central tendency → tendency of a given set of obs to cluster around a single central or middle value and the single value that represents given set of obs

facilitates comparison → measures of central tendency

mean

AM
$\bar{x} = \frac{\Sigma x_i}{n}$
simple

frequency
$\bar{x} = \frac{\Sigma f_i x_i}{N}$

grouped
$\bar{x} = A + \frac{\Sigma f_i d_i}{N} \times C$
$d_i = \frac{x_i - A}{C}$

→ A → middle most (odd)
A → two middle most (even)

Properties:
→ all obs (const K) AM = K.
→ for ungrouped data $\Sigma(x_i - \bar{x}) = 0$
→ for grouped $\Sigma f_i(x_i - \bar{x}) \neq 0$

GM
$\sqrt{ab}$
$\log G = \frac{1}{n}\Sigma \log x$
all obs const K GM = K
GM of z = GM of x . GM of y
GM of z = GM of x / GM of y
$G = (x_1^{f_1} \cdot x_2^{f_2})^{1/N}$
→ all obs const K HM = K
$\frac{n_1 + n_2}{\frac{n_1}{h_1} + \frac{n_2}{h_2}}$

$AH = G^2$ → only for 2 +ve obs

HM
weighted HM
$\frac{\Sigma w_i}{\Sigma(\frac{w_i}{x_i})}$
$\frac{2ab}{a+b}$
$H = \frac{n}{\Sigma(\frac{1}{x_i})}$

median

→ positional average
→ middle value of obs after arranging in ascending/descending
→ median for odd = $\frac{(n+1)^{th}}{2}$
→ even $\frac{(\frac{n}{2})^{th} + (\frac{n}{2}+1)^{th}}{2}$
→ avg of middle two value see eg. module 1 & 8
→ For grouped data
$m = L + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$
L → lower boundary of median class (preceding class)
cf → frequency
f → corresponding frequency
h → width
steps → data cont
1) cf
2) N/2
3) median class

→ Properties
$y = a + bx$
$\therefore y_{me} = a + bx_{me}$
$\Sigma|x_i - \text{median}| = \text{minimum}$
→ median is not affected by sampling

Partition values
Quartiles → 4 parts
end class

mode

→ maximum number a value is repeated
→ most common value
→ distribution having more than one mode is called multimodal distribution
→ Bi-modal distribution is one having two modes
→ all obs occurs equal time no mode
→ affected by sampling
→ does not dependent on all obs
→ for grouped data
$\text{mode} = L + \left[\frac{f_0 - f_{-1}}{2f_0 - f_{-1} - f_1}\right] \times h$
L → LCB of modal class
f_0 → modal class freq
f_{-1} → pre
f_1 → post

Empirical Relationship
mode = 3(mean - median)
→ $y = a + bx$ (moderately skewed)
$\therefore y_{mo} = a + bx_{mo}$
• perfectly skewed mean = mode = median.
• data moderately skewed +vely -vely