chapter 3
probability

Discrete r.v Distributions:

① The Binomial Distribution:

- When to use?

1- trails "عدد المحاولات" ≥ 1 → n ≥ 1

2- trails are independent

3- In each trail → success → p
→ failure → q

4- x: is the number of success in n trails

* $p(x) = \binom{n}{x} (p)^x (q)^{n-x}$

* $\mu = E(x) = np$

* $v(x) = npq$

② The Hypergeometric Distribution

⊖ When to use?

when you find yourself trying to get the ~~right~~ probability of that you choose 1 type of a set of 2 types "without replacement" where:

N: number of items

M: number of type 1

N-M: number of type 2

X: The number you want to calculate of M.

$$P(X) = \frac{\binom{M}{x}\binom{N-M}{n-x}}{\binom{N}{n}}$$

"Opportunities don't happen. You create them."

Date: / /

③ poisson Distribution:

- when to use?

When you need to pick randomly (x) items of a set that has:

n: number of items

u: precentage of special items

λ: n.u

$$p(x) = \frac{\lambda^x e^{-x}}{x!}$$

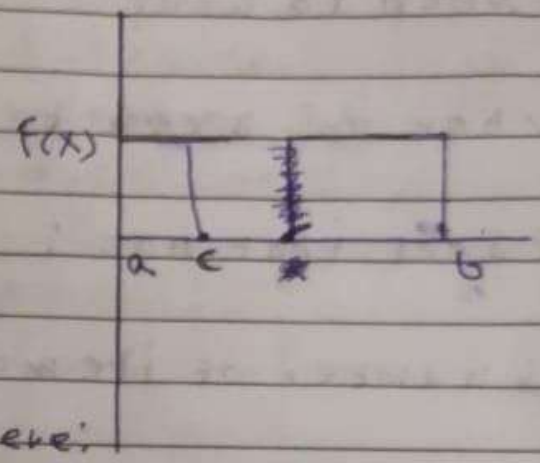
$$\mu = \lambda \ , \ \sigma^2 = \lambda$$

"Opportunities don't happen. You create them." Date: / /

The Continuous Distributions

1 The uniform (Rectangular) Distribution:

An event (x) is happening between a, b



where $x \rightarrow a \leq x \leq b$

you want to calc p(x) where:

$c \leq X \leq b$ by calculatin the area of the rectangle

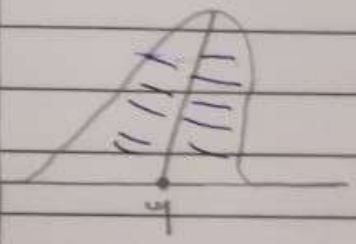
$p(x) = \bar{cb} \cdot f(x)$

$= (b-c) \cdot \frac{1}{a-b} \cdot$

② The Normal Distribution:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

- ✱ Has a bell-shaped graph
- ✱ $p(x<\mu) = p(x>\mu) = \frac{1}{2}$
- ✱ mean $= \mu$, variance $= \sigma^2$
- ✱ $p(\mu-\sigma<x<\mu+\sigma) = 68{,}26\%$



Standard normal distribution:

1- convert from X to Z where

X: Normal Dist r.v

Z: standard Normal Dist r.v

- ✱ $z = \frac{x-\mu}{\sigma}$
- ✱ $p(a<x<b) = F(b) - F(a)$
- ✱ $F(-a) = 1 - F(a)$