

Probability \Rightarrow The likelihood or chances of happening.

Range \Rightarrow 0% to 100%
 $=$ to $\underline{1}$

Variable \Rightarrow Just like a container that saves the data.

① Algebraic Variable \Rightarrow

$$\rightarrow y = mx + c$$

$$x + 5 = 10$$

$$x = 10 - 5$$

$$\boxed{x = 5}$$

Constant

② Random Variable :- The value of the variable changes randomly.

③ = Throwing a dice.



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

variable
coin $\rightarrow x = \{H, T\}$

↓
 Discrete RV
 $f(x)$

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

↓
continuous RV

ex- Height of the classroom.

~~~~~ X ~~~~~

$$\underline{\text{Probability}} = \frac{\text{possible outcome}}{\text{Total outcome}}.$$

ex- Throwing a dice.

$$\begin{aligned} \text{Total outcome} &= \{1, 2, 3, 4, 5, 6\} \\ &= 6 \end{aligned}$$

Probability of 4

$$\text{Probability} = \frac{1}{6}$$

$$\text{Probability of head (H)} = \frac{1}{2} = 0.5$$

$$\text{Total prob} = 1 \quad P(T)$$

$$= 1 - 0.5 = \underline{\underline{0.5}}$$

# Probability Distribution

Cross Tab

Tossing a  
coin

| Coin Toss   | H             | T             |
|-------------|---------------|---------------|
| probability | $\frac{1}{2}$ | $\frac{1}{2}$ |

Throwing a die.

| die     | 1             | 2             | 3             | 4             | 5             | 6             |
|---------|---------------|---------------|---------------|---------------|---------------|---------------|
| probabi | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ |

Throwing two  
dice at a time.

| dice1 | 1 | 1 | 2 | 3 | 4  | 5  | 6  |
|-------|---|---|---|---|----|----|----|
| dice2 | 2 | 2 | 3 | 4 | 5  | 6  | 7  |
|       | 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 |

$$P(2) = \frac{1}{36} \quad P(3) = \frac{2}{36} \quad P(4) = \frac{3}{36} \quad P(5) = \frac{4}{36}$$

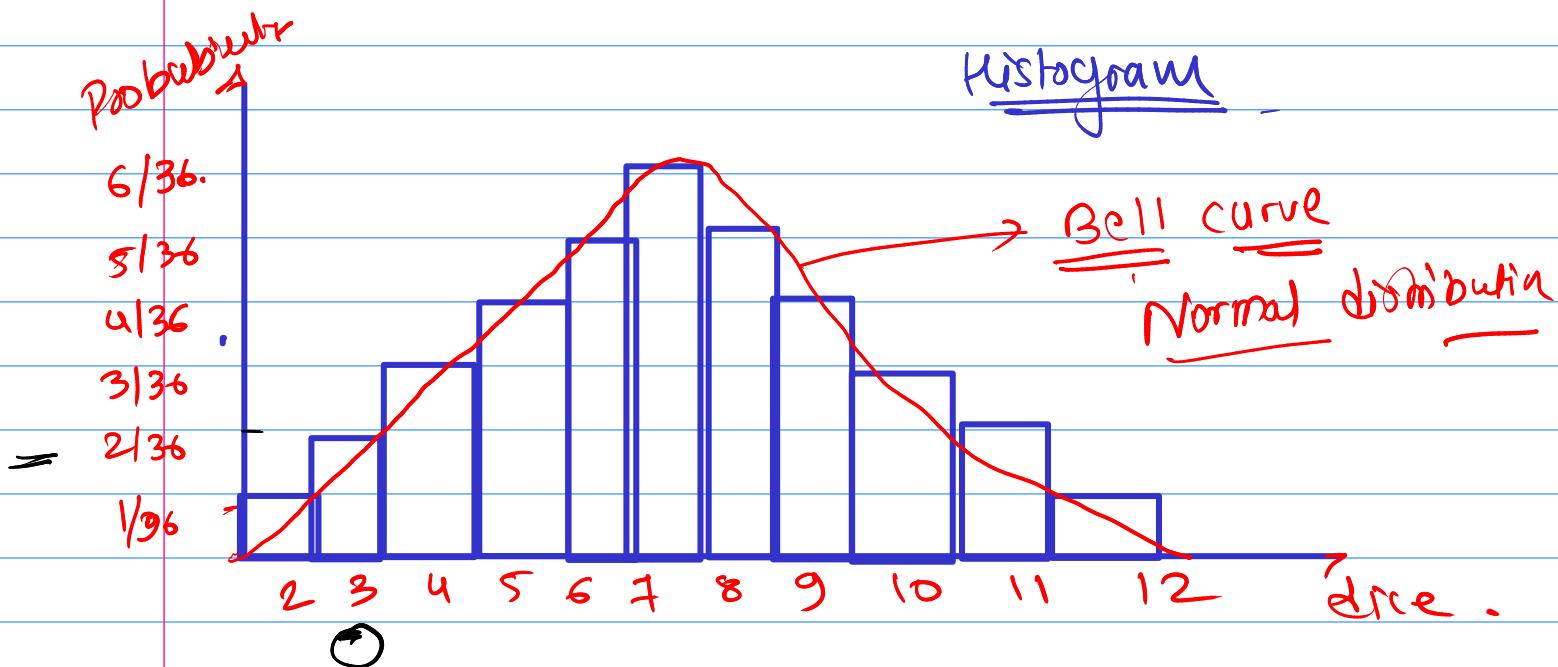
$$P(6) = \frac{5}{36} \quad P(7) = \frac{6}{36} \quad P(8) = \frac{5}{36} \quad P(9) = \frac{4}{36} \quad P(10) = \frac{3}{36}$$

$$P(11) = \frac{2}{36} \quad P(12) = \frac{1}{36}$$

~~Throw 3 time~~  
~~PDF~~ = Probability distribution function

① It help us to identify the distribution of the data in graphical form.

② If any function matches the standard distribution then we can calculate everything about the data using standard formulas.

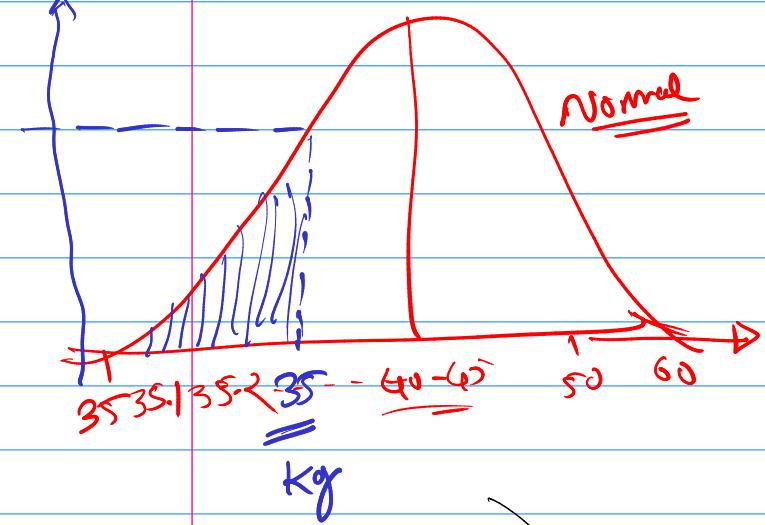
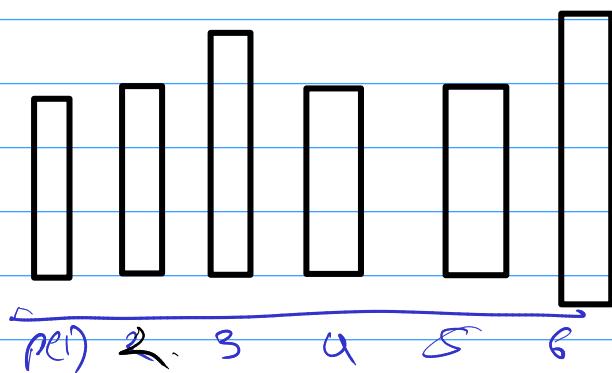
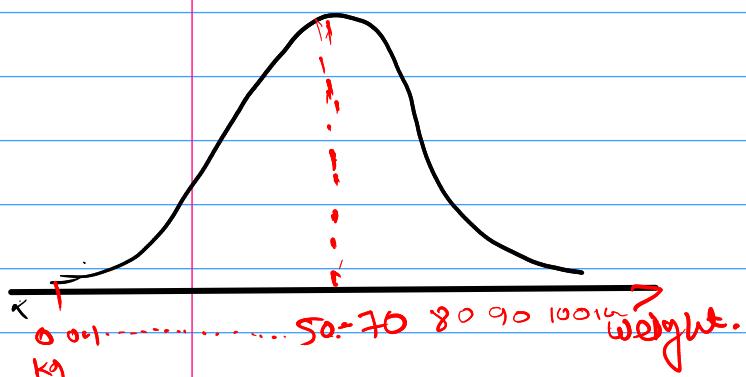


KDE = kernel density estimators.  
↳ smoother the histogram.

PDF

Probability Density function  
(Continuous)

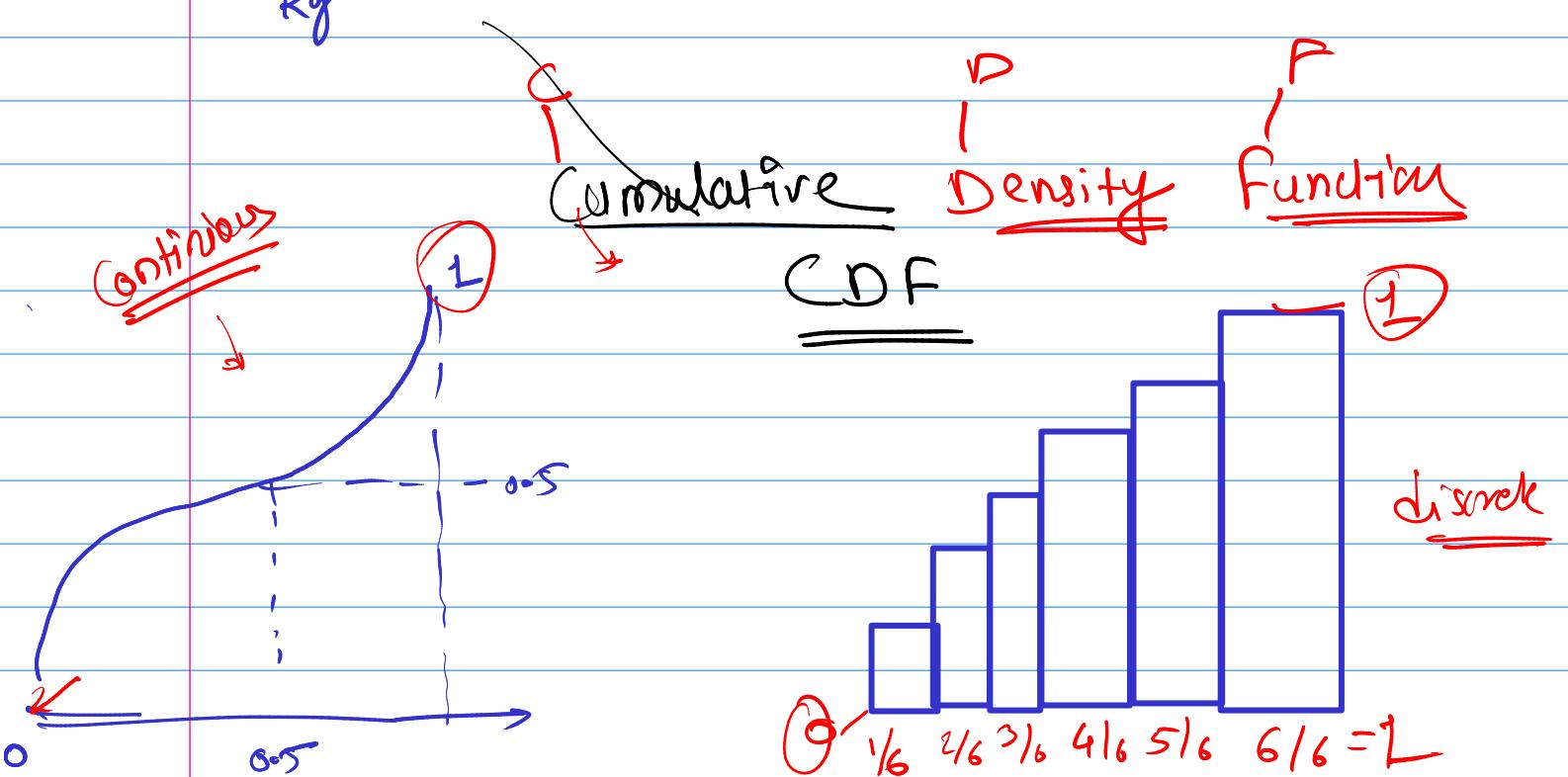
Probability Mass Function.  
(Discrete)



probability mass function  
fill up in due.

$$P(1) + P(2) + P(3) + P(4) =$$

$$\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6}$$



- ① Normal & Gaussian Distribution
- ② Bernoulli Distribution
- ③ Uniform Distribution
- ④ Poisson Distribution
- ⑤ Binomial Distribution
- ⑥ Log - Normal Distribution.