Science Dynamics Masterclass
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$$X_{new} = K * X_{old} + C$$

K,C are constants, $K \neq 0$

linear

> **linear**
> addition, subtraction, multiplication, division - shape stays the same (E.g. inches-cm)

- **retain order**
- **retain relative distance between points**
- **multiplied (divided) by K**
  - **NEW mean, median and mode mult . or div by K**
  - **new SD, range, IQR mult. or div. by ABS(K)**
  - **new variance = old * K^2**
  - **skewness**
    - **K positive = the same**
    - **K negative = -1*old**
- **C added or subtracted**
  - **NEW mean, median, mode = old +/- C**
  - **new SD, range, IQR = old**
  - **new variance = old**
  - **new skewness , sk. ratio = old**

monotonic

> **monotonic**
> retains the order of data of the original system

Transformation

> **Transformation**
> one-to-one correspondence between original and new numeric system

Linear and Nonlinear Transformations

4 - Re-Expressing Variables

nonlinear

> **nonlinear**
> retains the order of values, CHANGES relative distances!

square root

> **square root**
> makes distribution more symmetric

ONLY for data equal or greater than zero

if not, we have to transform the data first!

logarithm base 10

> **logarithm bas...**
> log-based transformation makes distribution even more symetric in highly skewed data. commonly used is e (2.7) Ln or log10.

ONLY for data greater than zero

ranking variables

> **ranking variab...**
> SPSS - Transform/Rank Cases. To know what percentage of values are below, we use percentile ranking

recoding variables

> **recoding varia...**
> SPSS Transform/ Recode/Into Different Variables - E.g. to change Likert scale etc.

collapsing variables

> **collapsing vari...**
> SPSS Transform/ Recode/Into Different Variables (pp.112)

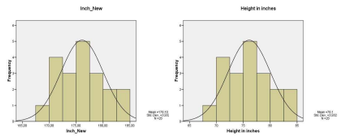
median split

> **median split**
> transforms many variables into two categories (one above and one below the median) - Transform/ Recode/Into different/Range Lowest through X, then Range through Highest X+1

combining variables

> **combining vari...**
> SPSS Transform/ Compute (pp113)

most common types of lin. transform.



translation

> **translation**
> shifting distribution along the horizontal axis (left - 65-85, right 165-185)

reflection

> **reflection**
> values multiplied by -1 mirror the original values -. those high are now low and vice versa

standard scores

> **standard scores**
> conveys how far above or below raw score is from the mean of its distribution relative do the standard deviation of that distribution

- **Examples**
  - **SAT (Mean 500, SD 100)**
  - **IQ (Mean 100, SD 15)**
  - **GRE (mean 500, SD 100)**

$$zscore = \frac{X - \bar{X}}{SD}$$

X = score, $\bar{X}$ = mean,

SD = standard deviation

z-scores

> **z-scores**
> re-expressed in terms of standard deviation distances from the mean. Z-score distribution has mean 0 and SD=1. SPSS Analyse/Descriptive stat/ Save standardized values as variables

$$X = S * z + \bar{X}$$

X = score, $\bar{X}$ = mean,

S = standard deviation

z = z-score

Back from z-score to raw data:

Beware!

> **Beware!**
> when shapes of distributions are not known to be similar, percentile ranks are better scoring system than z-scores