

## Descriptive Statistics I

- I. Frequency Distributions
- II. Measures of Central Tendency

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## Frequency Distributions

- A. A first step in summarizing a set of observation
- B. Definition:  
The number of scores in a given range
- C. Use with both Qualitative & Quantitative data

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## Frequency Distributions

- D. Example: Qualitative Data

Type of shoes

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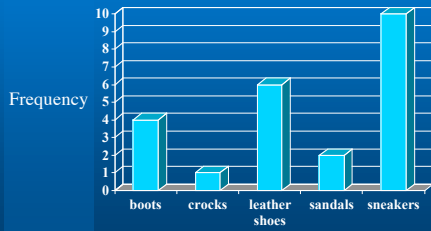
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## Frequency Distribution Graph




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## Frequency Distributions

### E. Quantitative Example

10.00 10.00 9.00 9.00 9.00 9.00 9.00  
 9.00 9.00 9.00 8.00 8.00 8.00 8.00  
 8.00 7.00 7.00 7.00 7.00 7.00 7.00  
 6.00 6.00 5.00 5.00

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## Frequency Distributions

### E. Quantitative Example

<i>X</i>	<i>f</i>	<i>cf</i>	<i>%Rank</i>
10	2	25	100
9	8	23	92
8	5	15	60
7	6	10	40
6	2	4	16
5	2	2	8

$\Sigma f = 25 = n$

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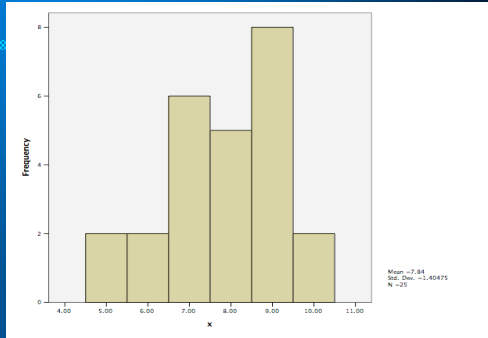
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### Frequency Distribution Graph: Histogram



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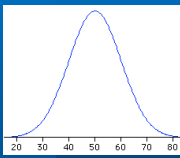
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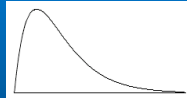
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### Shapes of Frequency Distributions

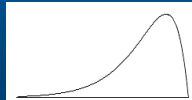
Symmetrical



Positive Skew



Negative Skew



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### II. Measures of Central Tendency

The one score would best capture, or summarize a group of scores.

Three ways to conceptualize this:

- Mode
- Median
- Mean

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Mode:  $M_o$

The most frequent observation:  
most common  
typical value

Good for qualitative variables  
(academic major)

Good for discrete variables  
(number of children)

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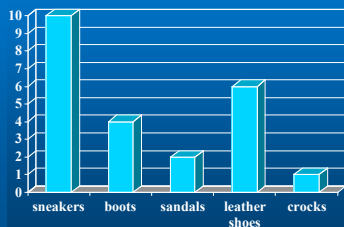
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What is the modal footwear?



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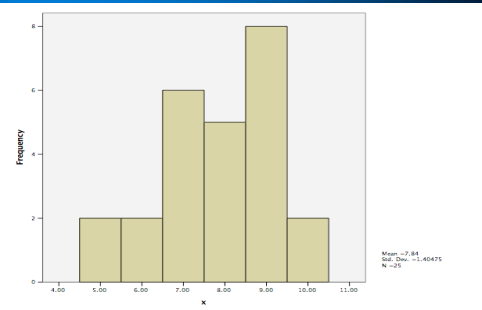
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What is the mode?



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## Median: $M_d$

- The middle score
- The score that cuts the distribution into two equal halves
- The 50th percentile

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## Median

### Three ways to calculate the median

1. Arrange scores high to low and pick the middle score.

2 4 3 52 6

2 3 4 6 56

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### Three ways to calculate the median

2. With an even number of scores, average the two middle scores.

2 4 6 8

$$\text{Median} = (4+6)/2 = 5$$

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## Three ways to calculate the median

3. From a frequency distribution table, with tied scores near the middle, calculate the 50th percentile.

Two examples:

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### Easy Example

X	f	cf	%Rank
10	2	25	100
9	8	23	92
8	5	15	60
7	6	10	40
6	2	4	16
5	2	2	8

What is the 50th Percentile?

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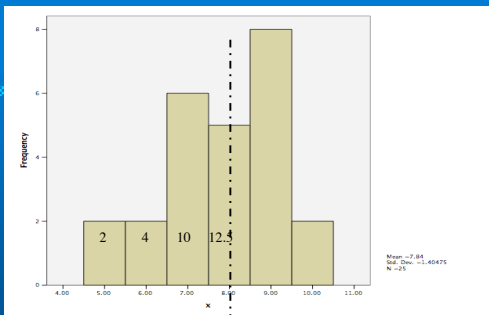
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### Harder Example

X	f	cf	%Rank
10	2	25	100
9	8	23	92
8	10	15	60
7	1	5	20
6	2	4	16
5	2	2	8

What is the 50th Percentile?

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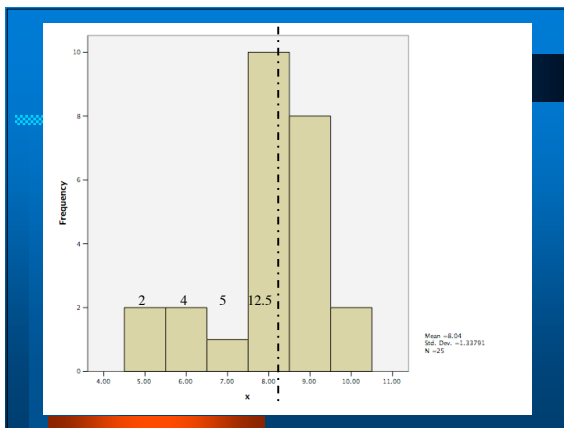
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### Interpolation

8.5 - 60th

? - 50th

7.5 - 20th

$$(50-20) / (60-20) = 30/40 = .75$$

$$8.5-7.5 = 1.0$$

$$.75 * 1.0 = .75$$

$$7.5 + .75 = 8.25$$

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### Hardest Example

$X$	$f$	$cf$	$\%Rank$
8	2	12	100
7	5	10	83.33
6	3	5	41.66
5	2	2	16.66

What is the 50th Percentile?

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### When to use the median

- Ordinal data
- When there are extreme scores
  - Example: 4, 5, 7, 11, 259
    - Median = 6      Mean = 48
- With open ended questions or indeterminate values:
  - Example: How many times a day do you eat 1, 2, 3, 4, 5 or more (circle one)

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Mean:  $M$

The arithmetic average

$$M = \frac{\sum X}{n}$$

Example: 3, 4, 6, 7

$$\sum X = 20, M = 20/4 = 5$$

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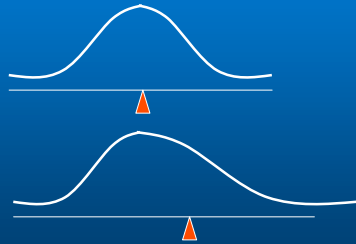
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Mean measures the balancing point of a distribution.



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Mean:  $M$

Further examples:

- Calculating  $M$  from a frequency distribution
- Weighted means:

$$M = \frac{n_1M_1 + n_2M_2}{n_1 + n_2}$$

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Mean:  $M$

When to use the mean:

Most frequently used measure.

*but*

Must have interval data or better.

Greatly influenced by extreme scores.

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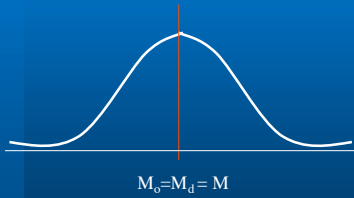
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Measure of Central Tendency and the shape of the frequency distribution.

Symmetrical Distributions



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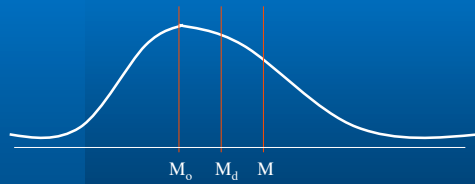
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Measure of Central Tendency and the shape of the frequency distribution.

**Skewed Distributions:**



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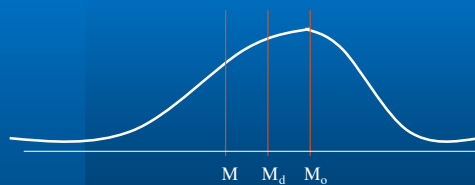
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Measure of Central Tendency and the shape of the frequency distribution.



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Measures of Central Tendency:  
wrap-up

Three different measures, each  
answering a different question, and  
suitable in different situations.

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