

## Tutorial Concept Sheet 3

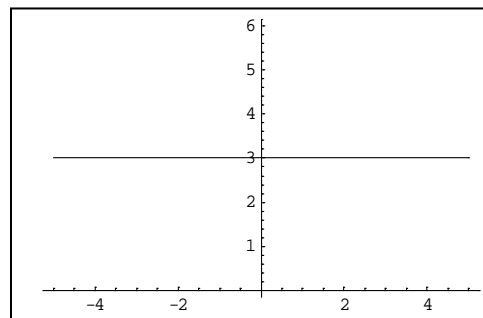
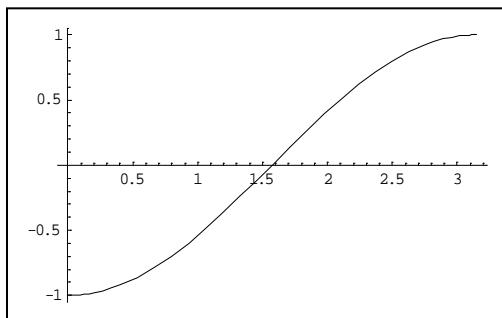
### What is measurement?

→ Levels of Measurement

Low	↓	Nominal (same – different)
		Ordinal (ordered: higher or lower)
		Interval (a difference of 10 means the same everywhere on the scale)
High		Ratio (zero point: we can say “is twice as large”)

### Permissible Transforms

1. For Nominal Data: Anything that preserves the Same-Different Relationship
2. For Ordinal Data: Monotonic Functional Transform
3. For Interval Data: (positive) Linear Transform  $Y = aX + b$   $a > 0$
4. For Ratio Data: (positive) Multiplicative Transform  $Y = aX$   $a > 0$



### Tabulating and depicting data

- i. Frequency distribution plots (frequency, relative frequency, cumulative frequency and cumulative relative frequency)
- ii. (Frequency) Histogram
- iii. Bar plots
- iv. Pie charts

Interpreting distributional shape:    bimodality  
   symmetry/skewness  
   outliers

Effect of skewness on relative positioning of mean, median, mode

## Measures of Central Tendency:

Median:

- “Number in the Middle” (even vs. odd amount of numbers)
- Minimum Distance
- Not sensitive to Outliers

Mean:

- “Average”:  $\bar{X} = \frac{1}{N} \sum_{i=1}^N X_i$
- Minimum *Squared* Distance
- Sensitive to Outliers

Computing and estimating the mean from a frequency distribution

Computing the mean for combined groups

Computing the mean with a changed score

Computing a mean with an additional operation —the “update” formula

Effect of a positive linear transformation on the mean, median, and mode.

*The proportion of cases is the mean of binary data coded 0–1.* Examples: batting averages, proportions of graduates.

*The percentage of cases is the mean of binary data coded 0–100.* Examples: percentages of graduates, percentage of people who are married.