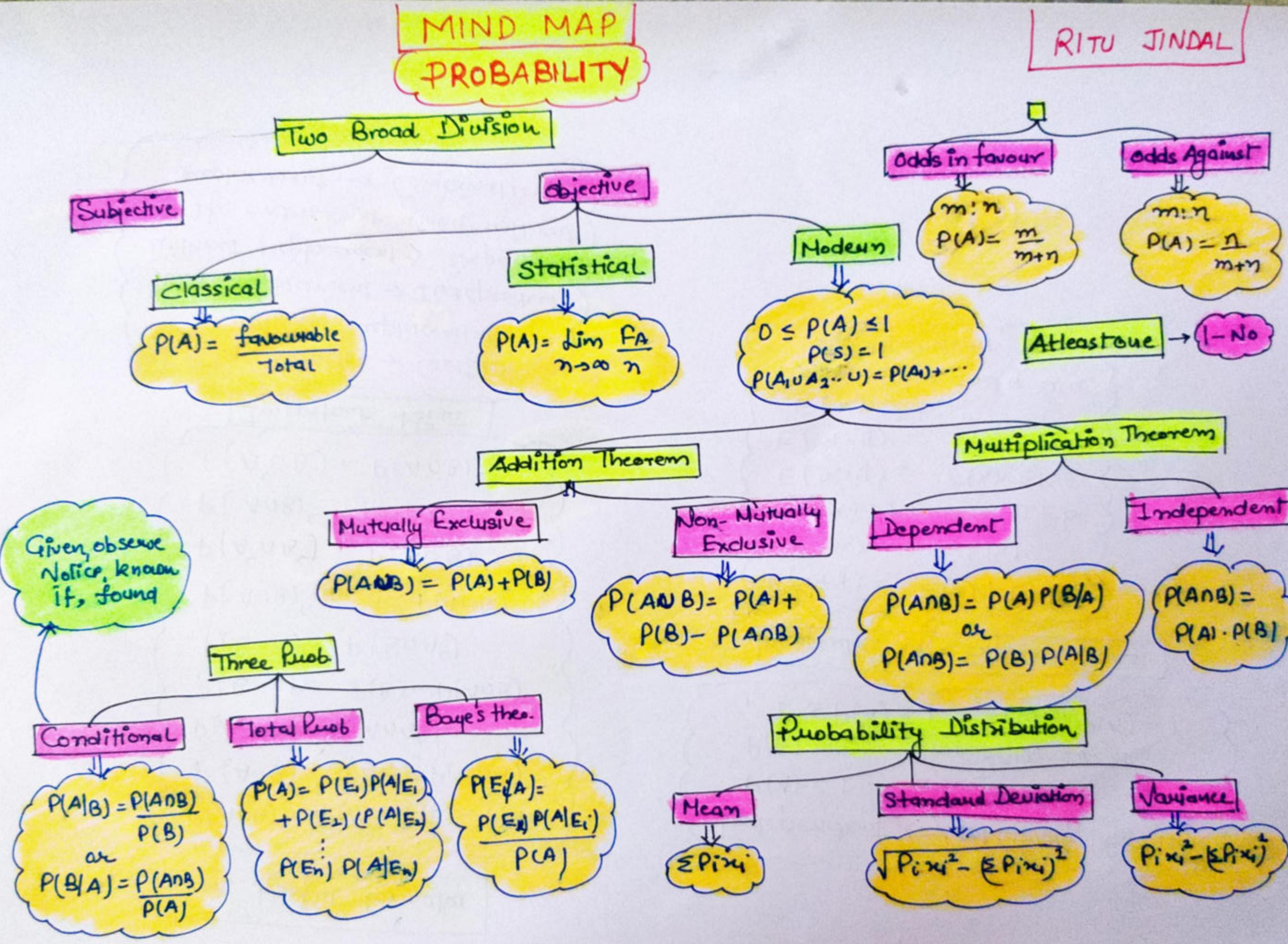
MIND MAP
PROBABILITY
RITU JINDAL
Two Broad Division
Subjective
Objective
Classical
$P(A) = \frac{\text{favourable}}{\text{Total}}$
Statistical
$P(A) = \lim_{n \to \infty} \frac{f_A}{n}$
Modern
$0 \le P(A) \le 1$
$P(S) = 1$
$P(A_1 \cup A_2 \cdots \cup) = P(A_1) + \cdots$
Odds in favour
$m : n$
$P(A) = \frac{m}{m+n}$
Odds Against
$m : n$
$P(A) = \frac{n}{m+n}$
Atleast one → 1 − No
Addition Theorem
Mutually Exclusive
$P(A \cup B) = P(A) + P(B)$
Non-Mutually Exclusive
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Multiplication Theorem
Dependent
$P(A \cap B) = P(A)\, P(B/A)$
or
$P(A \cap B) = P(B)\, P(A|B)$
Independent
$P(A \cap B) = P(A) \cdot P(B)$
Given, observe, Notice, known if, found
Three Prob
Conditional
$P(A|B) = \frac{P(A \cap B)}{P(B)}$
or
$P(B/A) = \frac{P(A \cap B)}{P(A)}$
Total Prob
$P(A) = P(E_1) P(A|E_1) + P(E_2) P(A|E_2) \vdots P(E_n) P(A|E_n)$
Baye's theo.
$P(E_i/A) = \frac{P(E_i) P(A|E_i)}{P(A)}$
Probability Distribution
Mean
$\Sigma P_i x_i$
Standard Deviation
$\sqrt{P_i x_i^2 - (\Sigma P_i x_i)^2}$
Variance
$P_i x_i^2 - (\Sigma P_i x_i)^2$

## Some Useful formulae

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A-B) = P(A) - P(A \cap B)$

$P(A-B) = P(A \cap B^c)$

$P(B-A) = P(B) - P(A \cap B)$

$P(B-A) = P(B \cap A^c)$

$P(A \cup B)^c = 1 - P(A \cup B)$

$P(A^c \cap B^c) = P(A \cup B)^c$

$P(A \cap B)^c = 1 - P(A \cap B)$

$P(A^c \cup B^c) = P(A \cap B)^c$

## Important Points

Nothing mention → Consider without replacement.

With replacement → Independent

Without replacement → Dependent

(If order not given without replacement → Combination

Independent $\not\Leftrightarrow$ Mutually Exclusive

$P(A) = 1$ Sure event

$P(A) = 0$ Impossible event.

$0 \leq P(A) \leq 1$ ; $P(A) + P(A') = 1$

## Properties of Expected Values:

$E(x+y) = E(x) + E(y)$

$E(kx) = k\,E(x)$

$E(ax+b) = a\,E(x) + b$

$E(x \cdot y) = E(x) \cdot E(y)$

$E(x-y) = E(x) - E(y)$

$E(k) = k.$

whenever $x$ and $y$ are Independent