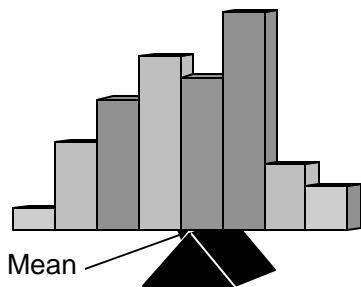
the number obtained by adding the values and dividing the total by the number of values

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Mean as a Balance Point



Mean as a Balance Point



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Notation

- S** denotes the addition of a set of values
- x** is the variable usually used to represent the individual data values
- n** represents the number of data values in a sample
- N** represents the number of data values in a population

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Notation

\bar{x} is pronounced 'x-bar' and denotes the mean of a set of sample values

$$\bar{x} = \frac{Sx}{n}$$

μ is pronounced 'mu' and denotes the mean of all values in a population

$$\mu = \frac{Sx}{N}$$

Calculators can calculate the mean of data

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Definitions

❖ Median

the middle value when the original data values are arranged in order of increasing (or decreasing) magnitude

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the middle value when the original data values are arranged in order of increasing (or decreasing) magnitude

❖ often denoted by \tilde{x} (pronounced 'x-tilde')

❖ is not affected by an extreme value

6.72	3.46	3.60	6.44
3.46	3.60	6.44	6.72

(even number of values)
no exact middle -- shared by two numbers

$$\frac{3.60 + 6.44}{2}$$

MEDIAN is 5.02

6.72	3.46	3.60	6.44
3.46	3.60	6.44	6.72

(even number of values)
no exact middle -- shared by two numbers

$$\frac{3.60 + 6.44}{2}$$

MEDIAN is 5.02

4

6.72	3.46	3.60	6.44	26.70
3.46	3.60	6.44	6.72	26.70

(in order - odd number of values)
exact middle **MEDIAN is 6.44**

Definitions

❖ Mode

the score that occurs most frequently

Bimodal

Multimodal

No Mode

denoted by M

the only measure of central tendency that can be used with nominal data

Examples

a. 5 5 5 3 1 5 1 4 3 5

← Mode is 5

b. 1 2 2 2 3 4 5 6 6 6 7 9

← Bimodal - 2 and 6

c. 1 2 3 6 7 8 9 10

← No Mode

Definitions

❖ Midrange

the value midway between the highest and lowest values in the original data set

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Definitions

❖ Midrange

the value midway between the highest and lowest values in the original data set

$$\text{Midrange} = \frac{\text{highest score} + \text{lowest score}}{2}$$

Round-off Rule for Measures of Center

Carry one more decimal place than is present in the original set of values

$$2 \ 4 \ 7 \ 8 \ 13 \ 15 \quad \bar{x} = 8.166... = 8.2$$

$$2.1 \ 3.5 \ 6.4 \ 8.1 \quad \bar{x} = 5.025 = 5.03$$

Measures of Center

Mean

Median

Mode

Midrange

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Mean from a Frequency Distribution

use class midpoint of classes for variable x

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$$\bar{x} = \frac{S(f \cdot x)}{Sf} \quad \text{Formula 3-2}$$

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use class midpoint of classes for variable x

$$\bar{x} = \frac{S(f \cdot x)}{Sf} \quad \text{Formula 3-2}$$

x = class midpoint

f = frequency

$Sf = n$

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Weighted Mean

$$\bar{x} = \frac{S(w \cdot x)}{S w}$$

Mean for a Frequency Distribution

Quiz Scores	Frequency
0-4	2
5-9	5
10-14	8
15-19	11
20-24	7

Mean for a Frequency Distribution

Quiz Scores	Midpoints	Frequency
0-4	2	2
5-9	7	5
10-14	12	8
15-19	17	11
20-24	22	7

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Mean for a Frequency Distribution

Quiz Scores	Midpoints	Frequency
0-4	2	2
5-9	7	5
10-14	12	8
15-19	17	11
20-24	22	7

$$\bar{x} = \frac{S(f \cdot x)}{Sf}$$

Calculator Basics for Statistical Data

1. Put calculator into statistical mode
2. Clear previous data
3. Enter data (and frequency)
4. Select key(s) that calculate \bar{x}

Mean for a Frequency Table

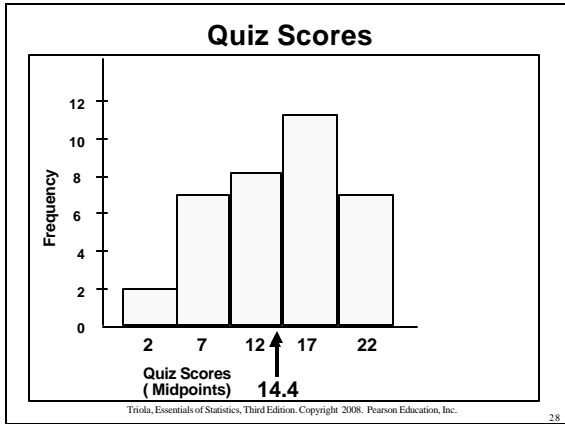
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Mean for a Frequency Table

Quiz Scores	Midpoints	Frequency
0-4	2	2
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$\bar{x} = 14.4$
(rounded to one more decimal place than data)



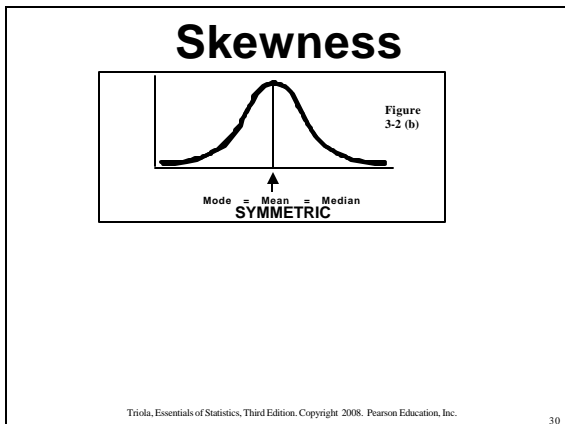
Definitions

❖ **Symmetric**
Data is symmetric if the left half of its histogram is roughly a mirror of its right half.

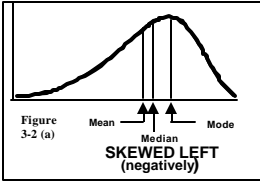
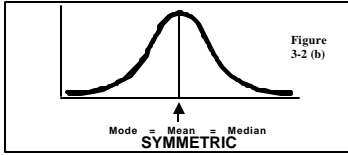
❖ **Skewed**
Data is skewed if it is not symmetric and if it extends more to one side than the other.

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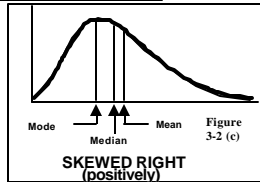
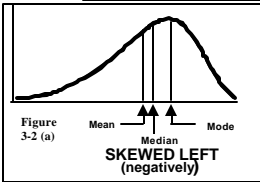
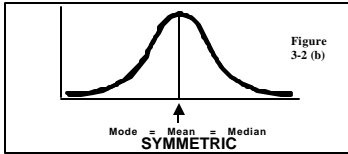


Skewness



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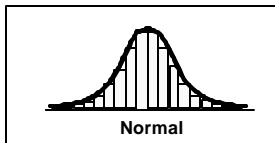
Skewness



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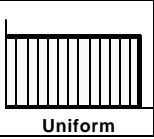
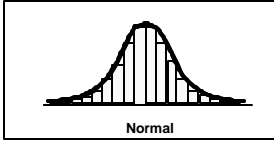
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Important Distributions

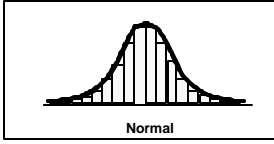


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Important Distributions

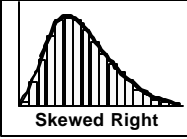
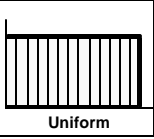
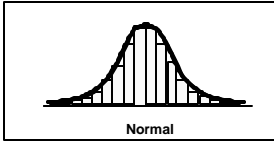


Important Distributions

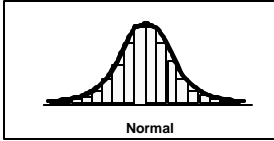


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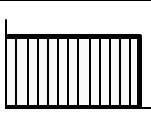
Important Distributions



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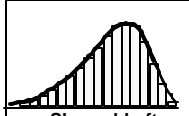
Normal



Uniform



Skewed Right



Skewed Left



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