

Measures of central tendency

- Used for interval or ordinal data
- “average” or “typical” value
- 3 averages: arithmetic mean, median, mode
- Sometimes equal, sometimes not

Arithmetic mean

- Assume 10 students have the following academic year earnings

\$7,000	\$4,000
\$8,000	\$16,000
\$4,000	\$7,000
\$25,000	\$8,000
\$15,000	\$7,000

Arithmetic mean:
ungrouped data

$$\bar{Y} = \frac{\sum Y}{n}$$

Arithmetic mean:
ungrouped data

$$= \frac{101,000}{10} = \$10,100$$

10

Arithmetic mean:
grouped data

$$\bar{Y} = \frac{\sum fY}{n}$$

Where $f = \#$ in group

Arithmetic mean: grouped data

<u>Values</u>	<u>Frequency</u>	<u>Value x frequency</u>
4,000 x	2	8,000
7,000 x	3	21,000
8,000 x	2	16,000
15,000 x	1	15,000
16,000 x	1	16,000
25,000 x	1	25,000
	10	101,000/10 = 10,100

Median

\$4,000
\$4,000
\$7,000
\$7,000
\$7,000
\$8,000
\$8,000
\$15,000
\$16,000
\$25,000

Order #'s low to high

If odd #: choose middle number

If even #: average two in middle

Interpretation: Half of the people earn more than \$7,500, half earn less.

Mode

\$4,000
\$4,000
\$7,000
\$7,000
\$7,000
\$8,000
\$8,000
\$15,000
\$16,000
\$25,000

Number that occurs most frequently =

\$7,000

Arithmetic mean: grouped data

Income of Households, 2004 (in 1,000's)		
<u>Household \$</u>	<u>f</u>	<u>Midpoint</u>
< \$10,000	9,805	5,000
\$10,000-19,999	14,754	15,000
\$20,000-39,999	26,904	30,000
\$40,000-59,999	19,972	50,000
\$60,000-79,999	14,535	70,000
\$80,000-99,999	9,362	90,000
\$100,000+	17,813	100,000
	113,145	

Arithmetic mean: grouped data

$$\bar{Y} = \frac{\sum fY}{n}$$

$$= \$50,531$$

Median: grouped data

Income of Households, 2004 (in 1,000's)		
<u>Household \$</u>	<u>f</u>	<u>Cumulative f</u>
< \$10,000	9,805	9,805
\$10,000-19,999	14,754	24,559
\$20,000-39,999	26,904	51,463
\$40,000-59,999	19,972	71,435
\$60,000-79,999	14,535	85,970
\$80,000-99,999	9,362	95,332
\$100,000+	17,813	113,145
	113,145	

Median (and percentiles): grouped data

- $113,145 \times .25 = 28286.25$
- $113,145 \times .50 = 56572.5$
- $113,145 \times .75 = 84858.75$

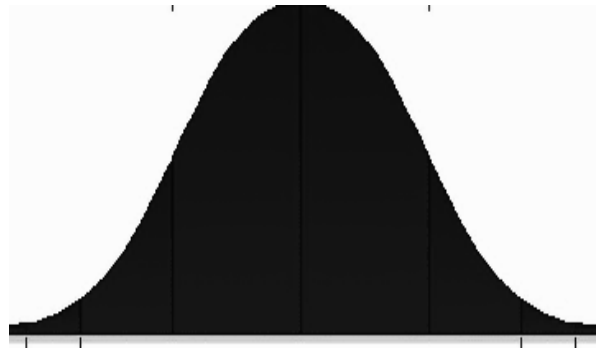
Median: grouped data

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\$40,000-59,999	19,972	71,435 (50%)
\$60,000-79,999	14,535	85,970 (75%)
\$80,000-99,999	9,362	95,332
\$100,000+	17,813	113,145
	113,145	

Median (and percentiles) grouped data

- 25th percentile: \$30,000
- 50th percentile (median): \$50,000
- 75th percentile: \$70,000

Normal distribution



Mean = Median = Mode

Positive skew, or skew to the right



Example: income distribution

Negative skew,
or skew to the left



Example: grade distribution

Bimodal distribution

