$P(H) = 0.5$

1000 (Law of large no)

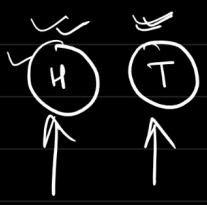
↓

Converge to average

50% → Head

50% → tail

Tossing a coin




→ Experiment is random

→ Outcome will be random

$X = \begin{cases} 0 \rightarrow T \\ 1 \rightarrow H \end{cases}$ → quantified each of the event

$P(H) = 1/2$

↓

random variable

$X = \{0, 1\}$

Can take any value from this set of values

$x + 5 = 10$

$x = 10 - 5$

$= 5$

↓

value is fixed

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

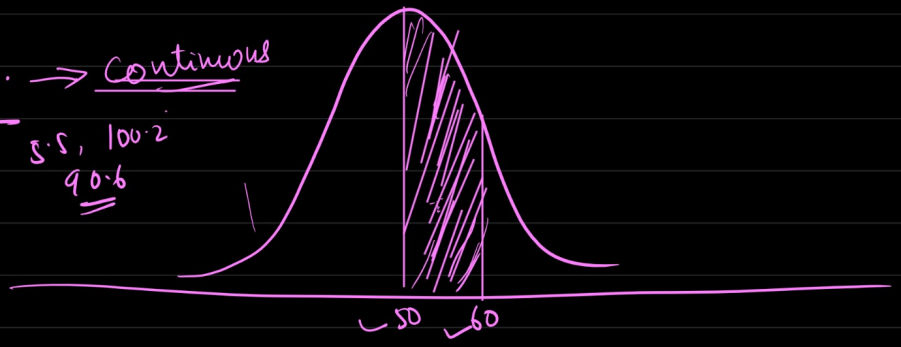
→ Discrete random variable

distribution of Age. → continuous

dist plot

5.5, 100.2

90.6



Experiment → random

↓

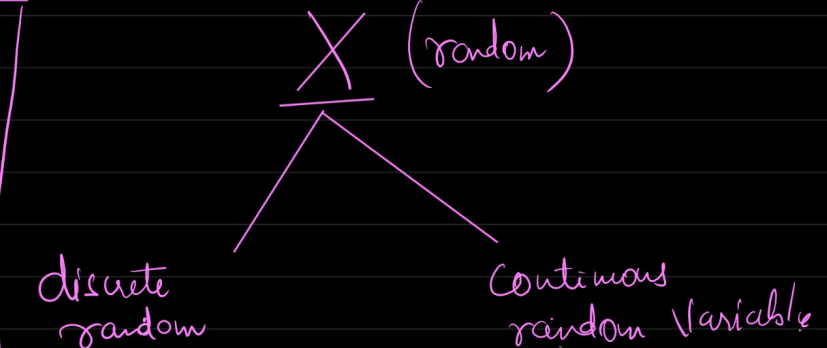
outcome is rando

↓

random variable

↓

discret / continuous




↳ A rv can take any values.

→ random Variable value is unknown.

$X = \{1, 0\}$

Tossing a coin = {H, T}

- P(H) = 1/2
- P(T) = 1/2

→ Give me a fn

Give me a generic fn & calculate prob of a event while tossing a coin.

$$P(X) = \frac{1}{n}$$ → Total no. of outcomes.

$P(X=0) = \frac{1}{2}$

$P(X=1) = 1/2$

dice → 1, 2, 3, 4, 5, 6

P(1) = 1/6

P(2) = 1/6

$P(X=5) = \frac{1}{6}$

$\Rightarrow P(X) = \frac{1}{n} =$

$P(X=6) = 1/6$

$\frac{1}{n}$ → function that can be use to get Probability.

Prob distribution fn ⟸ Outcome of an experiment

- discrete
  - → tossing a coin
  - → Throwing a dice
  - ↓
  - Prob mass fn
- Continuous
  - → Ht of the class
  - → Age of group
  - ↓
  - Prob density fn

---

## * Prob distribution fn.

* irrespective of outcomes nature, draw outcome in a form of distribution ⟶ Prob distribution fn.

### Prob distribution fn

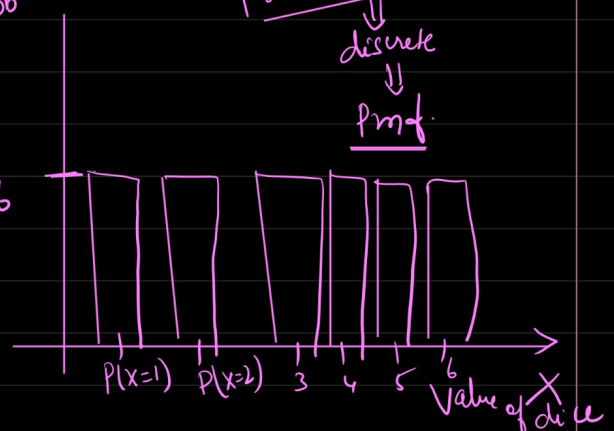
- Prob mass fn (Pmf) (discrete)
- Prob density fn (Pdf) (Continuous)

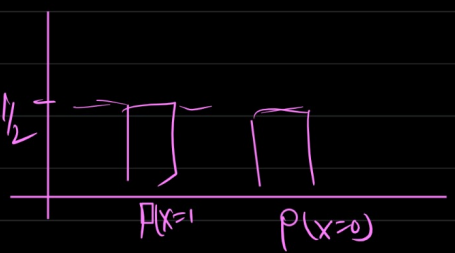
Throwing a dice

$P(1) = 1/6$
$P(2) = 1/6$
$P(3) = 1/6$
$P(4) = 1/6$
$P(5) = 1/6$
$P(6) = 1/6$

⇒

Prob distribution ⇓ discrete ⇓ Pmf.

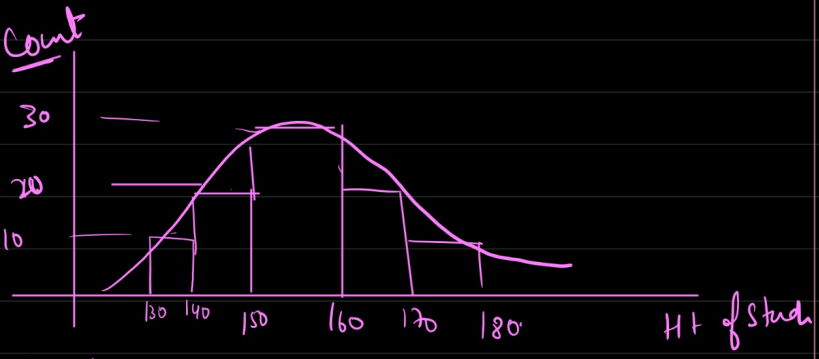




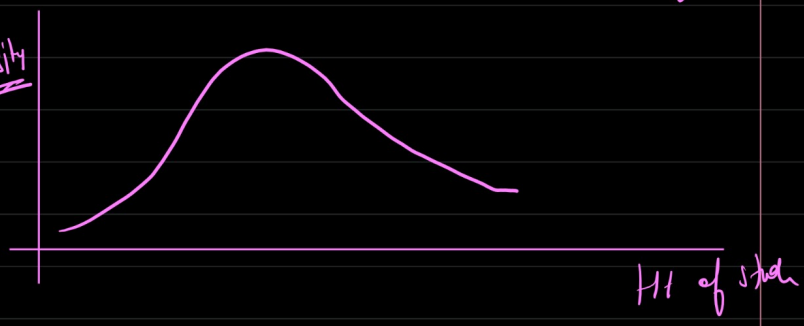

Continus. → Prob density fn

Ht. of Studen

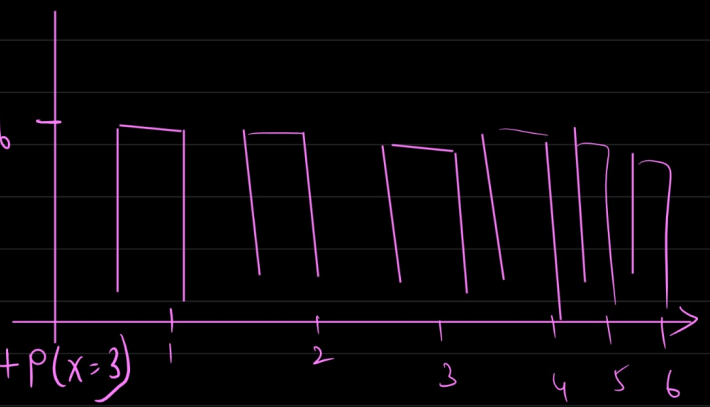
plt. histogram




plt. dist.




Rolling of dice → PMF




$P(X=1) = 1/6$

$P(X=2) = 1/6$

$P(X \leq 3) = P(X=1) + P(X=2) + P(X=3)$

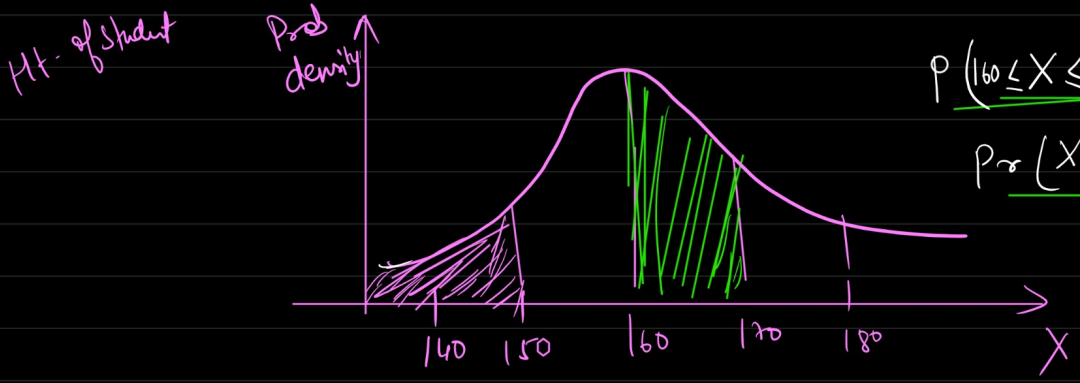
$= 1/6 + 1/6 + 1/6 = 3/6 = \frac{1}{2}$

$P(X \leq 4) = P(X=1) + P(X=2) + P(X=3) + P(X=4)$

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

$P(X \leq 6) = 1$

# Pdf → Prob dist of Continuous data

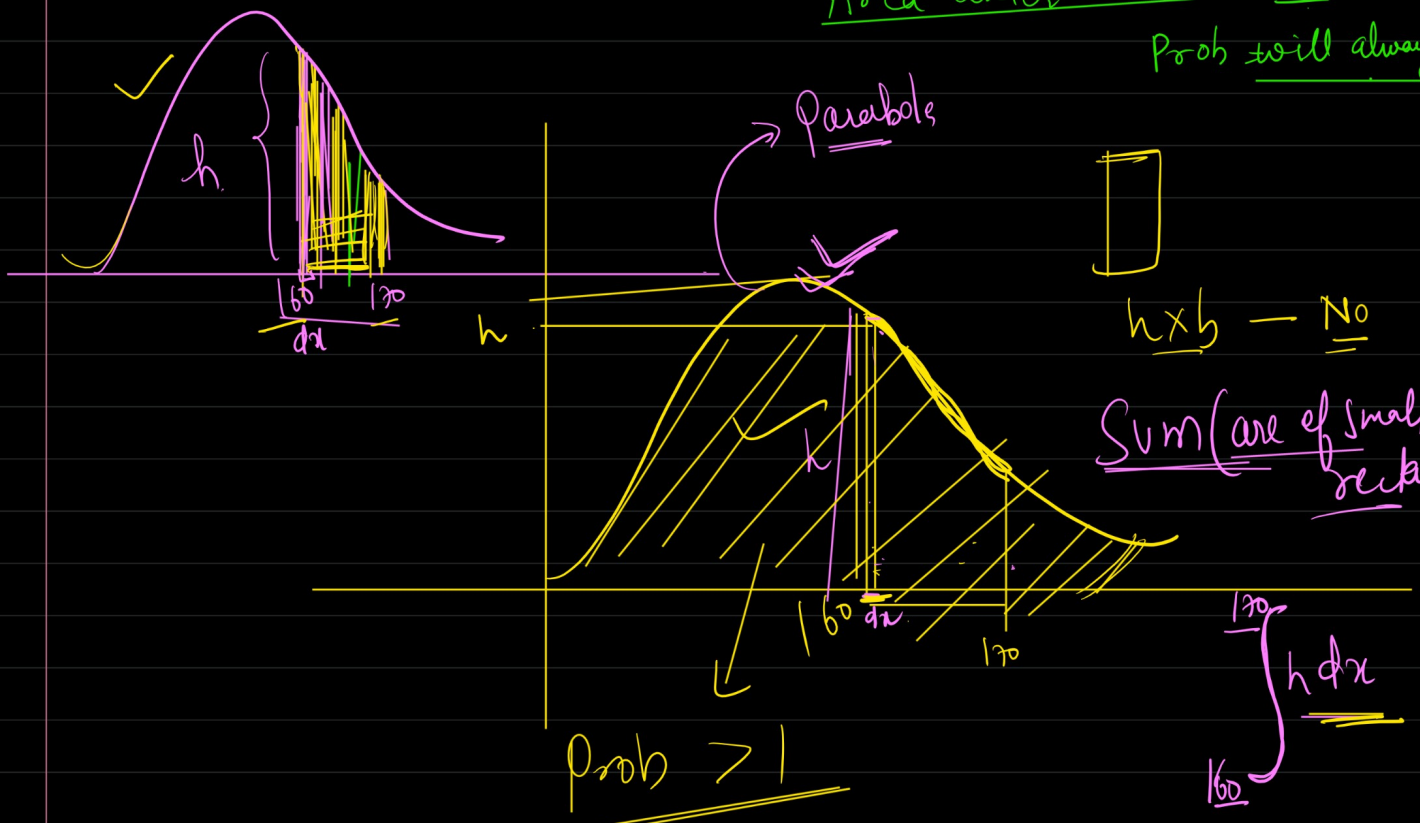



$P(160 \le X \le 170)$

$Pr(X \le 150)$

Area under Curve = 1

Prob will always be 1




$h \times b$ — No

Sum (area of small rectangles)

$\int_{160}^{170} h\,dx$

Prob > 1

## Cdf

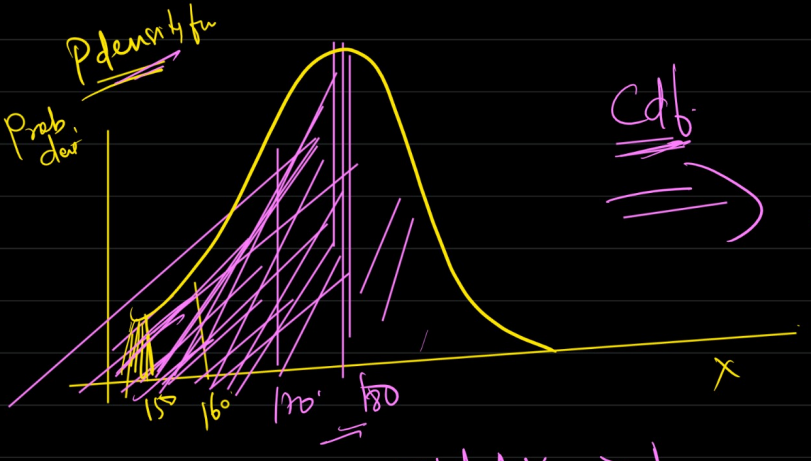
Pmf → discrete

Cumulative dist fn

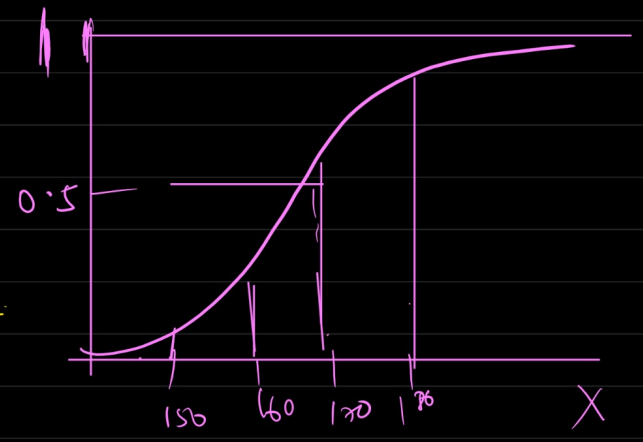
↓

adding values to current point

| X | P(x) (Pmf) | Cdf |
|---|---|---|
| 1 | 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 |




Cdf




Total AUC → 1

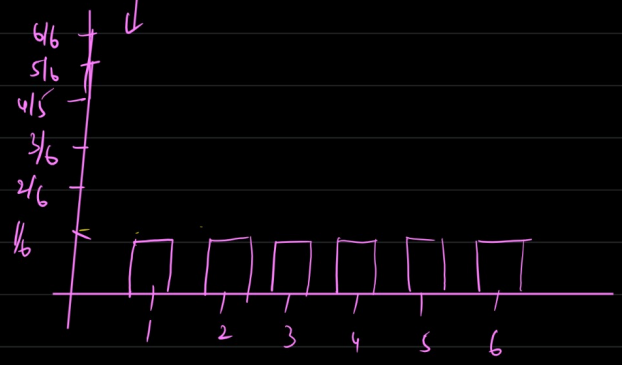
---

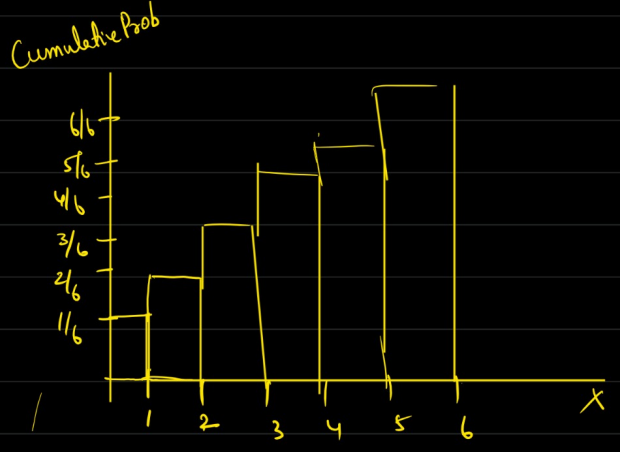
① Prob

Rolling a dice = {1, 2, 3, 4, 5, 6}

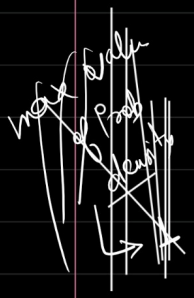
P(1) = 1/6
P(2) = 1/6
P(3) = 1/6
P(4) = 1/6
P(5) = 1/6
P(6) = 1/6

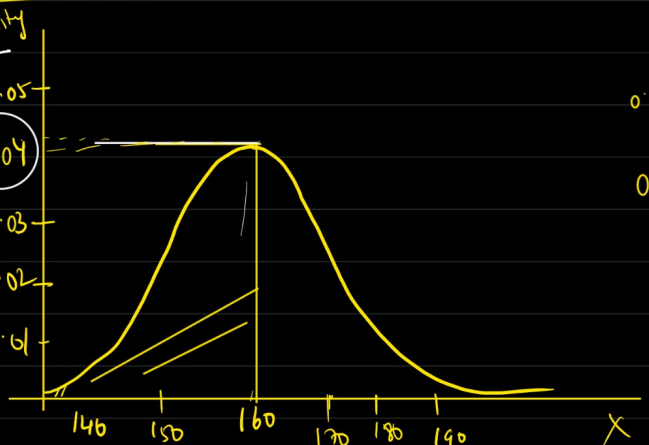
→ Uniform distn



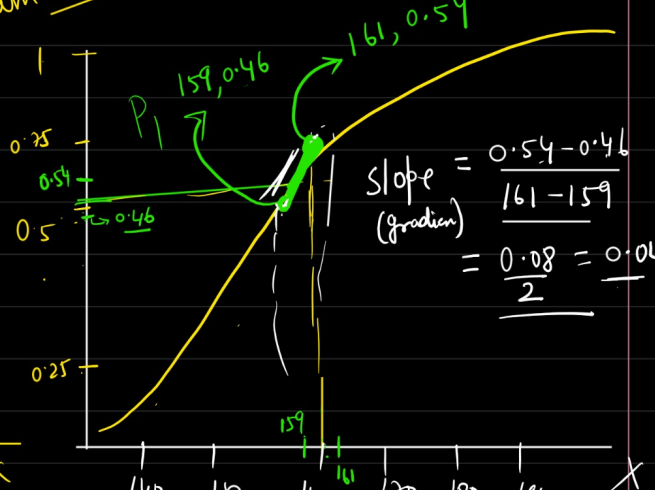




* Prob density fn



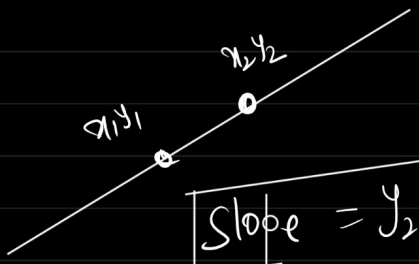




Cumulative Prob



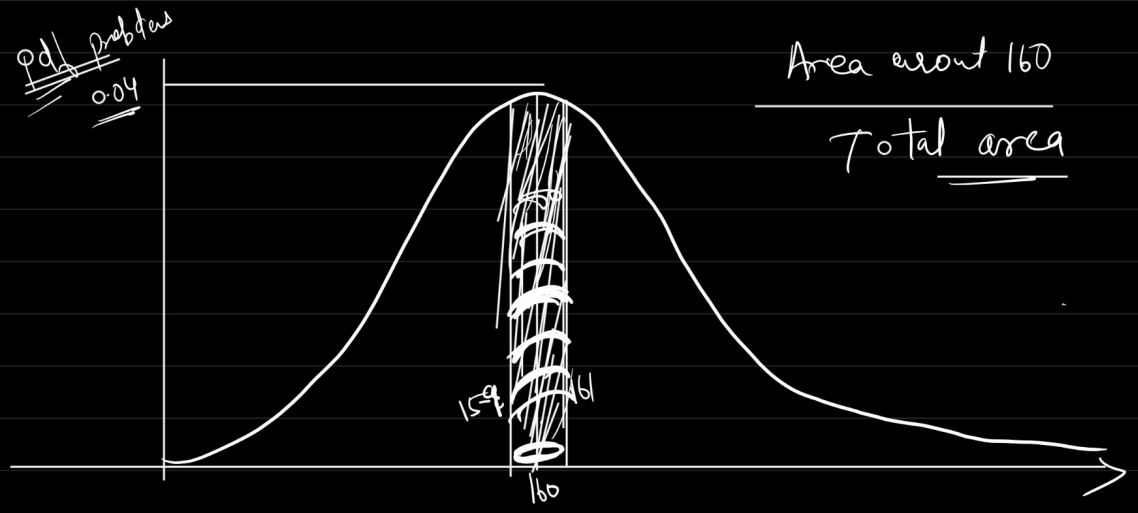

Slope (gradient) = $\frac{0.54 - 0.46}{161 - 159}$

$= \frac{0.08}{2} = 0.04$



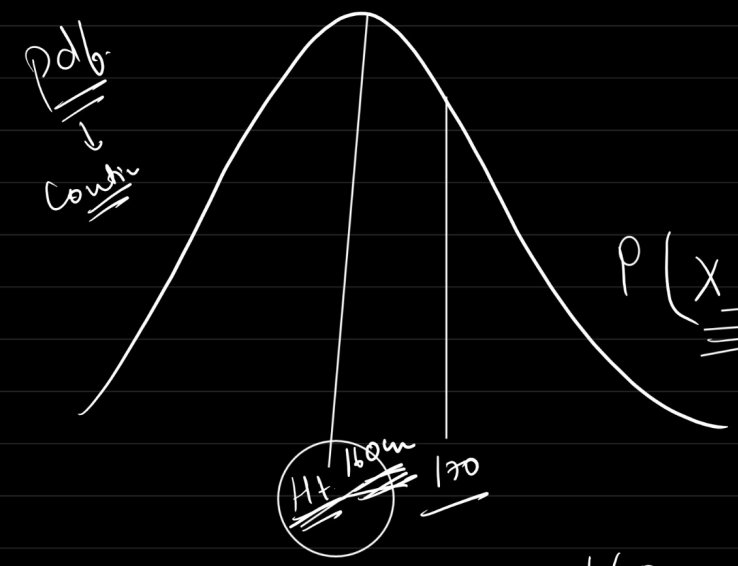

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{Prob density of Pdf} = \frac{\text{Slope of cdf}}{\text{gradient}}$$




Area around 160 / Total area

* Prob density can be greater than 1

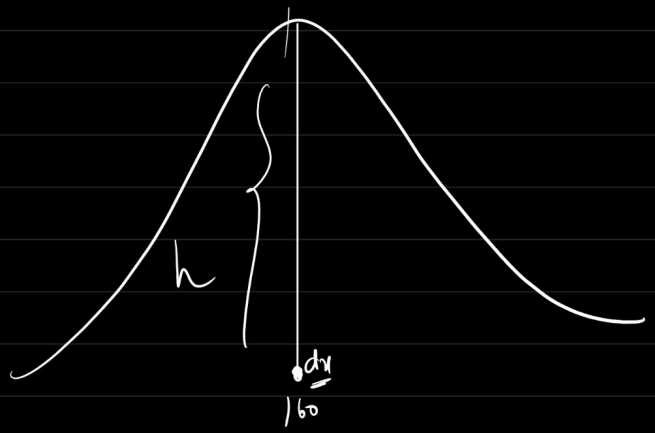



$P(X = 160\text{ cm}) \rightarrow 0$

Δo body is exactly equals to 160 cm

160

160.000000000000/




area of Point

$= 0$

$dx \to 0$

Prob distribution Funct

Pmf

Cont

Non

Prob dens fn