Binomial Distribution

> Bemoulli trial.

The Binomial Experiment.

-> X (Raudom Variable) that equals the # 03 trials that result in a success (x) from among M Bernoulli trials is called a Prinomial RV with parameters

OKP<1 and n=1,2,3,...

- · n is the total # of trials,
 · re is the # of trials that result in
 - · n-x is the # of trials that result in a failure,
 - \Rightarrow = Prob (succes) = $\frac{\pi}{n}$
 - · q = P(failure) = n-x or 1-p.

Success) P (failure)

To develop the PD for a Psinomial Random Experiment: (i) Must first determine the prob. of any one way the event of interest can occur.

of success = x

P (success) = p (ii) Then nultiply this prob. by the total

the of ways that this event of interest

can occur. ((n,x) = "(= n! and 0!=1 n!= nx (n-1) x (n-2) x ... x 3 x 2 x 1 The Prob. of one of the ways the event of intent can occur = px. qn-x Then,
Binomial RV X's PMF: f(x)= P(x=x)="(xpx.qn-x)

flavours = { Vanilla, Clisc, Strouberry, Black Convent,
Pistachio?

Assuming every transaction involves the purchase of a single ice cream only, find the probability that exactly 1 customer purchases one 'Strawberry' ice cream, in the next 5 customers.

We can use Binomial Dist, to determine its probability.

Experiment: determining the Prob of next customer purchasing a strawbury flavoured ice cream.

Event of interest = "A customer purchasing one Stranberry ice-cream."

Prob(succes) = p = 1 = 0.2

Prob (failure) = q = 1-p= 1-0.2 = 0.8 (4)

of trials: n=5

# of Successes	# of failure	w(x	Total Possible Ways	
O	5	<i>و</i> ره	1	
,	4	5 (5	
2	3	5(2	10	
3	2	5(3	۵۱	
4	1	564	5	
5	D	505	1	
			Σ=32	

$$X = \{20, 1, 2, 3, 4, 5\}$$

It of outcomes associated with our event of interest:

No. of successes

success is > "A customer purchasing ONE stranbeurg ice-cream"

This table shows the different ways in which the event of interest can occur:

Trials	Triall	Triol 2	Indol 3	Trial 4	Trials	px n-x	
·						= (0.2) x (0.8)	
	5 0.2	F0.8	F	F	F	0.08192	
Dutrone	F0.8	5 6.2	F	F	F	0.08192	
Dolar	F 0.8	F0.8	50.2	F	F	~	
	E 0.8	F .	F	502	F	n	
	F0.8	F.	F	F	S0.2	n	
		·					

$$P(-) = {}^{5}C_{1} \times 0.08192 = 5 \times 0.0819$$

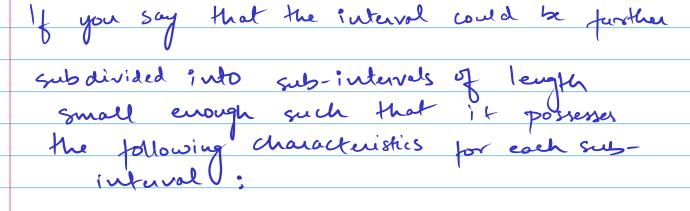
= 0.409599
= 40.95991.

Poisson Distribution

The Poisson Process:

In an interval of Real Numbers, let's assume their counts (ie success or an outcome of extreet -> x) occurring randomly

Throughout the interval



- (i) P (success >1) is almost O.
- (ii) P(success=1) would be the same for every subinterval I its value would be proportional to the sub-interval length.
- (iii) n (success) in each sub-interval would be independent of other sub-intervals.

 Doisson Process.

The Poisson Dist:

The RV (X) that equals the # of counts in the intuval of a Poisson process is called a Poisson RV with pavameter O(), and the PMF:

$$f(x) = P(X=x) = e^{\lambda} \cdot \lambda^{x}$$

$$x!$$

where x=0,1,2,3,...= # of counts ic.

the total # of successes

in the provided interval. λ = successes count we are expecting in the provided interval. e= 2.718 (Euler's Numba). Q) l= 10 austanus | h~ She wants to plan out to close the parlow for the day in another one hour. Calculate the prob of 12 or more customers visiting the parlour.

Sol4: Esperiment: determine >, 12 customers. Interval: 1 hour $\mu = \lambda = 10$ Event of interest: P(X)/12) = P(x=12) + P(x=13) + P(x=14) + ...= 1- P(X < 11)

Random Variable (X): X = # of Customers visiting the parlowr $X = \{0, 1, 2, 3, ... \}$