Probability distribution

→ Possible value avariable Can take = $\frac{\text{Freq. For each value}}{\text{total no. of elements}}$

↳ mean (average) → μ

↳ Variance (how spreadout the data is) → σ^2

Population data (all)	Sample data (Part)
mean μ	mean $\bar{X}$
Variance σ^2	Variance S^2

Standard deviation σ (population)

S (sample)

Types of distributions $X \sim N(\mu, \sigma^2)$

discrete distribution

Finite no. of outcomes

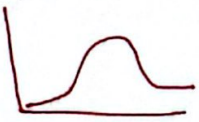
Die — picking Cards

→ if we Can say true or false we have Bernoulli Distribution

→ if we have many ittearion we have Binomial Distibution

→ Poisson distribution

Continious distri

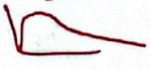


→ Normal distibut

→ T Distribution

→ Chi-squared

Asymmetric



Consist of nonnegative values

→ Exponential

Conditional Probability

$$P(E/F) = \frac{P(E \cap F)}{P(F)}$$

$P(E/F)$ ← بشرط حدوث F

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

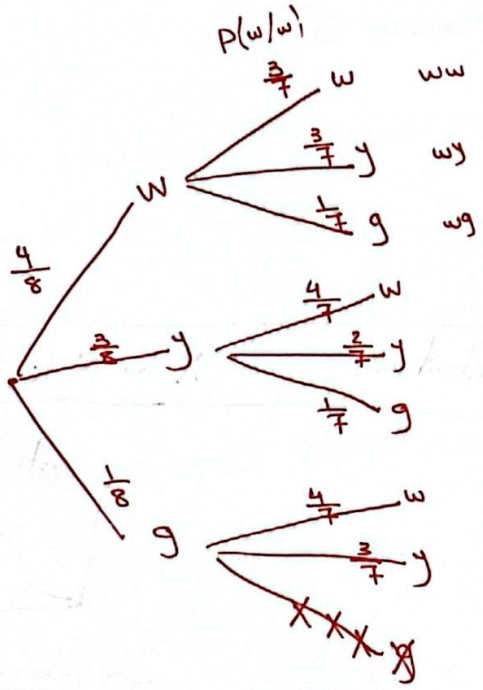
$A = \{1,3,5\}$

$B = \{1,2\}$

$P(B/A) = \frac{1}{3} = \frac{P(A \cap B)}{P(A)} = \frac{\frac{1}{6}}{3/6} = \frac{1}{3}$

4 white 3 yellow one green without replacement

$P(w/w)$ → tree diagram P(one white and one yellow)



$P(w \cap y) = P(w/y) * P(y) + P(y/w) * P(w)$

او

Independent Events

احداث غير معتمدة على بعضها

أنه الحدث لا يؤثر على السحبه (في المثال الي فات (with replacement

$$P(E|F) = P(E)$$ مهما كان

Criterion for independent events

$$P(E \cap F) = P(E) \cdot P(F)$$

$$\frac{P(E \cap F)}{P(F)} = \frac{P(E) \cdot P(F)}{P(F)}$$

① Die → 1 → 6

② Coin → H, T

③  .

$$P(1 \cap H \cap W) = P(1) \cdot P(H) \cdot P(W)$$

لا يوجد اعتماد ↙

$$= \frac{1}{6} * \frac{1}{2} * \frac{1}{4}$$

Coin → tossed repeatedly until the first tail appear

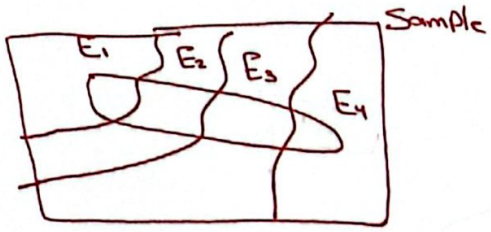
what P(tail) in 5^{th} trail

H → head $\quad P(h) = \frac{1}{2}$

T → tail $\quad P(t) = \frac{1}{2}$

$$P(h) \cdot P(h) \cdot P(h) \cdot P(h) \cdot P(t)$$

Law of total probability



$$P(B) = P(B \cap E_1) + P(B \cap E_2) + \dots + P(B + E_4)$$

mutually Exclusive

		defective
3 Machine	I → 0.4	2%
	II → 0.5	4 %
	III → 0.1	1 %

$P(\text{defective}) = ??$

$P(I) = 0.4$ $\quad P(D|I) = 0.02$

$P(II) = 0.5$ $\quad P(D|II) = 0.04$

$P(III) = 0.1$ $\quad P(D|III) = 0.01$

~~$P(D|I) = \frac{P(D \cap I)}{P(I)}$~~

$$P(D) = P(D \cap I) + P(D \cap II) + P(D \cap III)$$

$$= 0.02 * 0.4 + 0.04 * 0.5 + 0.01 * 0.1 = \checkmark$$

Bayess theorem

$$P(A/E) = \frac{P(A).\ P(E/A)}{P(E)}$$

$$P(A/B) = \frac{P(A) * P(B/A)}{P(B)}$$

Bay's theorem (clearly Explained)

$$P(\text{no love c \& loves} / \text{loves}) = \frac{P(\text{not lovee \& loves})}{P(\text{loves})}$$

$P(a)$

$P(b)$

$P(a/b) = \frac{P(a \cap b)}{P(b)}$ ✓

$\frac{P(b/a)}{1} = \frac{P(a \cap b)}{P(a)}$

$P(a/b) = \frac{P(a) * P(b/a)}{P(b)}$??

$P(b) = P(b/a) * P(a) + P(b/\bar{a}) * P(\bar{a})$

$P(b) =$ total