With repetition combination

$n = 5$

$r = 3$

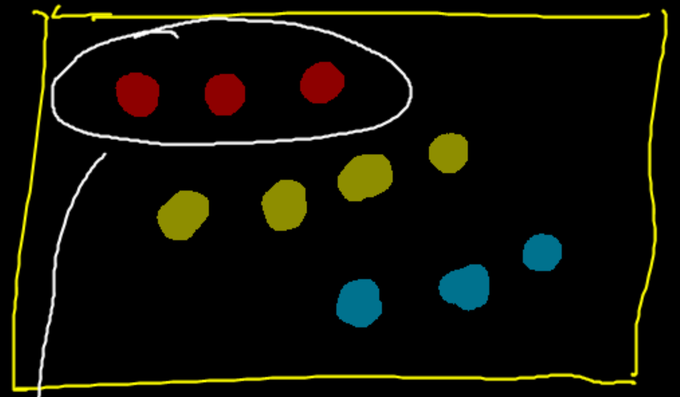
$$^{n+r-1}C_r = \frac{(n+r-1)!}{r!(n-1)!}$$

$$^{5+3-1}C_3 = \frac{7!}{3!\,4!} = 35$$

math.factorial(7)

---

math.factorial(3) * math.factorial(4!)



3 balls, atleast one ball is red

Total ball = 10

red = 3

① 1 red 2 more ball
② 2 red 1 other
③ 3 red 0 other

$$\frac{{}^{3}C_1 * {}^{7}C_2 + {}^{3}C_2 * {}^{7}C_1 + {}^{3}C_3 * {}^{7}C_0}{{}^{10}C_3}$$ or

$$P(A \cap B) = P(A) * P(B/A)$$

$$P(B \cap A) = P(B) * P(A/B)$$

Bayes Theorem — V.V.Imp — Naive bayes theorem

Likelihood

$$P(A/B) = \frac{P(B/A) * P(A)}{P(B)}$$

$P(A)$ — prior

$P(B)$ — marginal / Evidence

Posterior —

Probability Distribution function

Random variable {X, Y, Z ---}

caps letter

Algebraic variable {x, y, z ---}

Small letter

Coin

X = {H, T}

dice

Y = {1, 2, 3, 4, 5, 6}

sample space

x + 5 = 20 ∴ x = 15

Random variables

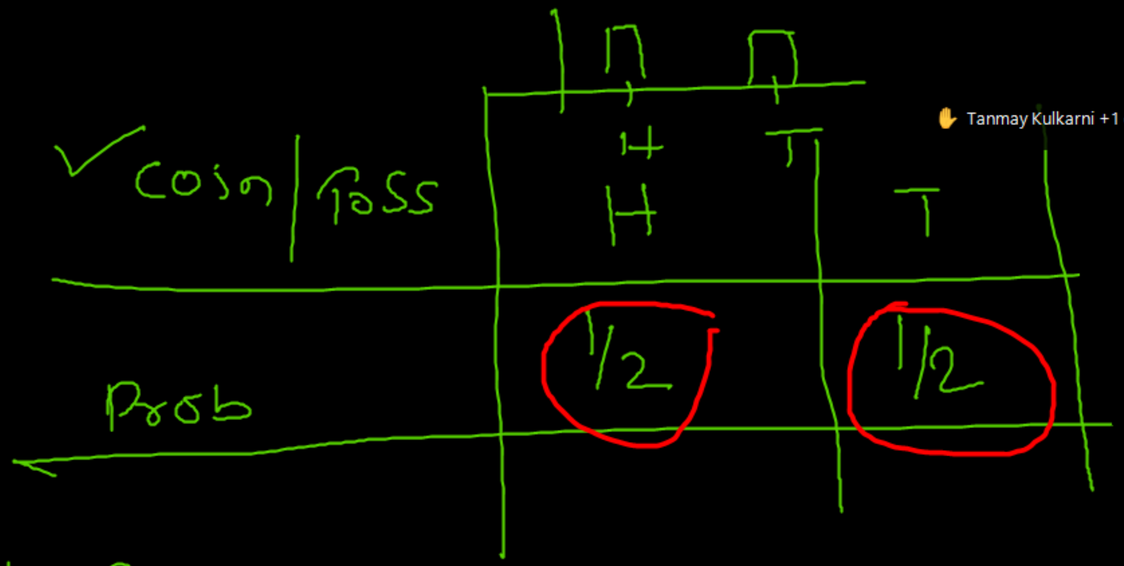
Discrete RV

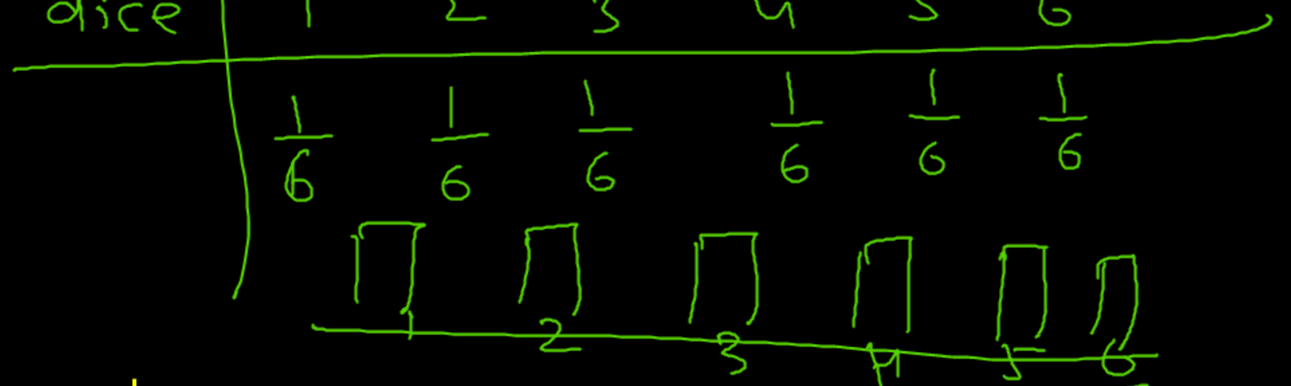
{H, T}

{1, 2, 3, 4, 5, 6}

continuous RV

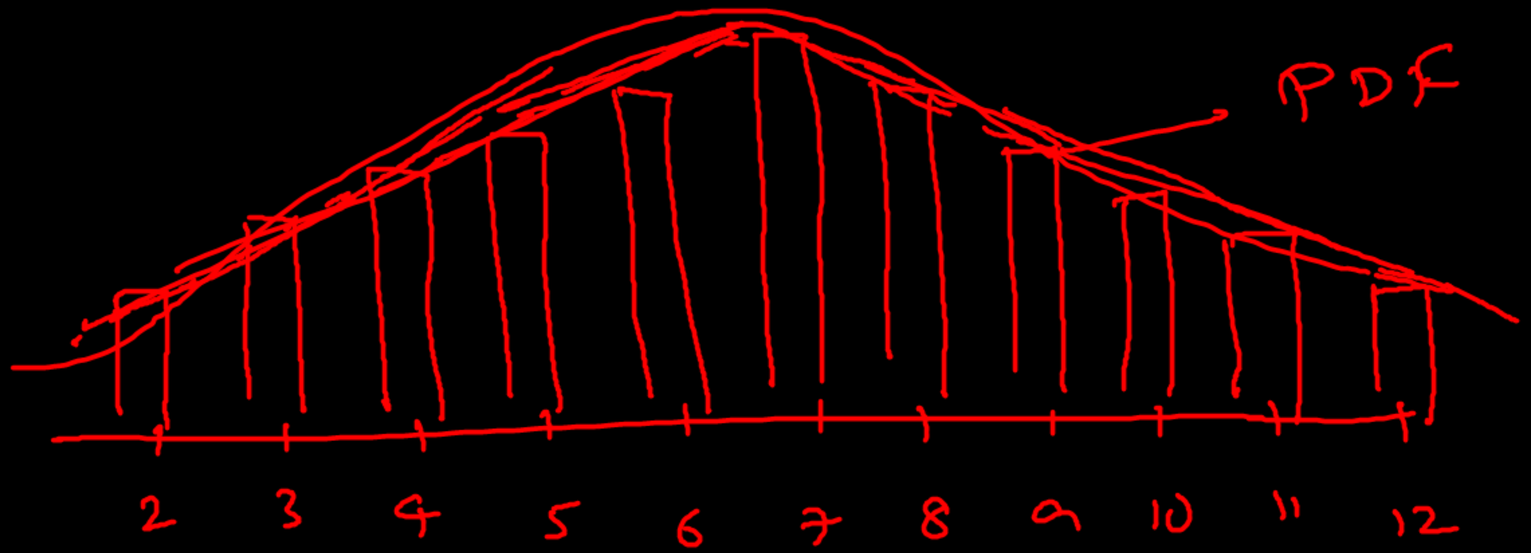
X = {0, 10}





2 → 1/36
3 → 2/36
4 → 3/36
5 → 4/36
6 → 5/36
7 → 6/36

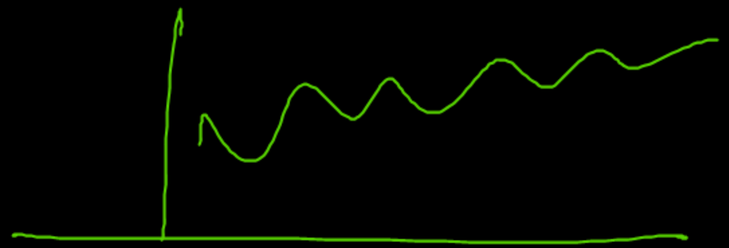
8 → 5/36
9 → 4/36
10 = 3/36
11 = 2/36
12 = 1/36

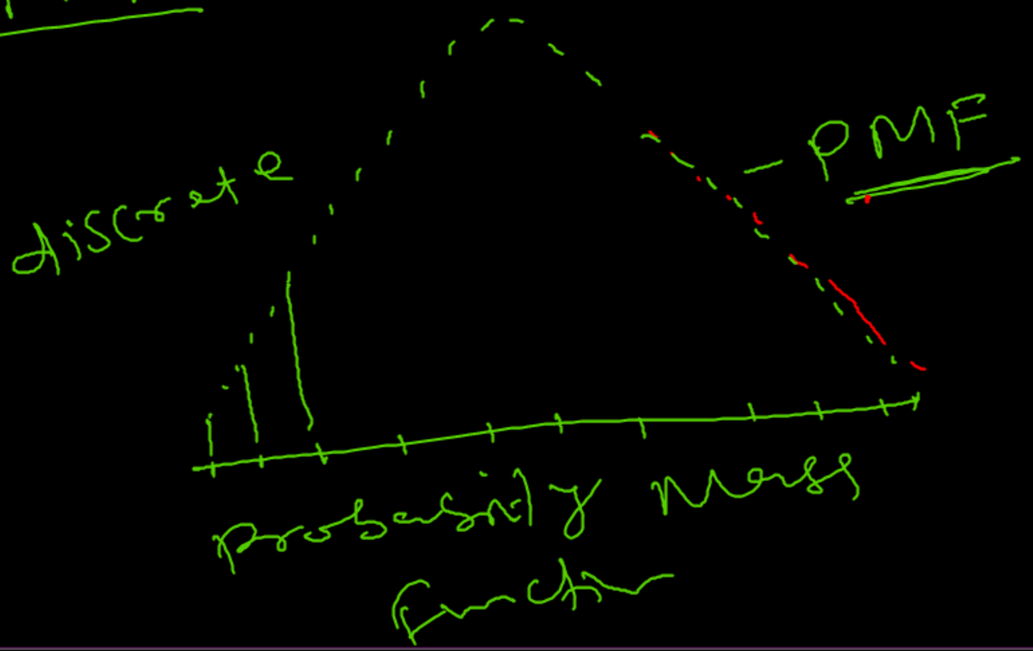


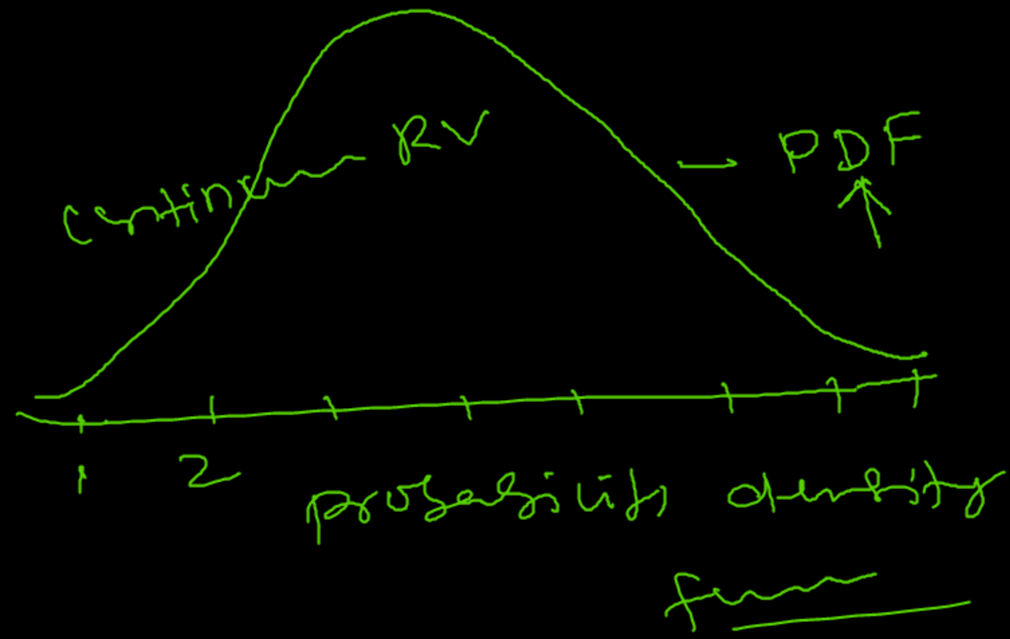
1 2 ... 3 4 5 6 — Continuous RV

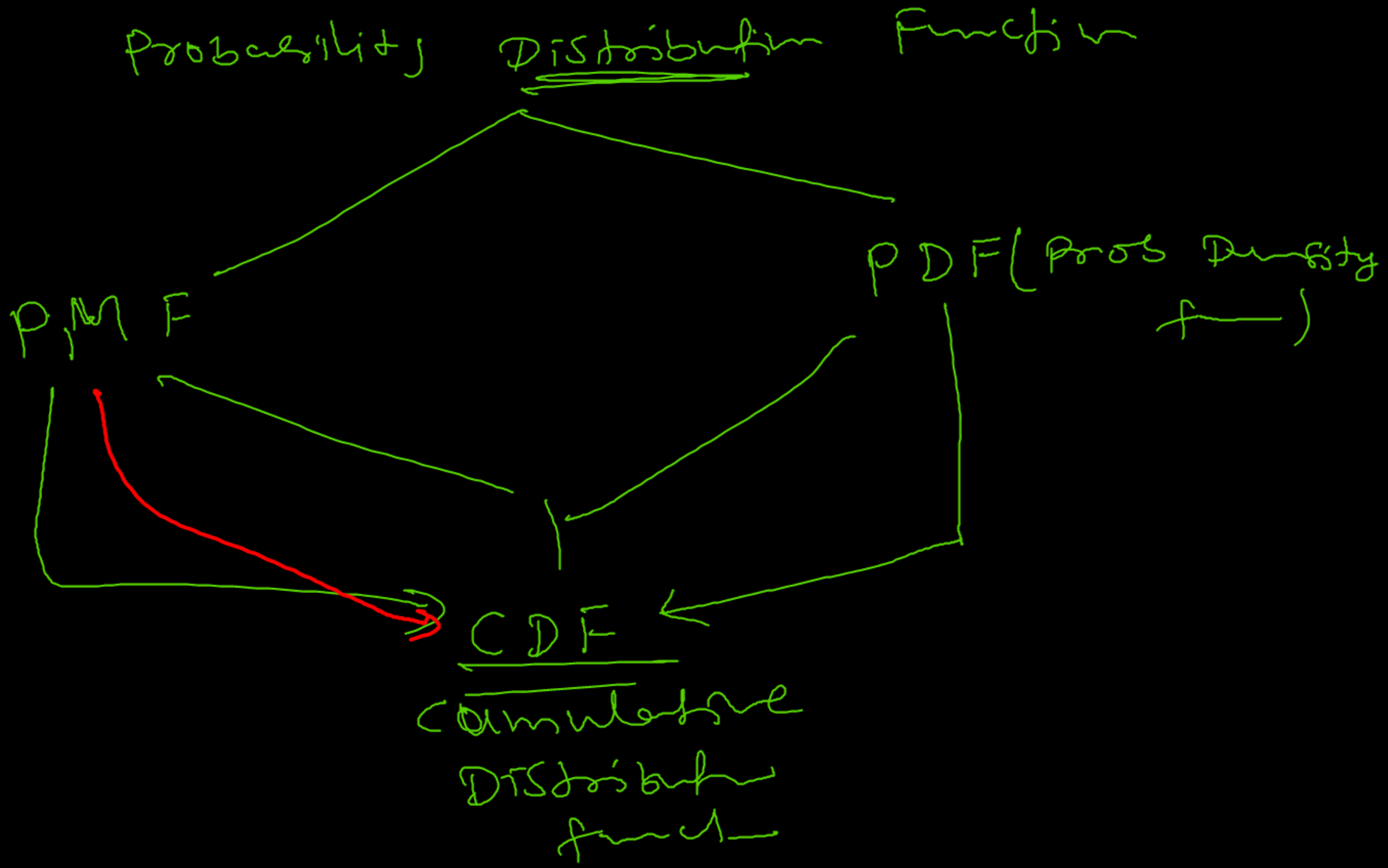
2.2222
2.00012

$y = f(x)$ — Pure maths









PMF → discrete Random variable

(1) The probability assigned to each value must be non-negative.

(2) The sum of the prob assigned to all possible value must be equal 1.

$Y = f(x)$ $\quad y = \begin{cases} 1/6 & \text{if } x \in \{1\,2\,3\,4\,5\,6\} \\ 0 & \text{otherwise} \end{cases}$

Coin	H	T
Prob	$\frac{1}{2}$	$\frac{1}{2}$

$\frac{1}{2} + \frac{1}{2} = 1$ dice $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6} = 1$

Cumulative Distribution function (CDF) of PMF

$$f(x) = P(X <= x)$$

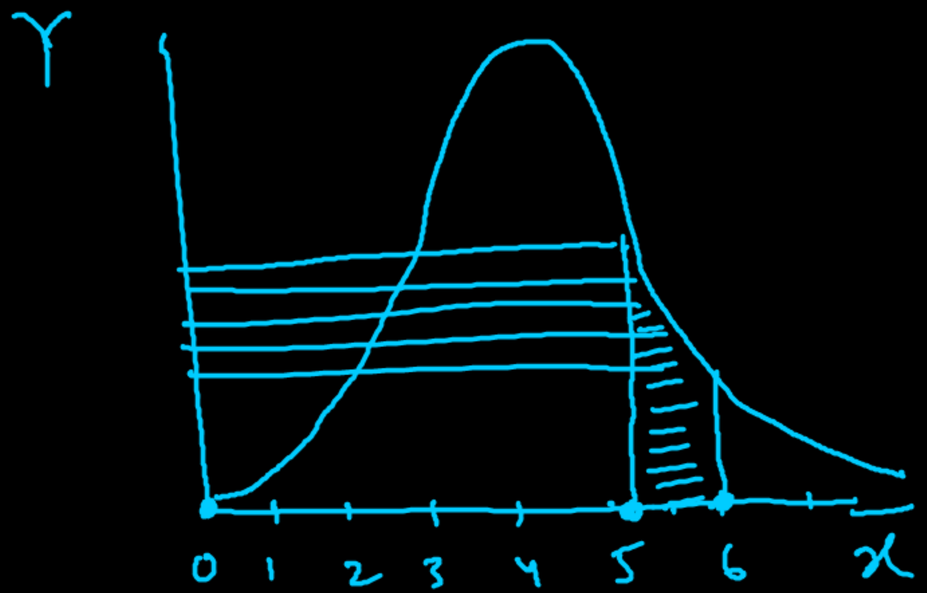
$P(X \leq 5)$

	PMF	CDF
1	$\frac{1}{6}$	1/6
2	1/6	2/6
→ 3	1/6	3/6
→ 4	1/6	4/6
5	1/6	5/6
6	1/6	6/6

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

$\frac{10}{36}$

PDF – Probability Density Function → continuous rando



$$P(5 \le x \le 6) = \int_5^6 f(x)\,dx$$

$\mu =$

$\sigma =$

"Parametric" → assume → Normal / Gaussian dist

"Non-Parametric" → don't make any assumption → KDE

PDF → CDF

Integration

5 more mins

diff

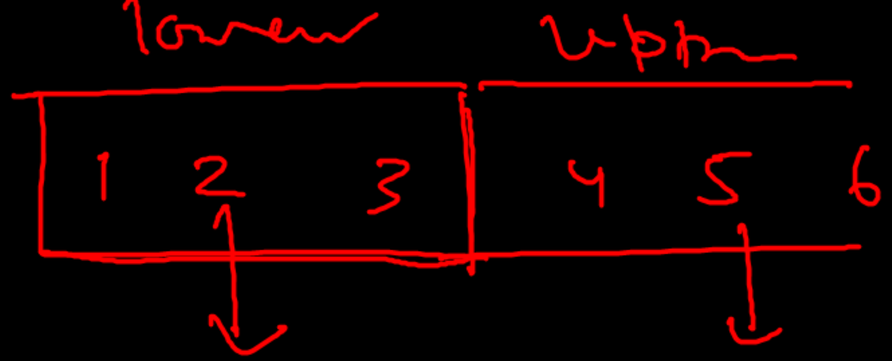
$\frac{(n+1)}{100}$ $\frac{75}{100}$ $\frac{99}{100}$

Quantile = Percetile

$\frac{1}{4}$ Docile = $\frac{1}{10}$ $Q1 = \frac{25}{100} =$

$Q1 = \frac{(n+1)}{4}$ $Q2 = \frac{2(n+1)}{4} = \frac{n+1}{2} =$ me

$Q3 = 3 \times \frac{n+1}{4}$ $Q4 = 99 \times \frac{n+1}{4}$



= even No.