Random Variable

Fix ⇒ Algebric Variable → x

$x + 5 = 10$

$x = 10 - 5$ $\quad \boxed{x = 5}$

⇒ Random experiment → value Random.

ex- Tossing a Coin (x)

$x = \{H, T\}$

event

event y = Throwing a Dice

Random variable → $y = \{1, 2, 3, 4, 5, 6\}$ → Sample Spare.

Probability = $\frac{\text{The Event}}{\text{Total outcome.}}$

Probability (H) = $\frac{1}{2}$

$T = 1/2$

probability of (1) in dice = $\frac{1}{6}$

Type of Random Variable

① Discrete RV (whole no)

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

$= \{H, T\}$

② Continious RV

$x = \{10, 10\}$

$= 1.2, 1.75.$

Probability Distribution

What are Probability Distributions?

A probability distribution is a list of all of the possible outcomes of a random variable along with their corresponding probability values.

Coin Toss	H	T
Prob value	1/2	1/2

← Probability Distribution

Dice

possible outcome	1	2	3	4	5	6
probability	1/6	2/6	3/6	4/6	5/6	6/6

Dice 1 / Dice 2	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

36 out come

Possible outcome	probability one
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	
11	
12	→ 1/36

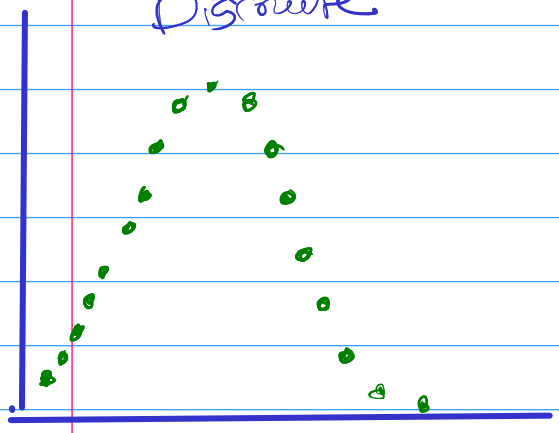
Problem → If the event is limited then we easily calculate.
but what if event is huge in no.

ex- 1 dice throw 10000 time
2 dice thrown 10,000 time.

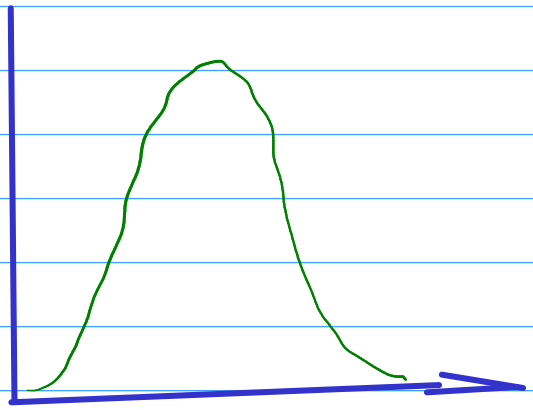
Probability Distribution function.

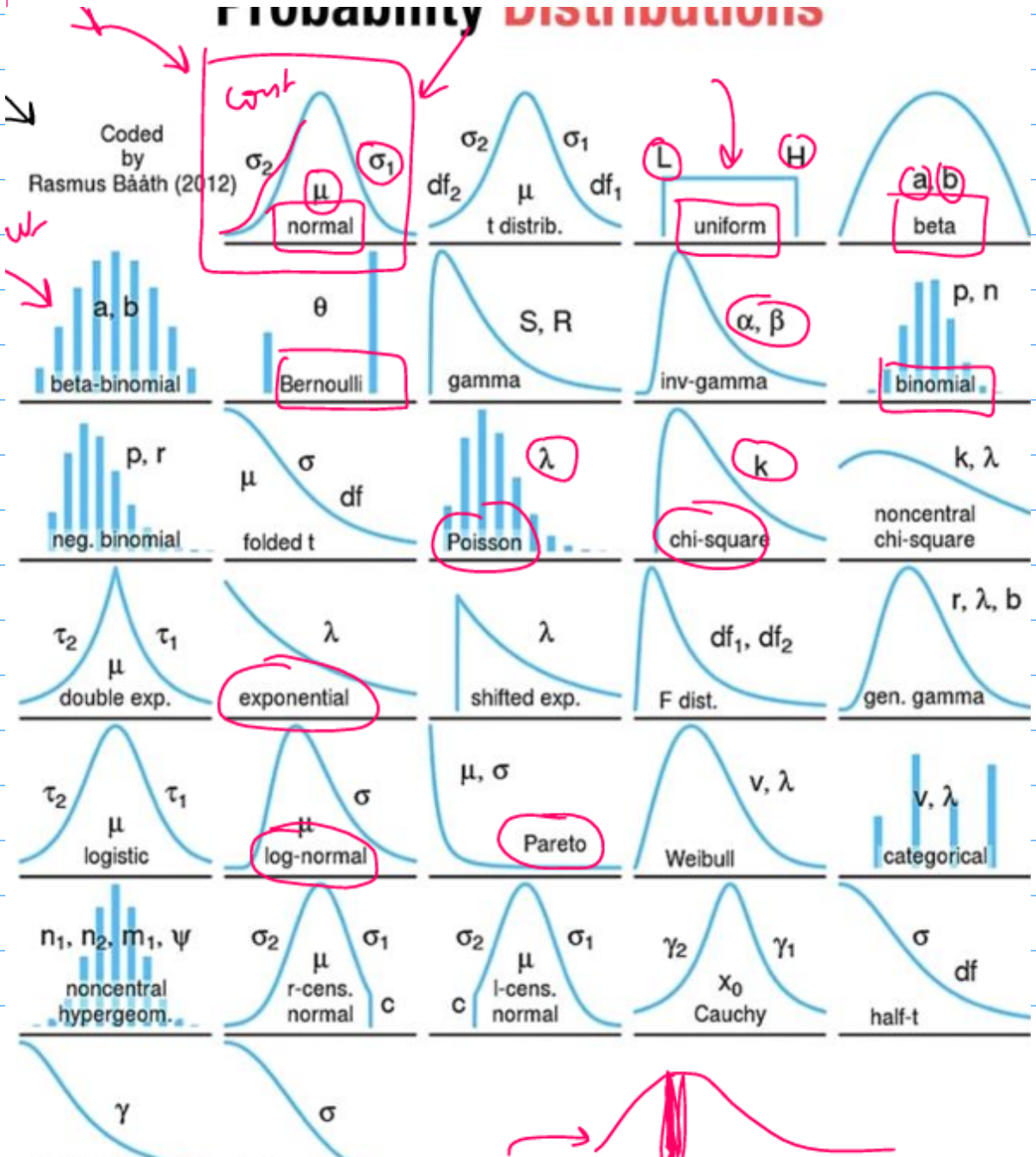
$y = f(x) =$ → in graphical Representation -

Discrete

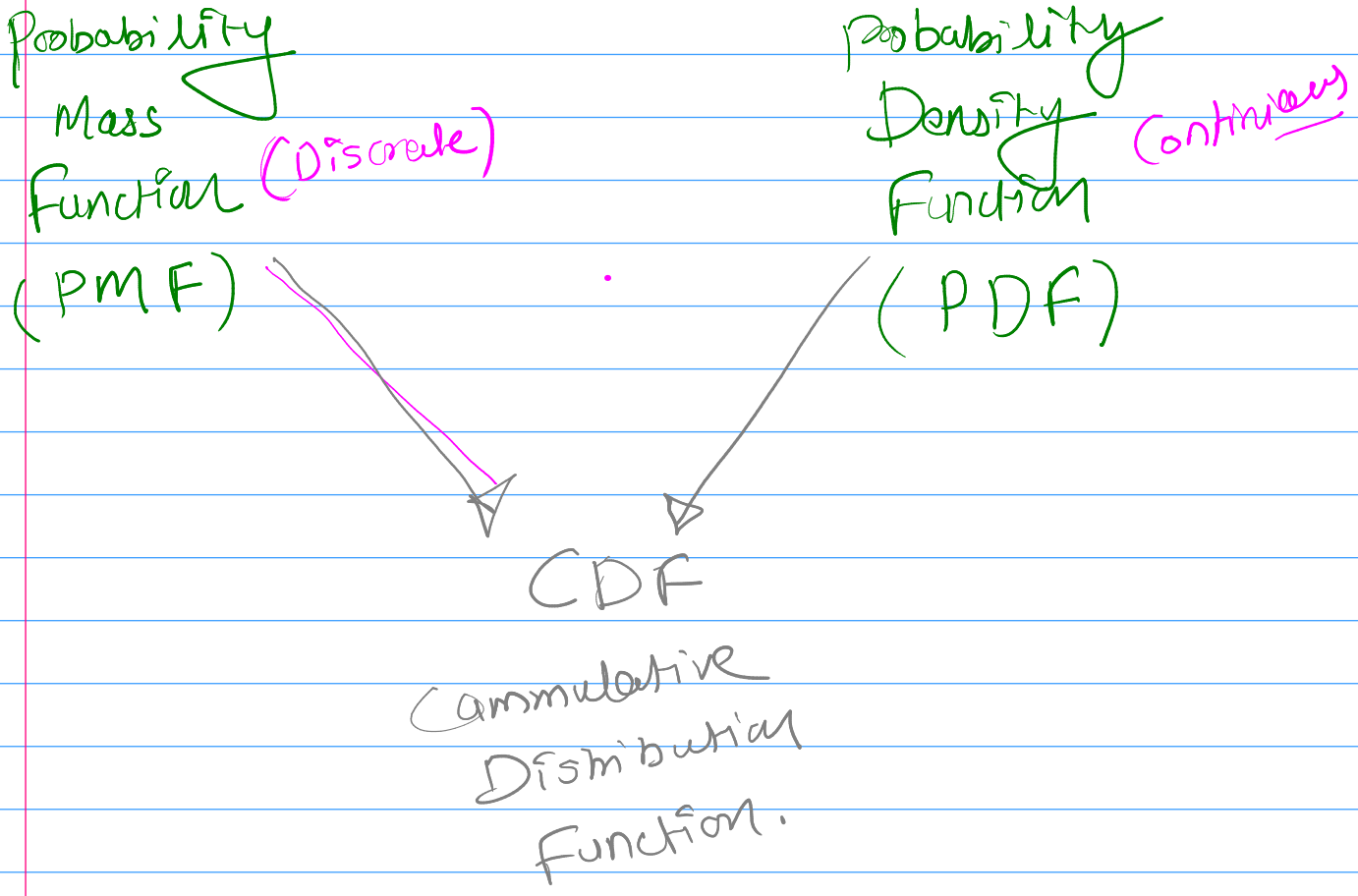


Continuous:





Probability Distribution function = PDF



A probability distribution function ([redacted]) is a mathematical function that describes the probability of obtaining different values of a random variable in a particular probability distribution.

PMF

PMF stands for Probability Mass Function. It is a mathematical function that describes the probability distribution of a **discrete random variable**.

The PMF of a discrete random variable assigns a probability to each possible value of the random variable. The probabilities assigned by the PMF must satisfy two conditions:

a. The probability assigned to each value must be non-negative (i.e., greater than or equal to zero).
b. The sum of the probabilities assigned to all possible values must equal 1.

Dice — 1 2 3 4 5 6

Prob $1/6 + 1/6 + 1/6 + 1/6 + 1/6 + 1/6 = 1$

Coin H T

prob $1/2 + 1/2 = 1$

$y = f(x)$

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

(Belongs to)

2 dice PMF $= y =$

$$\begin{cases} 1/36 & \text{if } x \in \{2, 12\} \\ 2/36 & \text{if } x \in \{3, 11\} \\ 3/36 & \text{if } x \in \{4, 10\} \\ \vdots & \\ 0 & \text{otherwise.} \end{cases}$$

CDF — Cummulative Distributing Function.

The cumulative distribution function (CDF) F(x) describes the probability that a random variable X with a given probability distribution will be found at a value less than or equal to x

CDF

$F(x) = f(x \le 4) = f(x=1) + f(x=2) + f(x=3) + f(x=4)$

$= 1/6 + 1/6 + 1/6 + 1/6$

$= 4/6 = 2/3$

	1	2	3	4	5	6
PDF	$1/6$	$1/6$	$1/6$	$1/6$	$1/6$	$1/6$
CDF	$1/6$	$2/6$	$3/6$	$4/6$	$5/6$	$6/6 = 1$