Agenda

- * Binomial Distribution
- * Bernouli Distribution => Special Case (**) Assignments
- * Population Vs Sample
- * Sample statistics
- * Sampling techniques
- * Uniform Distribution

Empirical vs Theoritical

Casino

Think stats

Binomial Distribution

Casino

=> Discrete probability distribution of the no of success in n independent experiments.

=>

→ no of red balls

Binomial RV

$\Rightarrow$ $\underline{\underline{n}}$ $\Rightarrow$ no of independent trials $n = 4$

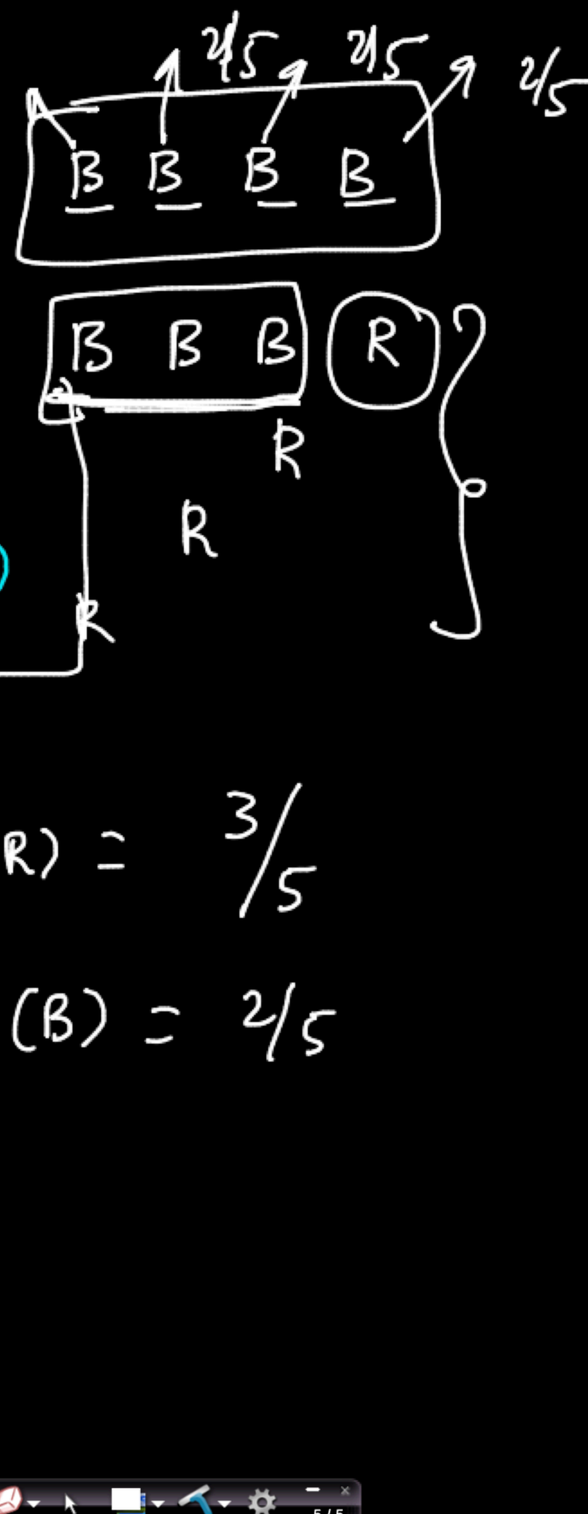
p $\Rightarrow$ probability of sucess in one trail $p = 3/5$

1-P failure

$$P(X = K) = {}^{n}C_{K} * P^{K} * (1-P)^{n-K}$$

$$P(X = 0) = {}^{4}C_{0} * \left(\frac{3}{5}\right)^{0} * (2/5)^{4}$$

X				P(x)
0	$4C_0$	$(2/5)^4$	$\Rightarrow$	$4C_0 * (\frac{2}{5})^4 (\frac{3}{5})^0$
1	$4C_1$	$(\frac{3}{5}) * (\frac{2}{5})^3$	$\Rightarrow$	$4C_1 * (\frac{3}{5})^1 * (\frac{2}{5})^3$
2	$4C_2$	⋮	$\Rightarrow$	$4C_2 * (\frac{3}{5})^2 * (\frac{2}{5})^2$
3	$4C_3$	⋮		⋮
4	$4C_4$	:		:



$P(R) = 3/5$

$P(B) = 2/5$

X			
0	$^4C_0$	$(2/5)^4$	$\Rightarrow {}^4C_0 * (\frac{2}{5})^4 (\frac{3}{5})^0$
1	$^4C_1$	$(\frac{3}{5}) * (\frac{2}{5})^3$	$\Rightarrow {}^4C_1 * (\frac{3}{5}) * (\frac{2}{5})^3$
2	$^4C_2$	⋮	$\Rightarrow {}^4C_2 * (\frac{3}{5})^2 * (\frac{2}{5})^2$
3	$^4C_3$	⋮	⋮
4	$^4C_4$	:	÷

P(X)

2/5 2/5 2/5 2/5

B B B B

B B B R

R

R

$P(R) = 3/5$

$P(B) = 2/5$

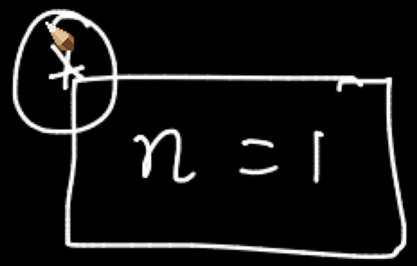
Conditions

1. Experiment must contains fixed no of trials ; with $n = 4$
   only 2 possible outcomes
2. Individual trials are identical and independent.
3. R.V denotes the no of sucss in n trials

Bernoulli Distribution

Special Binomial

Succes / Fail



Dice Example

P(R)

⇒ You throw 2 dice. If both dice are 6, you get Rs 2.
Else if one dice is 6 you get Rs 1 otherwise 0.

X → amount of money won

X = {0, 1, 2}

D_2

D_1	1	2	3	4	5	6
1	0	0	0	0	0	1
2	0	0	0	0	0	1
3	0	0	0	0	0	1
4	0	0	0	0	0	1
5	0	0	0	0	0	1
6	1	1	1	1	1	2

$P(X=0) = 25/36$

$P(X=1) = 10/36$

$P(X=2) = 1/36$

$$P(X = k) = {}^{n}C_{k} * (p)^{k} * (1-p)^{n-k}$$

$n = 2$

$p \Rightarrow$ probability of sucess in one trail $\Rightarrow p = 1/6$

$1 - p = 5/6$

$P(X=0) = {}^{2}C_{0} * (1/6)^{0} * (5/6)^{2} = 25/36$

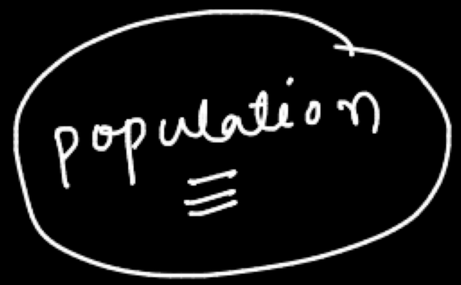
$P(X=1) = {}^{2}C_{1} * (1/6)^{1} * (5/6)^{1} \Rightarrow 10/36$

$P(X=2) = {}^{2}C_{2} * (1/6)^{2} * (5/6)^{0} = 1/36$ ✓

Population vs Sample

Inferential

=> 140 cr



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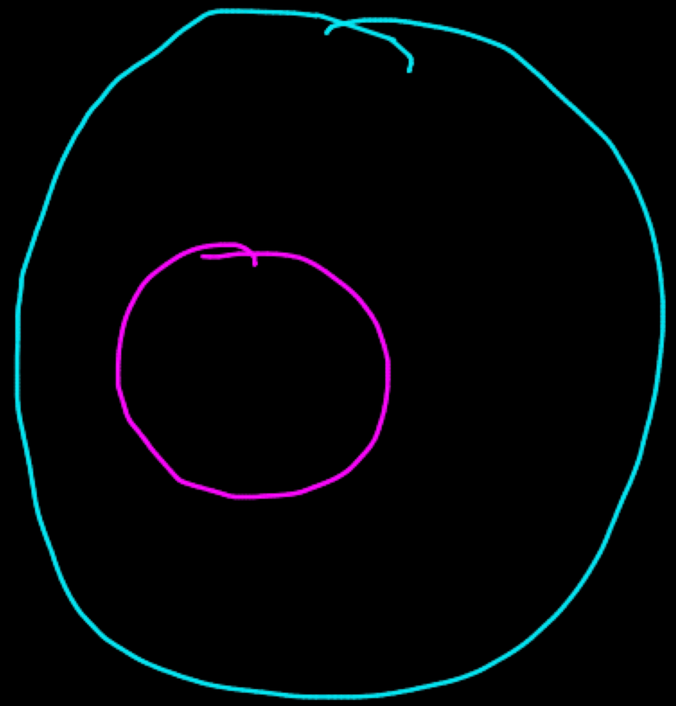

Avg

Sample : Unbiased Subset of the population

=> why should we use sample instead of population?

140 cr

(i) Practicality :

10 000

Sample Statistics

Population

Population mean $(\mu) = \frac{\sum x_i}{N}$

Population variance $(\sigma^2) = \frac{\sum_{i=1}^{n} (x_i - \mu)^2}{N}$

Population S.D $(\sigma) = \sqrt{\sigma^2}$

Sample (n)

mean $\Rightarrow \bar{x} = \frac{\sum x_i}{n}$

Variance $\Rightarrow s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$

S.D $= \sqrt{s^2}$

** Bessel's correction

correct bias

$(n-1)$, $n-2$, ____

Quiz #1

45 students

$N = 45$

5 students were randomly

$n = 5$

[131, 150, 140, 142, 152]

Sample mean

variance.

$$\bar{x} = \frac{131 + 150 + 140 + 142 + 152}{5}$$

$$= 715 / 5 = 143$$

$$s^2 = \frac{(131-143)^2 + (150-143)^2 + (140-143)^2 + (142-143)^2}{4}$$

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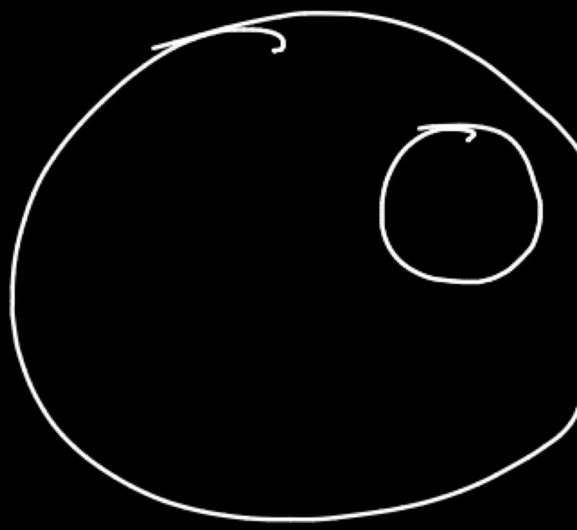
Sampling Techniques

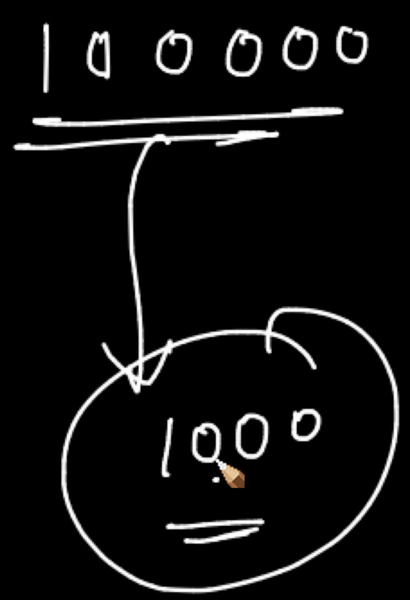
random

(1) Probability Sampling : → chance being selected

Non-random

(2) Non-probability : → not Every one





Probability Sampling techniques

** 1. Simple random ✓

2. Systematic

3. Stratified ✓

4. Cluster ✓

ML

ML

Simple random Sampling

randomly selected subset of a population

Sample

⇒ | 0 0 0 0

1 0 0 0

=> How many people like (coffee) (or) tea

=> ✓ population

✓ Contact

✓ proper resource, cost

100000

100

✓ Simple random sampling

1. Define population => 100000
2. Determine sample size => 1000
3. Randomly select your sample
4. Collect Data from sample

1.
2
3
4.
⋮
1000

Uniform Distribution

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

$P(\{1\}) = 1/6 \Rightarrow$

$\{2\}$ $1/6$

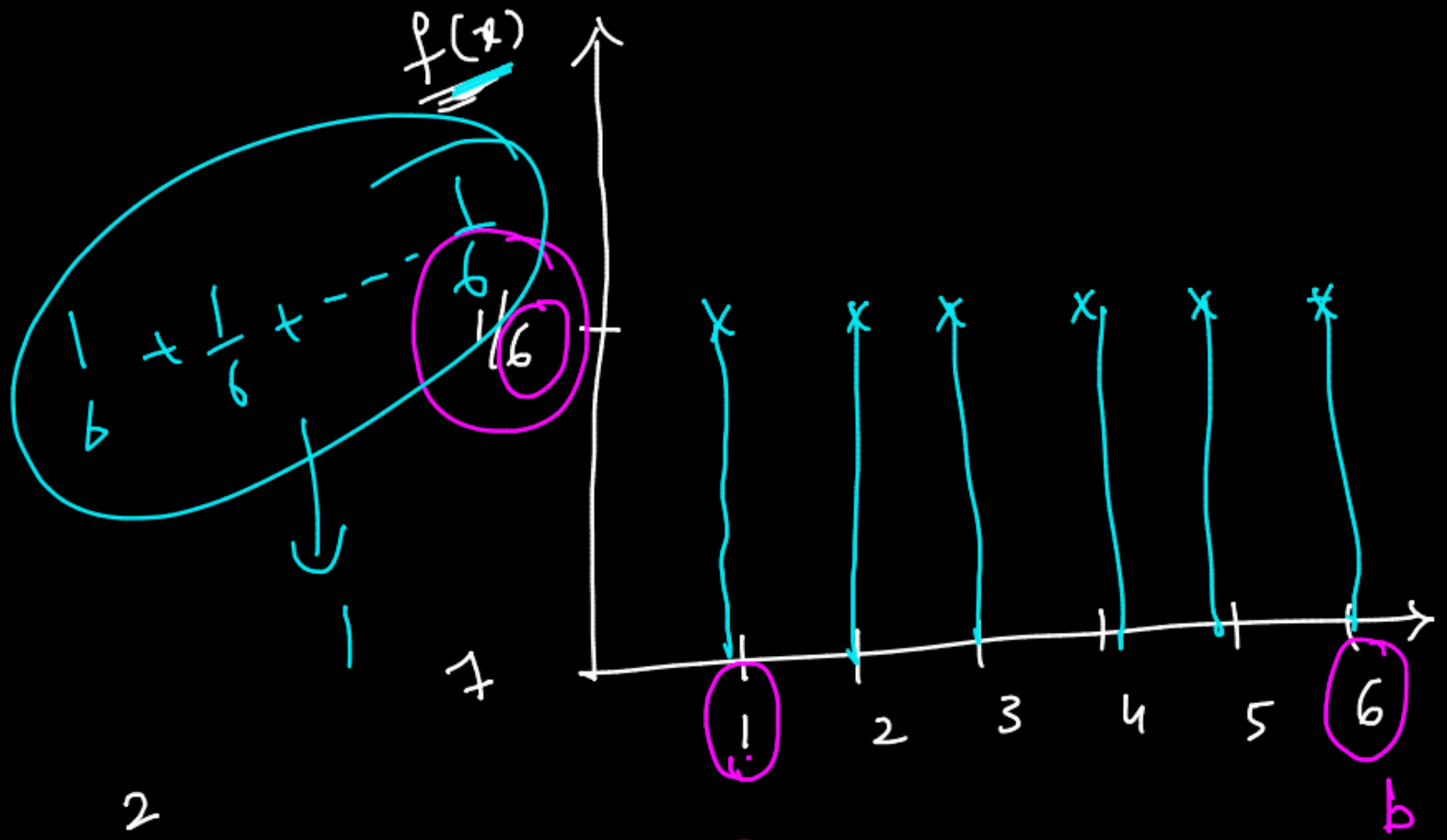
$\vdots$

$\{6\}$ $1/6$

1. Discrete uniform

2. Continuous " Distr

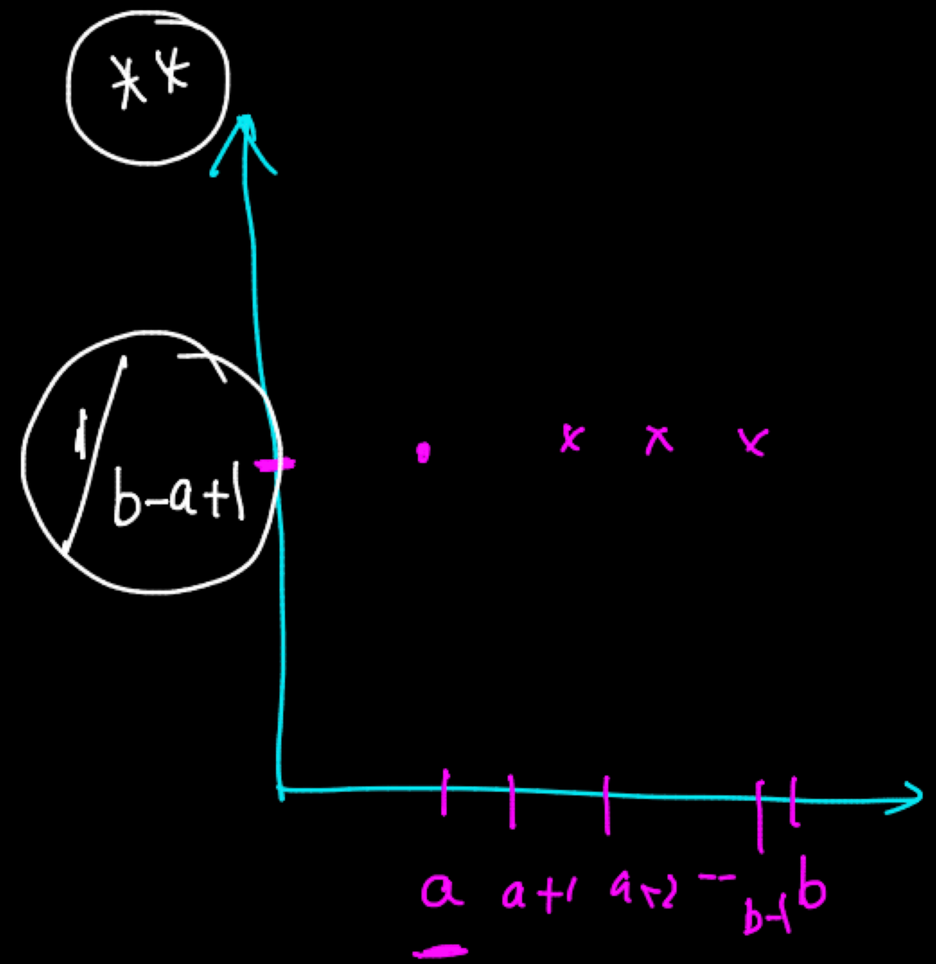
Discrete Uniform Distribution



$1/\max(a,b)$

$b-a+1$

$6-1$



$\Rightarrow$ we float 10 quizzes, with 4 options each

only 1 option is correct, and we are guessing the answer.

what is the probability that we will get atleast 4 answers

- ✓ $n = 10$
- ✓ $p = 1/4$

cdf

$P(X \geq 4)$

$\Rightarrow P(X=4) + P(X=5) + \cdots + P(X=10)$

$1 - \{P(X=1) + P(X=2) + P(X=3)\}$

$1 - P(X<4)$

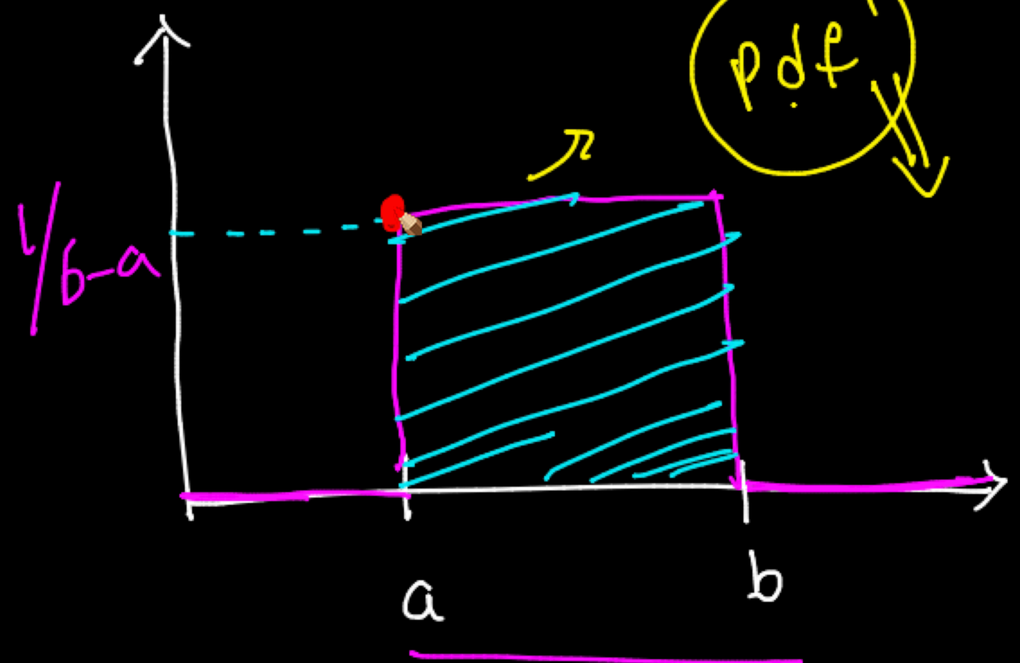
/ probability that we will get exactly 2 answers.

$n = 10$

$p = 1/4$

$$P(x = 2) = {}^{10}C_2 * \left(\frac{1}{4}\right)^2 * \left(\frac{3}{4}\right)^8$$

Pdf



pdf

Continuous R.V

P (a <= x = b)

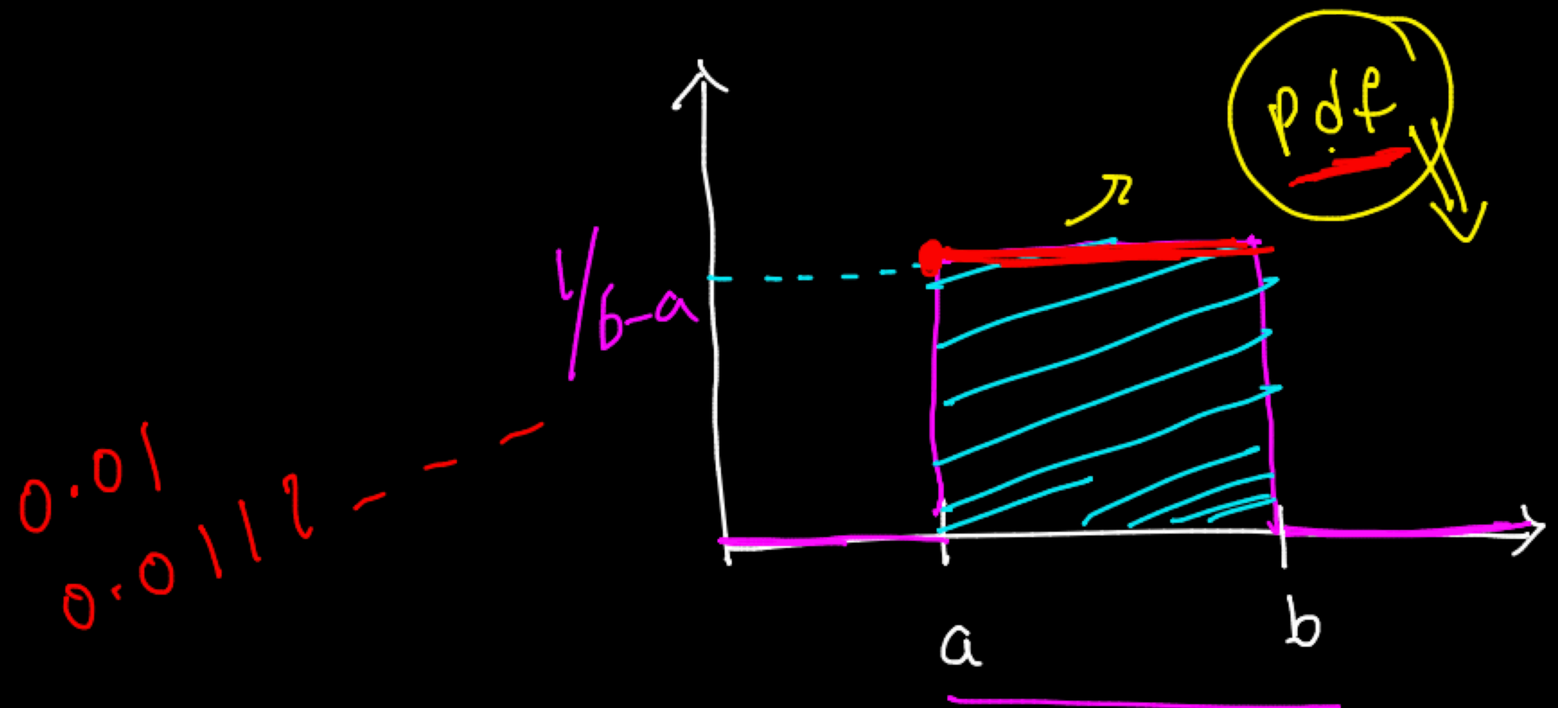
B * H

l = (b-a) * H

f(x)

f(H) = 1/b-a

pdf(x) = 1/b-a



Continuous R.V

P (a <= x = b)

0.01
0.0112 - - -

B * H

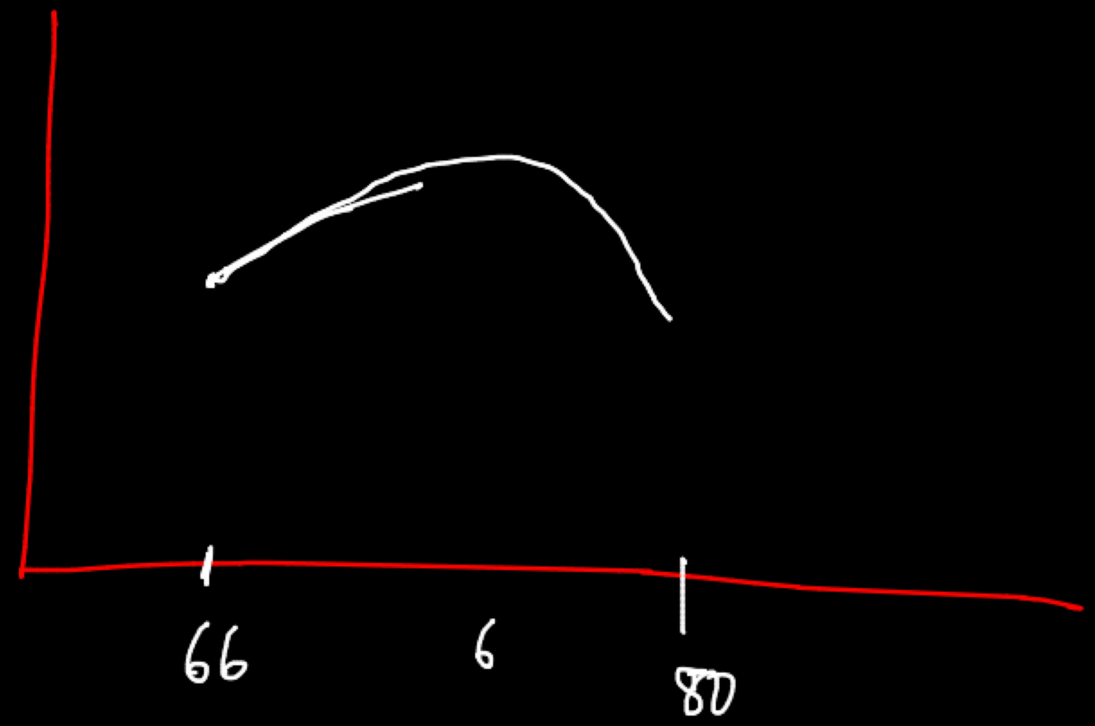
l = (b-a) * H

f(x)

f(H) = 1/b-a

pdf(x) = 1/b-a

66.125
66.25



Brilliant.
org

Cursor selected