

with repetition combination

$$n = 5$$

$$\gamma = 3$$

$$n+\gamma-1 \choose \gamma = \frac{(n+\gamma-1)!}{\gamma!(n-1)!}$$

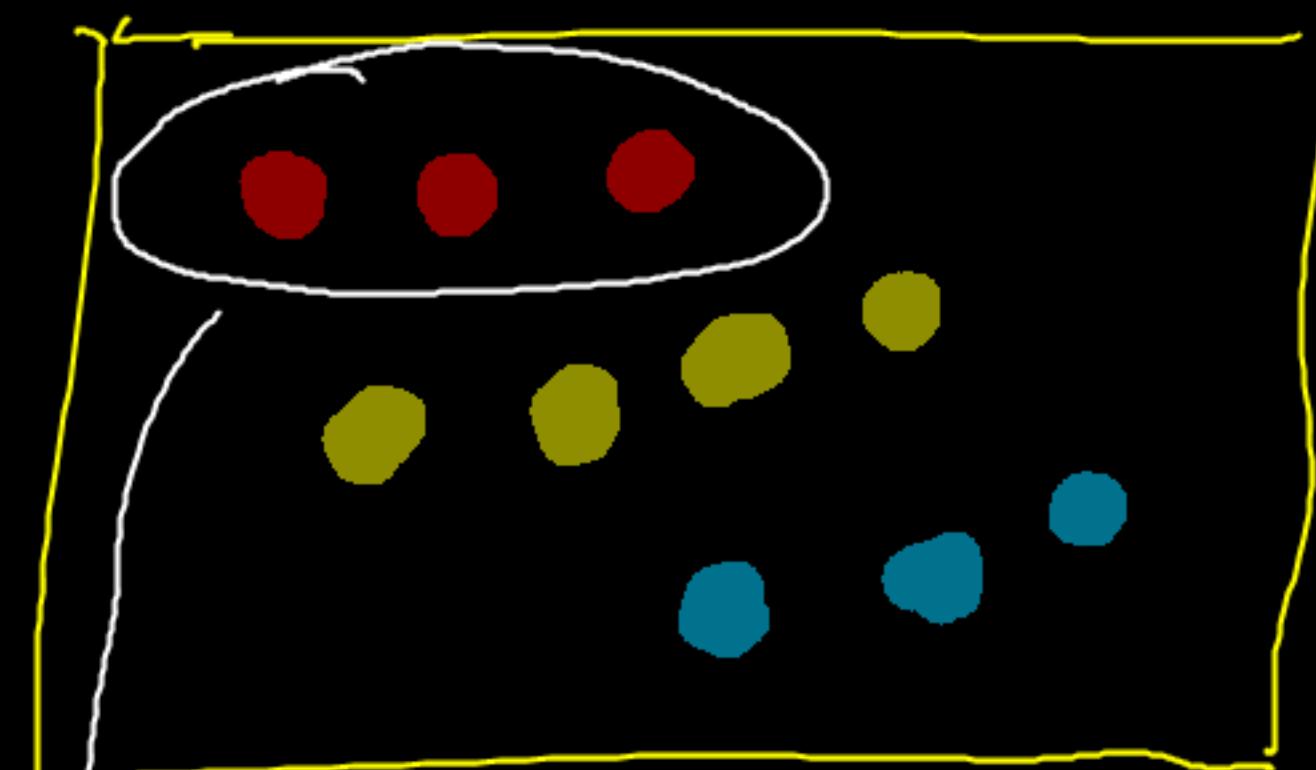
$$5+3-1 \choose 3 = \frac{7!}{3! 4!} = 35$$

math.factorial(7)

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

12

You are screen sharing Stop Share



(3 balls), at least one ball is red

Total ball = 10

red = 3

${}^3C_1$

- ① 1 red
- ② 2 red
- ③ 3 red

2 more ball  
1 same  
0 other

$${}^3C_1 * {}^7C_2 + {}^3C_2 * {}^7C_1 + {}^3C_3 * {}^7C_0 = 10$$

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

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

Bayes Theorem — V.V. Loop — Naive bayes theorem  
W.Kellogg

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

Prior — model of evidence

Posterior

Tanmay Kulkarni +1 other raised hands View x

# Probability Distribution function

Random variable { $X, Y, Z - \dots$ }

caps  $\downarrow$

coin

$$X = \{H, T\}$$

dice

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

sample space

Algebraic variable

$$\{x, y, z - \dots\}$$

$$x + 5 = 20 \therefore x = 15$$

$\hookrightarrow$  small letter

Random variables

Discrete

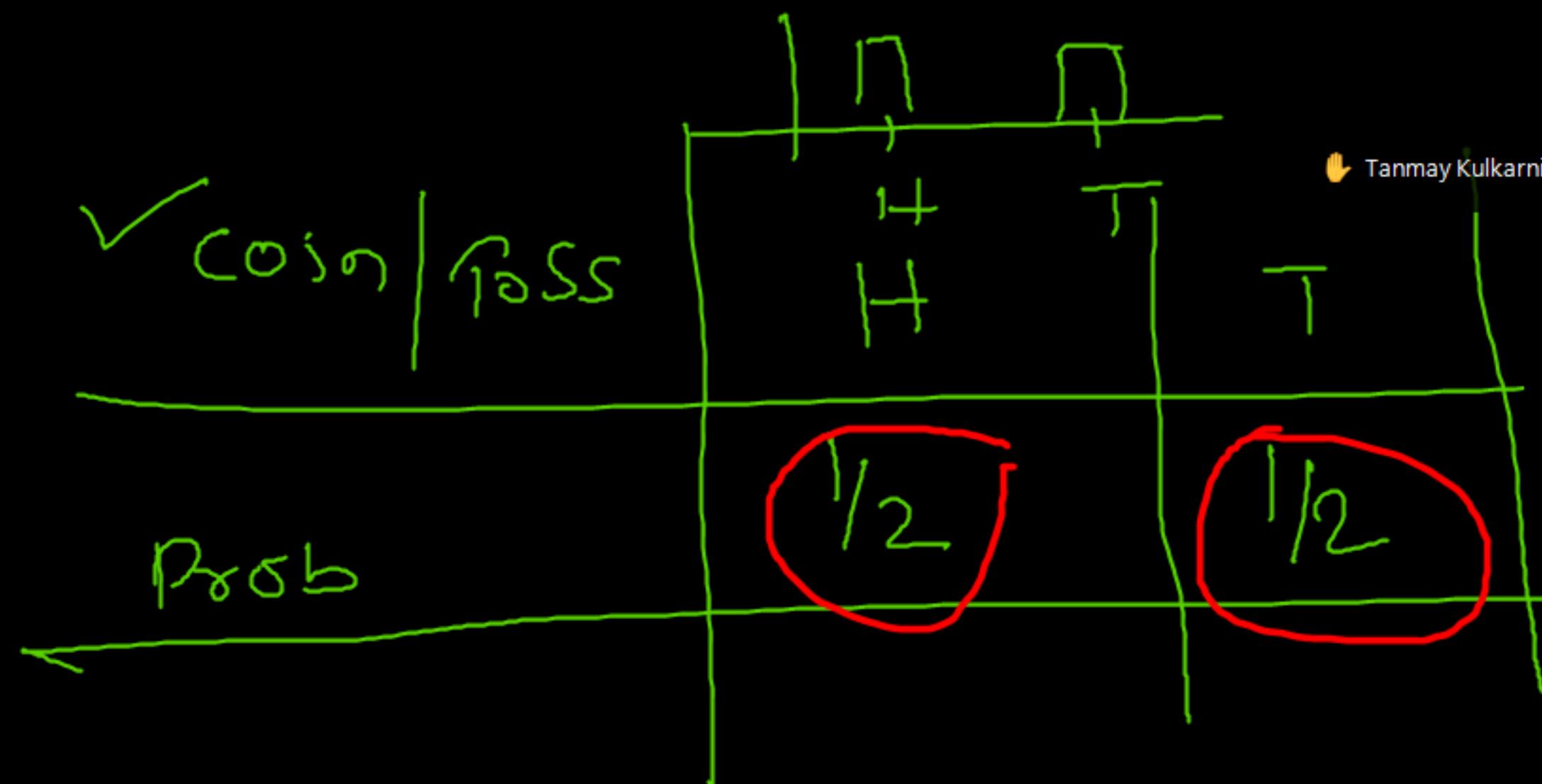
RV

$$\begin{cases} \{H, T\} \\ \{1, 2, 3, 4, 5, 6\} \end{cases}$$

continuous  
RV

$$X = \{0, 10\}$$

You are screen sharing Stop Share



dice

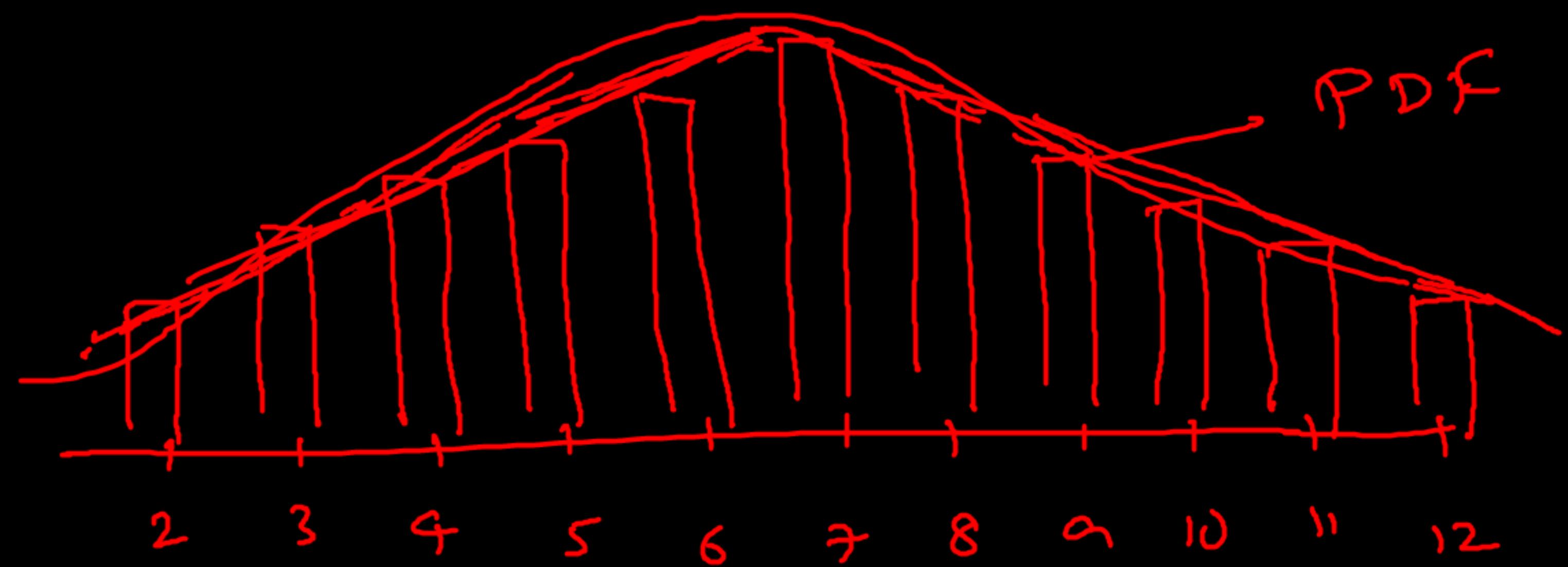
	1	2	3	4	5	6
1/6	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
2	$\boxed{\phantom{0}}$	$\boxed{\phantom{0}}$	$\boxed{\phantom{0}}$	$\boxed{\phantom{0}}$	$\boxed{\phantom{0}}$	$\boxed{\phantom{0}}$

dice 1      dice 2

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	3	4	5	6	7	8	9	10	11	12	13
3	3	4	5	6	7	8	9	10	11	12	13	14
4	4	5	6	7	8	9	10	11	12	13	14	15
5	5	6	7	8	9	10	11	12	13	14	15	16
6	6	7	8	9	10	11	12	13	14	15	16	17

$$\begin{aligned}
 2 &\rightarrow \frac{1}{36} = 0 \\
 3 &\rightarrow \frac{2}{36} \\
 4 &\rightarrow \frac{3}{36} \\
 5 &\rightarrow \frac{4}{36} \\
 6 &\rightarrow \frac{5}{36} \\
 7 &\rightarrow \frac{6}{36}
 \end{aligned}
 \quad
 \begin{aligned}
 8 &\rightarrow \frac{5}{36} \\
 9 &\rightarrow \frac{4}{36} \\
 10 &= \frac{3}{36} \\
 11 &= \frac{2}{36} \\
 12 &= \frac{1}{36}
 \end{aligned}$$

You are screen sharing Stop Share



 Tanmay Kulkarni +1 other raised hands [View](#) [X](#)

You are screen sharing

Top Share

## Apps

ore

1

$$2 \div \dots = 3$$

4

5 6 — Continuous RV

2.2222  
2.00012

$$y = f(x)$$

Pure metry



discrete

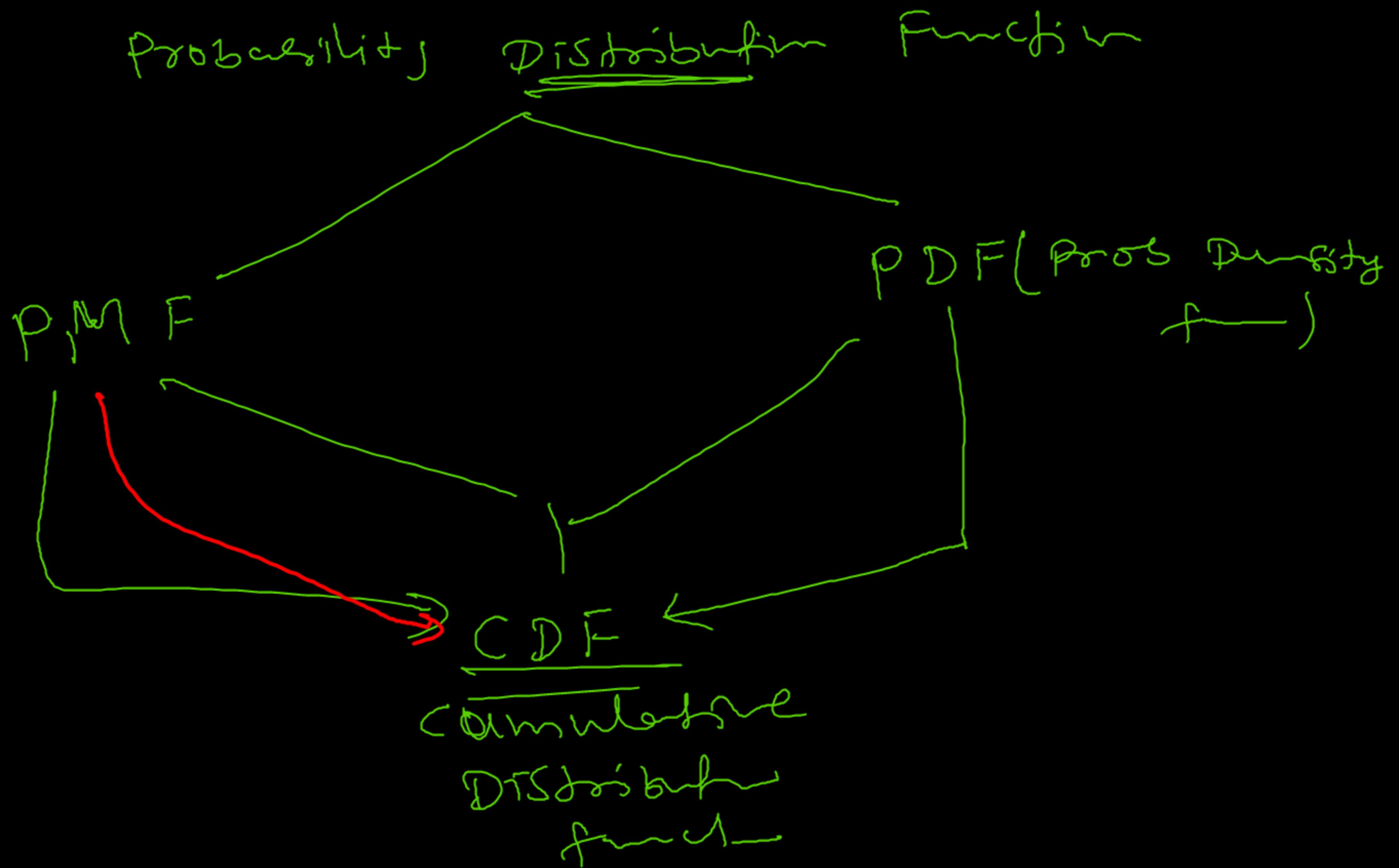
Probability Mass Function

- PMF

A hand-drawn graph illustrating a continuous random variable (RV) and its probability density function (PDF). The horizontal axis is labeled "probability density" and has tick marks labeled 1 and 2. A bell-shaped curve is labeled "continuous RV". An arrow points from the curve to the label "PDF". Below the x-axis, there is a wavy line labeled "f(x)".

You are screen sharing Stop Share

Tanmay Kulkarni +1 other raised hands View X



PMF  $\rightarrow$  discrete Random variable

- ① The probabilities assigned to each value must be non-negative.
- ② The sum of the prob assigned to all possible value must be equal 1.

$$y = f(x)$$

$$y = \begin{cases} \frac{1}{6} & \text{if } x \in \{1, 2, 3, 4, 5, 6\} \\ 0 & \text{otherwise} \end{cases}$$

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

$$f(x) = P(X \leq x)$$

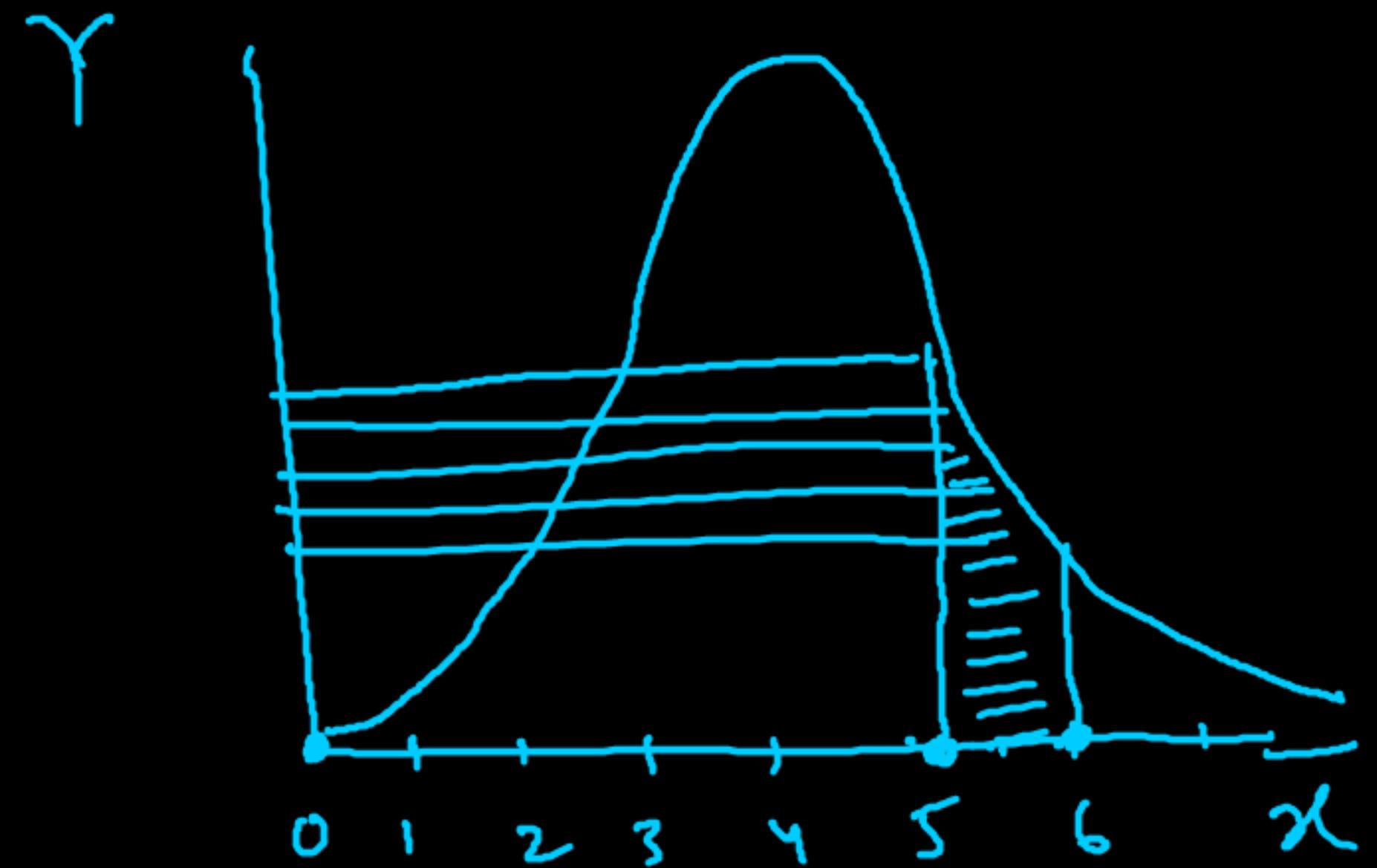
$$P(X \leq 5)$$

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

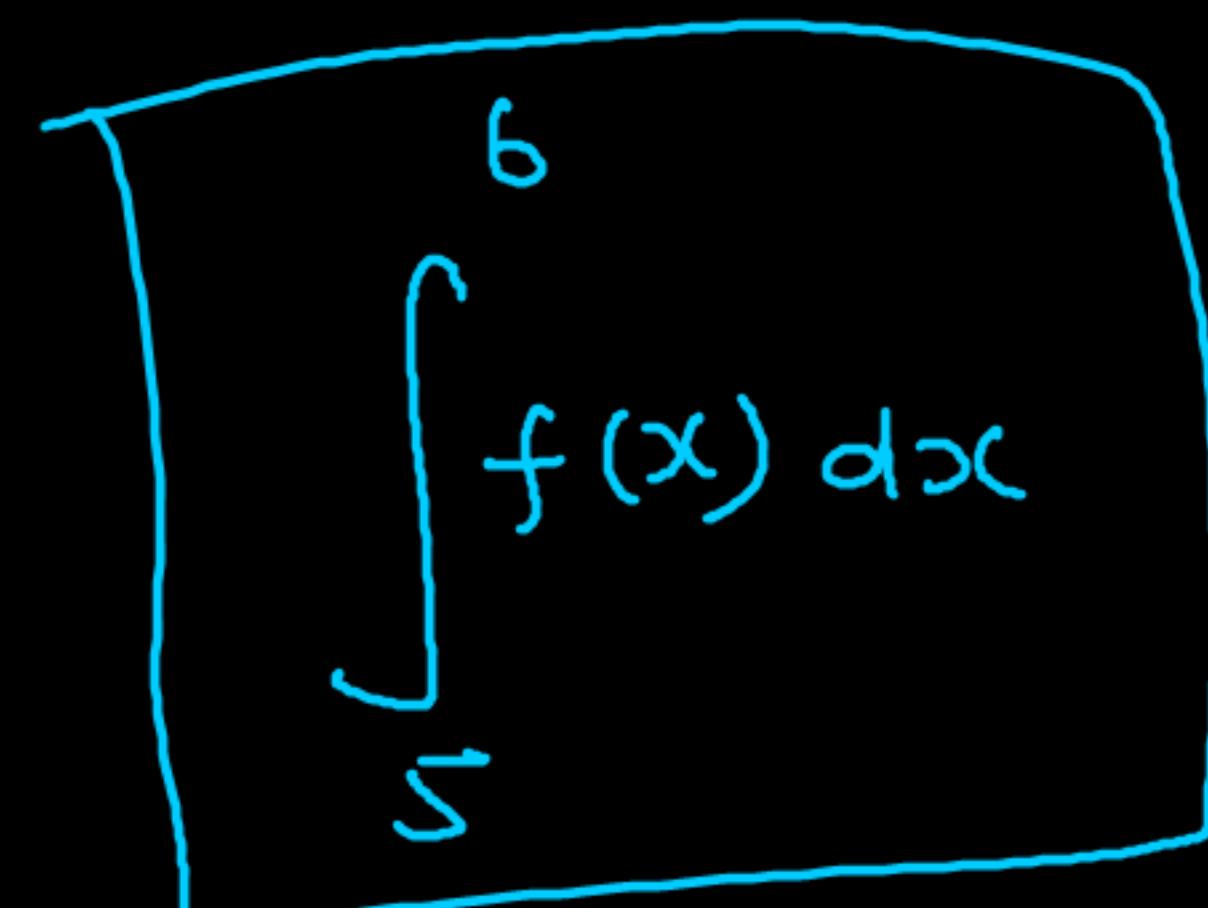


$$\frac{10}{36}$$

PDF - probability Density Function  $\rightarrow$  continuous random variable



$$P(5 \leq X \leq 6)$$



$$\begin{aligned} \mu = \\ \sigma = \end{aligned}$$

"parametric"  
assume  
Normal / Gaussian dist.

"Non-parametric"  
don't make any  
assumptions  
KDE

PDF

→

CDF

Integration

5 more min  
diff

Quantile = Percentile

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

$$\frac{99}{100}$$

$$\text{Decile} = \frac{1}{10} \quad Q_1 = \frac{25}{100} =$$

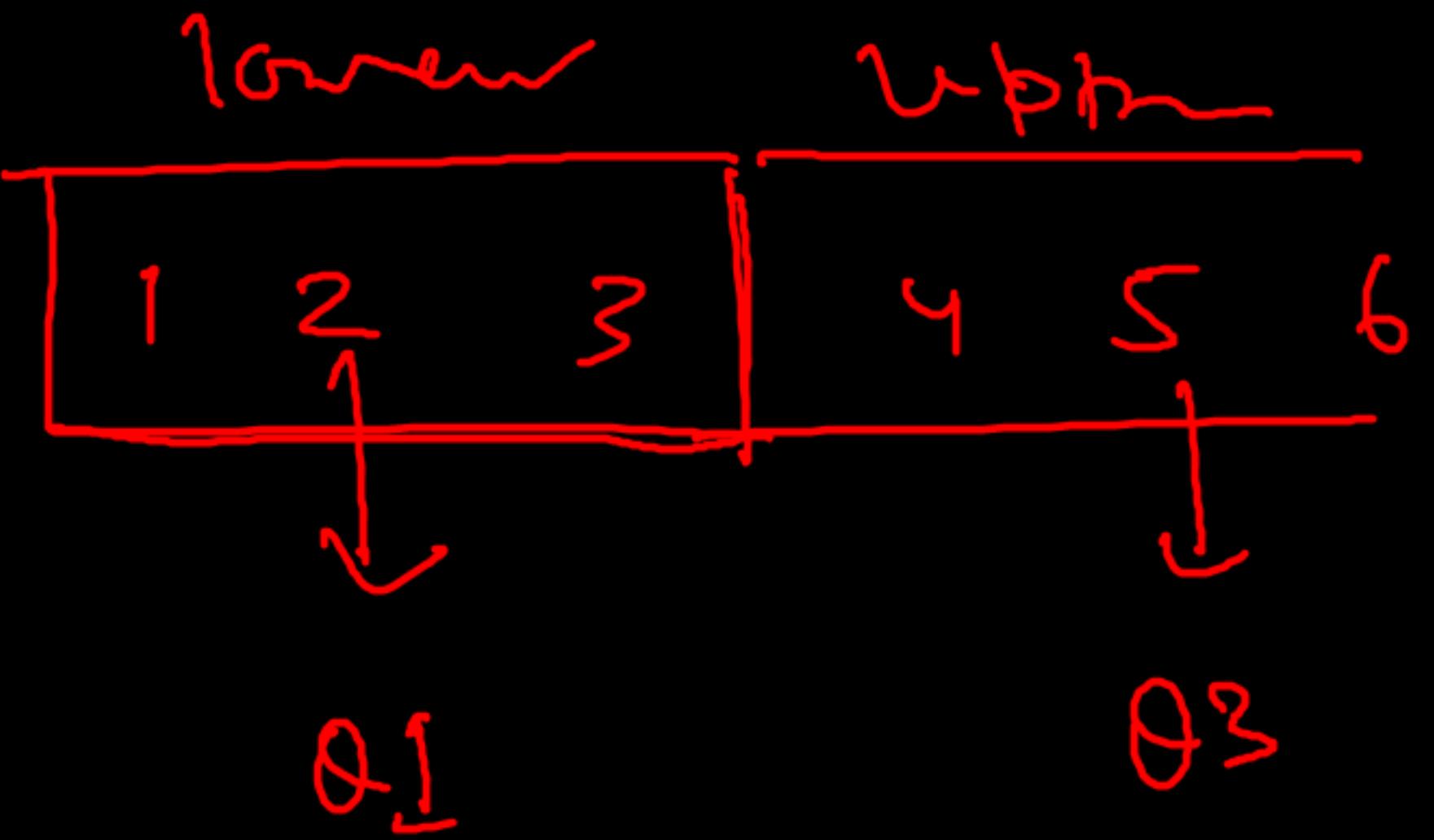
$$Q_1 = \frac{(n+1)}{4}$$

$$Q_3 = 3 \times \frac{n+1}{4}$$

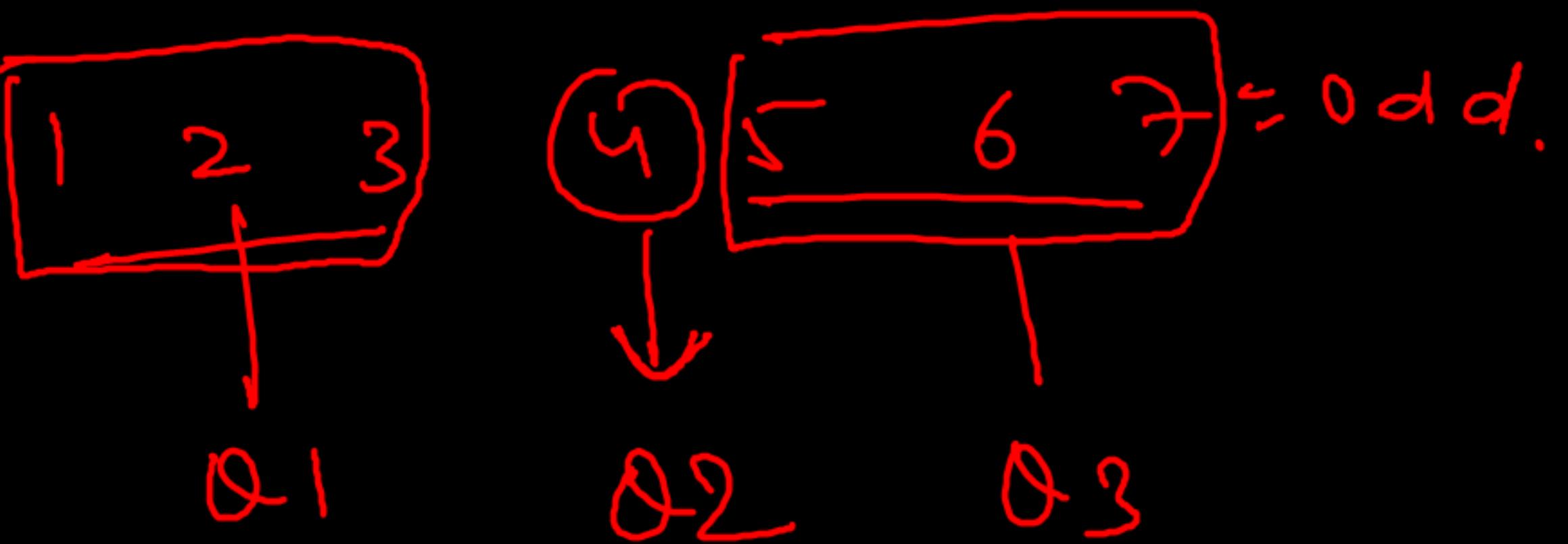
$$Q_2 = \frac{\sum (n+1)}{4} = \frac{nx}{2} = \text{me}$$

$$Q_4 = \frac{97}{4} \times \frac{n+1}{4}$$

You are screen sharing Stop Share



= Even No.



$$K \rightarrow (n+1)$$

100

= Per