

Mean

Mean = $\frac{\text{sum of all observations}}{N \rightarrow \text{Total observations}}$

in Python it will be

→

```
import numpy as np
arr = np.array([1, 2, 3, 4])
mean = sum(arr) / len(arr)
print(mean)
```

OR

→

```
np.mean(arr)
```

Weighted average

eg ~~[1, 2, 3, 4]~~ [1, 3, 5, 7, 9]

$$W.A. = \frac{1 \times 1 + 2 \times 3 + 3 \times 5 + 4 \times 7 + 5 \times 9}{5}$$

in numpy

```
arr = np.array([1, 2, 3, 4])
weights = np.array([1, 2, 3, 4])
np.average(arr, weight=weights)
```


$$\frac{n}{2} + \frac{n+1}{2}$$

$$\frac{2n+1}{2}$$

* arr = [1, 2, 3]
[4, 5, 6]

np.mean(arr, axis=1)

$\frac{1+2+3}{3}$, $\frac{4+5+6}{3}$ (along ~~row~~ column considering every row)

→ (2, 5)

axis = 0

→ along rows considering every column
 $(\frac{4+1}{2}, \frac{2+5}{2}, \frac{3+6}{2})$

Median

- ① Take array
- ② Sort in ascending
- ③ Get length of array

Case ①

$n \% 2 == 1 \rightarrow \left\lceil \frac{n+1}{2} \right\rceil$
↳ odd length

Case ②

$n \% 2 == 0$

↳ even length

$$\frac{(n/2) + (n/2 + 1)}{2}$$

eg [1, 3, 5, 7, 9]

np. median (arr)
→ 5

eg [1, 3, 5, 7]

np. median (arr)
→ 4 $(\frac{3+5}{2})$

MODE

↳ maximum occurrence of element

eg 1, 3, 3, 3, 5, 5, 9
↳ (3)

STANDARD DEVIATION & VARIANCE

Standard deviation → $\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{N}}$

Spread of data from mean line
($x - \bar{x}$)

x → values

\bar{x} → mean

N → Total values

Standard dev in Python

marks = ([1, 2, 3, 4])

5 def stand_dev(arr):

mean = arr.mean()

final = 0

for i in arr:

10 val = (i - mean) ** 2

final = final + val

return (final / len(arr)) ** 0.5

15 stand_dev(marks)

↳ arrs

Variance

20 ↳ $\sigma^2 = (\text{S.D})^2$

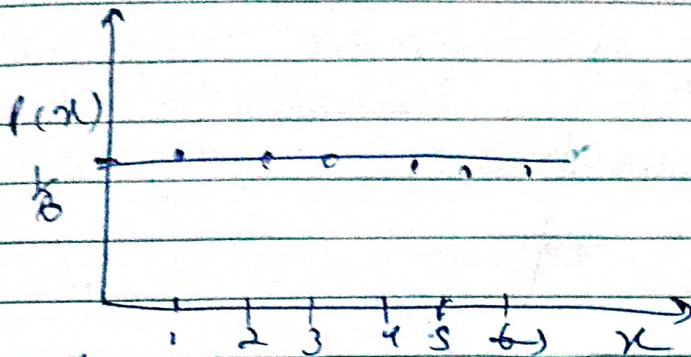
25 Normal Distribution

$\mu \rightarrow \text{mean}$
 $\sigma \rightarrow \text{SD}$

DATE: ___/___/___
 PAGE: ___

exent

eg $X = \{1, 2, 3, 4, 5, 6\}$ \rightarrow possibilities of dice

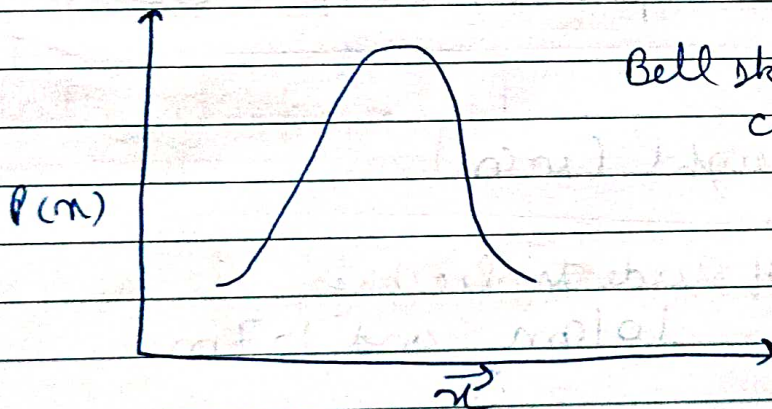


\rightarrow constant graph

All have probability of $(1/6)$

Probability distribution graph
 of a discrete class

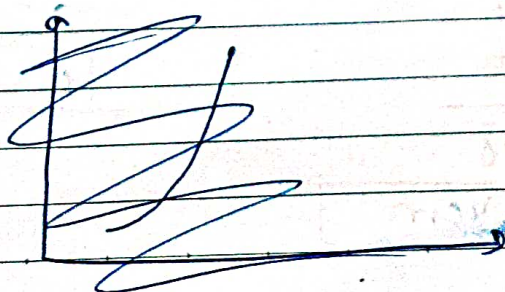
\rightarrow But what if its a continuous class
 eg \rightarrow marks in a class



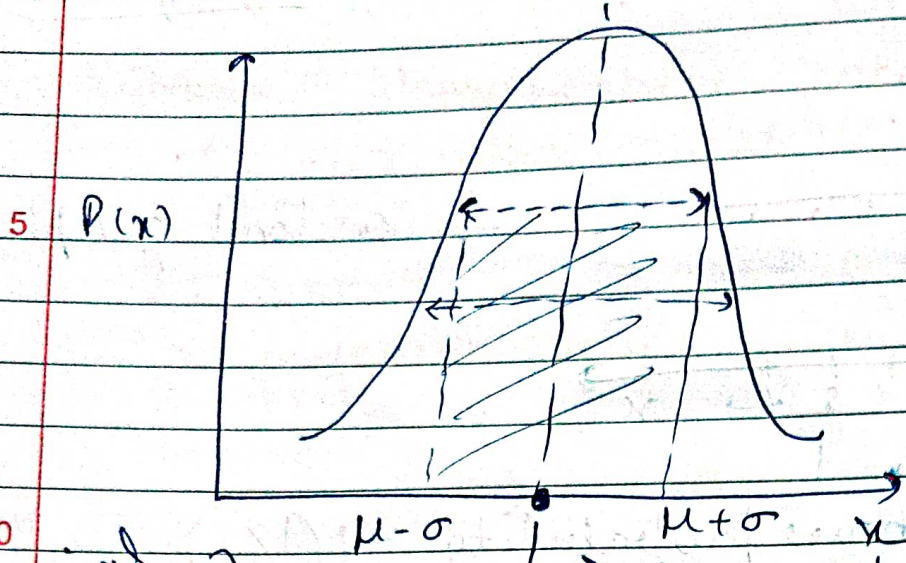
Bell shaped
 curve

Normal
 Distribution

If we have continuous variable and if we
 draw its P.D. Graph, it would look like



* Some Facts about normal distribution.



Empirical rule

mean, median, mode

68% of area of graph lies b/w $\mu - \sigma$ and $\mu + \sigma$

95% --- $\mu - 2\sigma$ and $\mu + 2\sigma$

99.7% --- $\mu - 3\sigma$ and $\mu + 3\sigma$

Eg let's take height (in cm)

68% of students lie b/w 101cm and 107cm

Find μ, σ

$$\begin{aligned} \mu - \sigma &= 101 \\ \mu + \sigma &= 107 \end{aligned}$$

$$\begin{aligned} \sigma &= 104 - 101 \\ \sigma &= 3 \end{aligned}$$

$$2\mu = 208$$

$$\boxed{\mu = 104 \text{ cm}}$$