STATISTICS (RECALL)

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Mathematically Inclined

(I) QUICK RECALL:

MEASURES OF CENTRAL TENDENCY:

1) MEAN / ARITHMETIC MEAN / AVERAGE ($\overline{X}$)

UNGROUPED

For observations $x_1, x_2, \dots, x_n$

$$\boxed{\overline{X} = \frac{\sum_{i=1}^{n} x_i}{n}}$$

GROUPED

For observations $x_1, x_2, \dots, x_n$ with frequencies $f_1, f_2, \dots, f_n$

$$\boxed{\overline{X} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}}$$

ASSUMED MEAN (SHORTCUT) METHOD

$$\boxed{\overline{X} = A + \frac{\sum_{i=1}^{n} f_i d_i}{\sum_{i=1}^{n} f_i}}, \quad \boxed{d_i = x_i - A}$$

A → Assumed Mean

2) MEDIAN (M): Middle most or Central value when data is arranged in ASCENDING order.

UNGROUPED

n is odd: $M = \left(\frac{n+1}{2}\right)^{th}$ term

n is even: $\left(\frac{\frac{n}{2}^{th} + \frac{n+2}{2}^{th}}{2}\right)$ term

GROUPED

$$M = l + \frac{\frac{n}{2} - c.f.}{f} \times h$$

h → Class size

l: lower lim of median class

f: Frequency " "

$c.f.$: Cumulative freq. of preceding class

3) MODE: (M) Most frequently occurring value.

UNGROUPED

Observation having maximum frequency

GROUPED

$$M = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

l: lower limit of the modal class

h: class size

f_1: Frequency of the modal class

f_2: frequency of the class succeeding modal class

f_0: class preceding modal class

** EMPERICAL RELATION between Mean, Median and Mode.

$$\boxed{\text{MODE} = 3\ \text{MEDIAN} - 2\ \text{MEAN}}$$

NOTE: Measures of Central tendency give only representative value So, is INSUFFICIENT in many scenarios.

To overcome, this we learn MEASURES OF DISPERSION.

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KDS ho gya! ♡ ♡

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STATISTICS

(II) MEASURES OF DISPERSION

1. RANGE: = Max value of the Distribution − Min value of the Distribution

2. MEAN DEVIATION:

DATA	ABOUT $\overline{X}$	ABOUT MEDIAN (M)
UNGROUPED	$\dfrac{\sum_{i=1}^{n} \lvert x_i-\overline{x} \rvert}{n}$	$\dfrac{\sum_{i=1}^{n} \lvert x_i-M \rvert}{n}$
GROUPED	$\dfrac{\sum_{i=1}^{n} f_i \lvert x_i-\overline{x} \rvert}{N}$ $N=\sum_{i=1}^{n} f_i$	$\dfrac{\sum_{i=1}^{n} f_i \lvert x_i-M \rvert}{N}$ $N=\sum_{i=1}^{n} f_i$

(*) Shortcut method for calculating $\overline{X}$ or M is available on Page 1

3. VARIANCE and STANDARD DEVIATION

Var σ^2

S.D. σ

$$\boxed{S.D. = +\sqrt{Var}}$$

Mean of the squares of the deviations from mean is called variance.

DATA TYPE	VARIANCE	STANDARD DEVIATION
UNGROUPED	$\sigma^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i-\overline{x})^2$	$\sigma = \sqrt{\frac{1}{n}\left(\sum_{i=1}^{n}(x_i-\overline{x})^2\right)}$
GROUPED	$\sigma^2 = \frac{1}{N}\sum_{i=1}^{n} f_i(x_i-\overline{x})^2$ $N=\sum_{i=1}^{n} f_i$	$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{n} f_i(x_i-\overline{x})^2}$

ALTERNATE FORMULAE: V. Imp

* UNGROUPED $\sigma^2 = \frac{1}{n}\left(\sum x_i^2\right) - \overline{x}^2$

* GROUPED $\sigma^2 = \frac{1}{n}\sum f_i x_i^2 - \left(\frac{\sum f_i x_i}{N}\right)^2$

(III) MAGIC TABLE

Quantity	Change of Origin	Change of Scale
Mean	+/− a	a(old) or old/a
Median	+/− a	a(old) or old/a
Mode	+/− a	a(old) or old/a
Var	Same	a^2(old)
S.D.	Same	|a|(old)

(IV) COEFFICIENT of VARIATION

$$\boxed{CV = \frac{\sigma}{\overline{X}} \times 100}$$

Used for comparing DISPERSION of 2 series

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